WEF Western Flat Land System

Area: 22,033 ha

Annual rainfall: 520 - 560 mm average

Geology: The land system is formed on an ancient coastal dune-corridor system. The dunes (originally consisting of silica and shell sands) have hardened into calcarenite which is the main geological material underlying the rises and low hills of the System. Between the dunes are flats and corridors underlain by Tertiary clays and clayey sands, presumably exposed by erosion and/or dissolution on low rises on the flats. These are characterised by bright coloured sandy clay sandstone deposits. The original dune sands have become more quartzitic over time as the calcareous component has been dissolved out. This sand has been reworked into sand spreads on both rises and flats.

Topography: The Western Flat Land System has a characteristic topographic pattern of rises and low hills formed on calcarenite, surrounded by gently undulating plains. The rises and low hills are up to 40 m high with slopes of 10%. Very low rises (formed on windblown sands, calcarenite or Tertiary sediments) alternate with flats formed on Tertiary sediments on the undulating plains.

Elevation: 50 m in the west to 110 m in the east

Relief: Up to 40 m

Soils:

Sandy soils (dunes, rises and flats)

H3 Bleached siliceous sand
G2 Sand grading to sandy clay loam
G3 Thick sand over clay
G4 Sand over poorly structured clay

Stony soils

B2 Shallow calcareous loam on calcrete
B3 Shallow sandy loam on calcrete
B4 Shallow red loam on calcrete
B6 Shallow loam over red-brown clay on calcrete
B7 Shallow sand over clay on calcrete

Heavy soils (flats, rises and swamps)

F2 Sandy loam over poorly structured brown or dark clay
E3 Grey or brown cracking clay
M2 Deep friable gradational clay loam
N3 Wet soil (non to moderately saline)
WW Water

Main features: The Western Flat Land System comprises two distinct components. Undulating to very gently undulating flats are characterised by sand over clay soils with marginal fertility and variable drainage characteristics depending on depth to and nature of clayey subsoil. Swamps and waterlogged depressions are a feature of lower lying areas. Low rises associated with the flats have mainly deep sandy soils. More prominent rises and low hills have mixed stony soils and sands which are well drained but with moderate to very low fertility and limited waterholding capacity.

Soil Landscape Units summary: 16 Soil Landscape Units (SLUs) mapped in the Western Flat Land System

