

# WLS Wells Land System

**Area:** 12,166 ha

**Annual rainfall:** 525 – 600 mm average

**Geology:** The land system is underlain by sediments of the Padthaway Formation, which includes clays and interbedded sands and limestones or dolomites, deposited in coastal lagoons as the sea gradually receded over the last few hundred thousand years. Miscellaneous swamp floor sediments have subsequently accumulated in lower lying areas. Protruding through the Padthaway sediments are scattered calcarenites, probably islands in the old lagoons. The rises are variably covered by deposits of Molineaux Sand.

**Topography:** The Wells Land System is a NNW-SSE trending flat (inter-dune corridor), bordered by ancient coastal dune ranges on both the western and eastern sides. The corridor has an imperceptible fall to the north. Drains have been installed to assist the flow of surface water into the Log Crossing – Messent watercourse which is the northern extension of the Wells System. There is also a fall to the west causing water to pond against the western range. There is a saline water table within a metre or so of the surface over most of the flats, so they are characteristically marginally to highly saline. There are occasional swamps. These are considered to be pre-European features where water tables have been at the surface for substantial periods. Seasonal inundation is a feature of non-swampy lower lying areas. Low rises scattered across the flats are less than 15 m high, and have a general lineation parallel to the higher ranges on each side. Sands blown over the top of the rises commonly occur as low dunes with an east-west orientation.

**Elevation:** 13 m on the flats to 35 m on crests of some rises

**Relief:** Up to 15 m

**Soils:** *Sandy soils (Sandy rises and flats)*

- H3** Bleached siliceous sand
- G2** Bleached sand over sandy clay loam
- G3** Thick sand over clay
- G4** Sand over poorly structured clay

*Stony rise soils (minor)*

- B2** Shallow calcareous loam on calcrete
- B3** Shallow sandy loam on calcrete
- B4** Shallow red loam on limestone
- B7** Shallow sand over clay on calcrete
- L1** Shallow soil on rock
- RR** Limestone outcrop

*Other soils (flats and swamps)*

- B5** Shallow dark clay loam on limestone
- M2** Deep friable gradational clay loam
- N2** Saline soil

**Main features:** The Wells Land System consists of two distinct elements, viz. flats and rises. The flats are generally poorly drained with saline water tables within a metre or two of the surface. Soils typically have sandy surfaces and mottled clayey subsoils which impede drainage and root growth. Fertility is moderate to low. The main limitations to productivity are waterlogging and salinity. Generally the flats are too saline for clovers or conventional perennial grasses to persist. The rises are well drained and not saline, but have either stony and often very shallow soils of moderately low fertility or highly infertile and erosion prone sandy soils.



**Soil Landscape Unit summary:** 11 Soil Landscape Units (SLUs) mapped in the Wells Land System

SLU	% of area	Main features #
A-g	0.3	Isolated granite outcrops. There is extensive rocky outcrop and surface stone. Main soils: <u>shallow soil on rock</u> - <b>L1</b> (D). These areas have little agricultural value.
MHB MHt	0.2 0.6	Isolated sandy rises with less than 15 m relief formed on calcarenite that is overlain with Molineaux Sand. These rises occur to the western side of the plain, but have a general lineation parallel to the higher older coastal dunes to the west. The rises are outliers of these higher ranges. There are minor swampy depressions within the rises. <b>MHB</b> Gently sloping rises <b>MHt</b> Gently sloping rises with 10-50% swampy saline depressions Deep sandy soils: <u>bleached siliceous sand</u> - <b>H3</b> (E) and <u>sand grading to sandy clay loam</u> - <b>G2</b> (E). 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. Shallow soils: <u>shallow sandy loam on calcrete</u> - <b>B3</b> (L), <u>shallow red loam on limestone</u> - <b>B4</b> (L), <u>shallow sand over clay on calcrete</u> - <b>B7</b> (M) and <u>shallow calcareous loam on calcrete</u> - <b>B2</b> (M). This land is semi-arable as these soils are very shallow and/or and have moderately low to low waterholding capacity and fertility. Swampy soils: <u>saline soil</u> - <b>N2</b> (M). These soils are deep, have moderately low fertility, moderate waterholding capacity and poor to very poor drainage. There is a slight limitation to root growth due to the dispersive subsoil clay. Salinity levels are high to very high.
MJB	11.8	Low stony rises of less than 15 m relief formed on calcarenite and partially overlain by windblown Molineaux Sand. The rises are scattered across the flats, but have a general lineation parallel to the higher older coastal dunes to the west. The rises are outliers of these higher ranges, and are probably protruding crests of very low ranges, now mostly covered by younger sediments. There are minor swampy depressions within some of the larger rises. Main soils: <i>Stony rises:</i> <u>shallow sandy loam on calcrete</u> - <b>B3</b> and <u>shallow sand over clay on calcrete</u> - <b>B7</b> . <i>Sandy rises:</i> <u>bleached siliceous sand</u> - <b>H3</b> and <u>sand grading to sandy clay loam</u> - <b>G2</b> .
NZp	0.8	Flat plain with 20-29% sandy rises and 0-10% swamps formed on calcreted sediments of the Padthaway formation. Main soils: <u>sand over poorly structured clay</u> - <b>G4</b> (V), <u>thick sand over clay</u> - <b>G3</b> (L) <u>shallow dark clay loam on limestone</u> - <b>B5</b> (M), <u>deep friable gradational clay loam</u> - <b>M2</b> (M) and <u>saline soil</u> - <b>N2</b> (M). These soils are of moderate to shallow depth, moderate fertility and moderate to moderately low waterholding capacity. Drainage is imperfect to poor. Salinity levels vary from moderate to moderately high due to rising saline groundwater tables. There is a slight to moderate limitation to root growth due to the dispersive subsoil clay. The sandy soils on the rising ground include <u>bleached siliceous sand</u> - <b>H3</b> (M), <u>sand grading to sandy clay loam</u> - <b>G2</b> (M), and <b>G3</b> . These soils are deep with moderately low fertility, moderate waterholding capacity and slightly imperfectly drained. Moderate water repellence and the susceptibility to wind erosion are limitations.
ZS-	1.1	Saline swamps formed on calcareous clays and marls. These are natural features, representing the lowest points in the local landscape. They are seasonally inundated. Vegetation is commonly a reflection of the level of salinity. Cutting grass is common on moderately saline land, tea tree and samphire on highly saline land, while extremely saline land is usually bare. Main soils: <u>saline soil</u> - <b>N2</b> (D). These soils are very poorly drained with high to extreme salinity and are seasonally inundated. The swamps are too saline for any production other than opportunistic light grazing, but protection of halophytic vegetation must be considered.
ZnJ ZnL Znj	39.8 28.3 14.1	Flat plains with up to 10% low stony and sandy rises formed on clayey and limestone sediments of the Padthaway Formation. The lowest lying ground tends to be swampy and the land is seasonally waterlogged and affected by saline groundwater tables. <b>Znj</b> and <b>Znl</b> is land where salinity is higher