SLU	% of area	Main features #
MHB MHC	0.53 30.5	Undulating rises and low hills with relief varying from 10 m to 40, and slopes of up to 10%. In the northern areas there is a distinct WNW – ESE lineation in the rises corresponding to the ancient coastal dunes, although the ridges are discontinuous. In the south, the lineation is less apparent. There is extensive surface calcrete stone and sheet rock in places, particularly on the more exposed south west facing slopes. Sand spreads are common, particularly on the north east facing slopes. In places the sand occurs as low east - west dunes. lated sandhills throughout the northern parts of the land system with up to 20 m high and slopes up to 6%. The ridges are formed on calcreted calcarenite and are partially overlain by sand spreads which tend to be more extensive on the eastern slopes. Sand is sometimes in dune form. **MHB** Undulating plains to rises **MHC** Undulating rises to low hills Main soils: bleached siliceous sand - **H3** (V) and sand grading to sandy clay loam - **G2** (C). These soils are deep with low fertility, moderate waterholding capacity and rapid drainage. Severe water repellence and soil acidity are limitations for pasture and crop growth and is susceptible to wind erosion. The shallow soils include shallow sandy loam on calcrete - **B3** (M), shallow red loam on limestone – **B4** (M), shallow sand over clay on calcrete - **B7** (M) and shallow calcareous loam on calcrete - **B2** (M). This land is semi-arable as these soils are very shallow and/or stony and have moderately low to low waterholding capacity and fertility.
MJC	0.02	Undulating to low hills on which there is extensive surface calcrete stone and sheet rock in places, particularly on the more exposed south west facing slopes. Sand spreads are common, particularly on the north east facing slopes. In places the sand occurs as low east - west dunes. Main soils: shallow sandy loam on calcrete - **B3** (E), shallow red loam on limestone – **B4** (C), shallow sand over clay on calcrete - **B7** (L) and shallow calcareous loam on calcrete - **B2** (C). This land is semi-arable as these soils are very shallow and/or stony and have moderately low to low waterholding capacity and fertility. The minor soils are bleached siliceous sand - **H3** (L) and sand grading to sandy clay loam - **G2** (L). These soils are deep with low fertility, moderate waterholding capacity and rapid drainage. Severe water repellence and soil acidity are limitations for pasture and crop growth and is susceptible to wind erosion
NFG	0.53	Lower slopes associated with the ranges of Soil Landscape **MHC**, formed on calcreted calcarenite and calcified sandy clay outwash sediments. Main soils: shallow sand over clay on calcrete - **B7** (E), thick sand over clay - **G3** (E) and sand over clay - **G4** (E). These soils are moderately deep to deep with moderately low fertility. The waterholding capacity would be moderately low to moderate depending on the depth to calcrete. These soils will be susceptible to water repellence and soil acidity and slight limitations to root growth due to some poorly structured subsoil clays.
OQC OQI	0.4 2.21	Jumbled low sand dunes and associated enclosed flats. Sandy complex with up to 90% sand dunes of varying height. The dunes generally run east-west to NW-SE with sandy flats interspersed. This unit has minor depressions. **OQC** Single dune or over 90% sand dune coverage **OQI** 30-60% sand dune coverage Main soils: bleached siliceous sand - **H3** (E), sand grading to sandy clay loam - **G2** (E), thick sand over clay - **G3** (C). The sandy soils are deep with low fertility, moderately low waterholding capacity and rapid drainage. Severe water repellence and soil acidity are limitations for pasture and crop growth and the land is susceptible to wind erosion. The waterholding capacity on the flats is moderate and the drainage is imperfect where the dispersive subsoil clays cause water to perch. These soils have marginal fertility due to sandy surface textures, susceptibility to water repellence and soil acidity, and restricted root growth due to the subsoil clays.

PCB PCb	0.7 0.5	Gently undulating plains to rises found to the west of the Land System between sandy rises and dunes. **PCB** Undulating rises **PCb** Undulating rises with 10-30% sand dunes Main soils: thick sand over clay - **G3** (E), bleached siliceous sand - **H3** (E), sand grading to sandy clay loam - **G2** (C) and sand over clay - **G4** (L). These soils are deep and have moderately low to low fertility. The plain soils will be susceptible to water repellence and slight limitations to root growth due to poorly structured subsoil clays. Soil acidity may also be a slight limitation on all soils. The rises are limited by severe water repellence, low fertility and susceptibility to wind erosion.
PQA	1.16	Flats and swamps within sand plains. Main soils: sandy loam over poorly structured brown or dark clay - **F2** (E), deep friable gradational clay loam - **M2** (E), grey or brown cracking clay - **E3** (M) and wet soil - **N3** (M). These soils are characterised by waterlogging for up to several months and poorly structured clay within 20 cm which will restrict root growth penetration. These areas are not suitable for cropping
PRA	22.7	Level plains with minor swamps. **PRA** Level plains to gently undulating plains with less than 10% swamps Main soils: sand over poorly structured clay - **G4** (V) and thick sand over clay - **G3** (E). These soils are deep and have moderately low fertility and moderate to high waterholding capacity. There is a moderate limitation to emergence and root growth due to the dispersive subsoil clays. Water repellence, soil acidity and the slight risk to wind erosion are other minor limitations.
PXA PXa	2.55 1.25	Level to very gently undulating plains with 10-30% sand dunes and minor swamps. **PXA** Level plains to gently undulating plains **PXa** Level plains to gently undulating plains with 10-30% sand dunes Main soils: sand over poorly structured clay - **G4** (E), thick sand over clay - **G3** (C), sandy loam over poorly structured brown or dark clay - **F2** (C), bleached siliceous sand - **H3** (L), bleached sand over sandy clay loam - **G2** (L) and wet soil - **N3** (M). The deep sands have low fertility and moderate waterholding capacity, are acidic and susceptible to water repellence. The sand over clay soils exhibit similar potential to acidification and water repellence however their main limitation is imperfect drainage due to the dispersive subsoil clays at quite a shallow depth. This will also pose emergence and root growth restrictions. These soils have moderately low to moderate fertility and have high waterholding capacity. The low lying areas are prone to inundation and the rising ground to wind erosion.
PYA PYB PYb	0.5 0.6 35.6	Gently undulating plains to gently undulating rises with 10-30% sand dunes and no swamps. **PYA** Gently undulating plain **PYB** Undulating rises **PYb** Undulating rises with 10-30% sand dunes Main soils: sand over clay - **G4** (C), bleached siliceous sand - **H3** (C), thick sand over clay - **G3**(C) and sand grading to sandy clay loam - **G2** (C). (M). These soils are deep and have moderate to low fertility, depending on elevation. The deep sandy soils limitations are soil acidity, water repellence, rapid drainage and susceptibility to wind erosion while the shallow sand over clay soils limitations include limited root growth penetration due to dispersive subsoil clay, susceptibility to waterlogging and soil acidity. The minor shallow soil shallow loam over red-brown clay on calcrete - **B6** has moderately low to low waterholding capacity and fertility. The minor loam over red clay - **D2** soil has high fertility and waterholding capacity however this soil is found sporadically.
Xq-	0.25	Fresh to marginally saline swamps, at least seasonally inundated.