Znl	1.7	<p>and which is subject to inundation in wet years.</p> <p><b>ZnJ</b> Plains with 10-50 % swamps and 0-10 % stony rises</p> <p><b>ZnL</b> Plains with 10-50% swamps and 0-10% mixed rises (stony and sandy)</p> <p><b>Znj</b> Plains with 10-50% saline swamps and 0-10% stony rises</p> <p><b>Znl</b> Plains with 10-50% saline swamps and 0-10% mixed rises (stony and sandy).</p> <p>Main soils: <u>sand over clay</u> - <b>G4</b> (E), <u>saline soil</u> - <b>N2</b> (E), <u>shallow sandy loam on calcrete</u> - <b>B3</b> (L), <u>shallow sand over clay on calcrete</u> - <b>B7</b> (M) and <u>limestone outcrop</u> - <b>RR</b> (M).</p> <p>The flats are imperfectly to poorly drained due to shallow water tables and dispersive clay subsoils. The subsoil clays will also provide a moderate limitation to root growth. There is moderate waterholding capacity and moderately low fertility. The flats require salt tolerant species for productive pasture growth (ie clovers and conventional perennial grasses will not persist on most of this land).</p> <p>The rises are not salt affected but have low fertility and moderately low waterholding capacity. The soils are mainly very shallow stony soils with up to 20% surface calcrete stone.</p>
ZpK	1.3	<p>Plains with extensive swamps and up to 10% sandy rises formed on calcreted sediments of the Padthaway formation. This soil landscapes is found to the south of the Land System adjoining sandy rise bridge of the Peacock Land System Ranges. Groundwater tables are within one or two metres of the surface.</p> <p>Main plain and swamp soils: <u>sand over poorly structured clay</u> - <b>G4</b> (E), <u>saline soil</u> - <b>N2</b> (E) and <u>deep friable gradational clay loam</u> - <b>M2</b> (M).</p> <p>These soils are deep, have moderately low fertility and high waterholding capacity. There is a moderate limitation to root growth due to the dispersive subsoil clay. The drainage is imperfect to very poor, there is moderately high to high salinity and the land is seasonally inundated. The majority of the area has only salt tolerant species present. The productive potential is very low.</p> <p>Sandy rise soils: <u>thick sand over clay</u> - <b>G3</b> (M), <u>bleached siliceous sand</u> - <b>H3</b> (M) and <u>sand grading to sandy clay loam</u> - <b>G2</b> (M).</p> <p>These soils are deep with moderately low fertility, moderate waterholding capacity and are slightly imperfectly drained. Moderate water repellence and the susceptibility to wind erosion are limitations.</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:

- B3** Loamy sand over sandy clay loam on calcrete (Petrocalcic, Brown Kandosol / Petrocalcic, Leptic Tenosol)  
Medium to thick loamy sand with a bleached A2 layer, sometimes with a thin brown friable light sandy clay loam subsoil, over calcreted calcarenite.
- B7** Sand over friable brown clay on calcrete (Petrocalcic, Brown Chromosol)  
Medium thickness sand overlying brownish friable clay on limestone or calcreted sandy clay within 50 cm.
- G2** Sand grading to sandy clay loam (Mesotrophic, Yellow Kandosol)  
Grey sand with a thick bleached A2 layer, over a yellow and red friable massive sandy clay loam.
- G3** Thick sand over clay (Hypercalcic, Brown Sodosol/ Chromosol)  
Thick bleached sand with an organically darkened surface abruptly overlying a massive to coarsely structured brown to reddish yellow sandy clay to clay, calcareous with depth - rises.
- G4** Sand over poorly structured clay (Lithocalcic / Calcic, Brown / Grey Sodosol)  
Medium to thick sand abruptly overlying a brown and grey mottled columnar sandy clay loam to sandy clay, with rubbly or soft carbonate at depth.



- H3** Deep bleached sand (Basic, Arenic, Bleached-Orthic Tenosol)  
Grey sand with a thick to very thick bleached A2 layer, over yellow sand continuing below 100 cm.
- L1** Shallow stony loam (Paralithic, Leptic Tenosol)  
Shallow stony loam, often calcareous throughout or with depth, overlying weathering rock shallower than 50 cm.
- N2a** Wet highly saline grey clay (Dermosolic, Hypersalic Hydrosol)  
Medium thickness dark grey to black clay loam to clay grading to a well structured dark grey clay with minor carbonates and a water table within 100 cm.
- N2b** Wet highly saline calcareous loam (Calcarosolic, Hypersalic Hydrosol)  
Grey very highly calcareous loam grading to a pale grey clay loam over a white very highly calcareous silty clay loam by about 30 cm, with a water table within 100 cm.
- N2/G4** Sand over wet saline clay (Sodosolic, Hypersalic Hydrosol)  
Medium thickness loamy sand abruptly overlying a grey and yellow brown mottled clay (seasonally saturated), with massive to rubbly carbonate at depth and a saline water table within 100 cm.
- RR** Bare rock
- WW** Water

*Sandy soils (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 100 cm.
- G2** Bleached sand over sandy clay loam (Sandy Petrocalcic, Brown Chromosol-Kandosol)  
Medium to thick sand with a bleached A2 layer abruptly overlying a brownish friable light sandy clay loam to sandy clay over calcreted calcarenite
- G3** Thick sand over clay (Mesotrophic, Mesonatric, Brown Chromosol/Sodosol)  
Thick to very thick sand with a pale sand layer directly overlying a brownish clay
- G4** Sand over poorly structured clay (Mesonatric, Brown/Grey Sodosol)  
Thick organically stained sandy surface overlying a pale sand layer overlying a brown poorly structured clay on limestone or calcrete usually within 100 cm.

*Stony soils (rises and flats)*

- B2** Shallow calcareous loam on calcrete (Hypocalcic, Petrocalcic Grey/Black Calcarosol)  
Thin to medium thickness calcareous clay loam becoming more calcareous, more clayey and greyer with depth, overlying calcreted lagoonal sediments at less than 50 cm.
- B3** Loamy sand over sandy clay loam on calcrete (Petrocalcic, Brown Kandosol / Petrocalcic, Leptic Tenosol)  
Medium to thick loamy sand with a bleached A2 layer, sometimes with a thin brown friable light sandy clay loam subsoil, over calcreted calcarenite.
- B4** Red sandy loam over calcrete (Petrocalcic, Red Dermosol)  
Medium thickness red sandy loam grading to friable red clay loam over calcreted calcarenite within 50 cm - rises.
- B5** Shallow dark clay loam on limestone (Petrocalcic, Black Dermosol)  
Black clay loam to light clay over calcreted limestone at shallow depth, grading to highly calcareous clay - flats.
- B7** Shallow sand over clay on calcrete (Petrocalcic, Yellow/Brown Chromosol)  
Medium thickness sand overlying yellow friable clay on limestone or calcreted sandy clay within 50 cm.



**L1** Shallow soil on rock (Gritty Red Kandosol)

Variable thickness gritty red loamy sand to sandy loam, becoming more clayey with depth over weathering rock.

**RR** Limestone outcrop (Petrocalcic, Leptic Rudosol)

Organically stained sandy to loamy sand surface over a sandy sub-soil with very little development on limestone or calcrete.

*Other soils (flats and swamps)***M2** Deep friable gradational clay loam (Red-Brown-Grey- Black Dermosol)

Deep well structured red clay loamy soil.

**N2** Saline soil (Dermosolic, Salic Hydrosol)

Grey clay loam grading to pale grey calcareous light clay directly overlying a white very highly calcareous silty clay loam by about 30 cm, with a water table within 100 cm.

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