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:

Sandy soils (dunes, rises and flats)

H3 Bleached siliceous sand (Arenic, Bleached-Orthic Tenosol)
Thick to very thick bleached sand, organically darkened at the surface over yellow sand continuing below 150 cm. Common on rises.

G2 Sand grading to sandy clay loam (Mesotrophic, Yellow Kandosol)
Thick bleached sand, organically darkened at surface, over a yellow and red friable massive sandy clay loam

G3 Thick sand over clay (Eutrophic-Calcic, Brown Chromosol)
Thick to very thick bleached sand to loamy sand with an organically darkened surface abruptly overlying a friable yellowish brown and red sandy clay, with or without soft carbonate accumulations. Extensive on flats and low rises.

G4 Sand over poorly structured clay (Sandy Hypercalcic, Brown Sodosol)
Thin to medium thickness sand sharply overlying a brown and yellow or grey mottled dispersive clay with strong columnar structure, calcareous with depth. Extensive on flats.

Stony soils

B2 Shallow calcareous loam on calcrete (Petrocalcic, Lithocalcic Calcarosol)
Thin stony loam to clay loam with overlying a brown clay loam overlying a calcreted calcarenite shallower than 50 cm. Limited on stony rises.

B3 Shallow sandy loam on calcrete (Petrocalcic, Orthic Tenosol)
Loamy sand to loam with variable rubble and slight clay increase with depth overlying calcreted calcarenite shallower than 50 cm. Extensive on stony rises.

B4 Shallow red loam on calcrete

B6 Shallow loam over red-brown clay on calcrete

B7 Shallow sand over clay on calcrete (Petrocalcic, Yellow Chromosol)
Medium thickness sand overlying yellow friable clay on limestone or calcreted sandy clay within 50 cm. Limited in corridors between stony rises.

Heavy soils (flats, rises and swamps)

F2 Sandy loam over poorly structured brown or dark clay (Eutrophic, Mottled-Mesotrophic Brown Sodosol)
Thin to medium sandy loam surface over a loamy sand layer sharply overlying a brown and yellow dispersive mottled clay with strong columnar structure. With depth the clay grades to a yellow sandy clay.

E3 Grey or brown cracking clay

M2 Deep friable gradational clay loam

N3 Wet soil (non to moderately saline) (Dermosolic, Oxyaquic Hydrosol)
Medium thickness clay overlying a dispersive grey clay with increasing pH at depth.

D2 Loam over red clay

Further information: DEWNR Soil and Land Program