MNA McNamara Land System

Very gently undulating plains occupying most of the Hundred of McNamara

Area: 428.5 km²

Annual rainfall: 495 – 540 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. Superimposed on the sediments are Recent windblown sands (Molineaux Sands). There are minor outcrops of Bridgewater Formation calcarenites (remnants of old coastal dunes). Swamps which are common in low

lying areas are frequently veneered by thin black clay layers.

Topography: The McNamara Land System is an extensive plain lying between two ancient coastal dune

ridges (to the west and the east). There is virtually no fall from east to west, but drift sand deposits in the form of parabolic and jumbled dunes and low irregular rises provide internal relief of 5 - 20 m. There is a saline watertable within a metre or so of the surface over most of the flats, so they are characteristically marginally to highly saline. Swamps are common. 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.

Elevation: 30 m on the highest dunes to 10 - 15 m over substantial areas of flats

Relief: Maximum relief is 20 m, but more usually flats to sand rise relief is 5 - 15 m

Soils: Sandy surfaced soils are dominant. Some are deep, while others have subsoils ranging from

friable light sandy clay loams through to dispersive clays or calcrete. A variety of wet saline

soils occur in depressions.

Main soils

Soils of poorly drained flats and swamps

N2/G4 Sand over yellow and grey saline clay B7/N2 Sand over saline clay on calcrete

N2a Wet saline sand

N2b Wet highly saline grey clay N2c Wet saline calcareous loam

Soils of moderately well drained flats

G4 Sand over dispersive brown clay

Soils of sandy rises

H3 Deep bleached sand

G2 Sand grading to sandy clay loam

Minor soils

Soils of sandy rises and moderately well drained flats

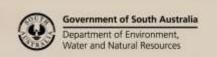
B7 Sand over brown clay on calcrete - flats and rises

Shallow sand over calcrete - rises

Thick sand over friable clay - flats

H3/G2 Very thick sand over sandy clay loam - flats

Vegetation: Broombush, tea-tree and mallee.





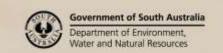
Main features:

The McNamara Land System consists of three distinctive elements.

- Moderately well to poorly drained flats with sandy texture contrast soils of moderately low fertility and moderate to high salinity. Generally these are too saline for any plants other than tolerant species to persist.
- Sand dunes and rises with deep infertile soils prone to water repellence and wind erosion.
- Swampy depressions with highly saline watertables at the surface for most of the time. These have little agricultural value.

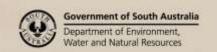
Soil Landscape Unit summary: 13 Soil Landscape Units (SLUs) mapped in the McNamara Land System:

SLU	% of area	Main features #		
MJB	0.1			
		Low ridges (relict coastal dunes) with a NNW-SSE orientation. The ridges are up 30 m hig slopes of 3-10%. They are partially overlain by low parallel east - west sand dunes, which be more common in the north, and on the eastern sides of the ridges. There is variable su stone on the non sandy slopes.		
		Main soils: <u>shallow stony loamy sand over calcrete</u> - B3 (C), <u>bleached sand over calcrete</u> - B8 (and <u>loamy sand over red sandy clay on calcrete</u> - B7/B3 (L) on stony areas, and <u>deep bleached sand</u> - H3 (C) and <u>sand grading to sandy clay loam</u> - G2 (L) on sand dunes.		
		Key properties: Drainage: Fertility: Physical condition: AWHC:	Rapidly to well drained. Moderately low on stony soils, to very low on deep sands. Surface soils are soft to loose and do not restrict root growth. Where subsoils occur they are friable and not restrictive to root growth. Very low to low on stony soils, due to shallow depth to hard calcrete. Moderate on sandy soils.	
		Salinity: Erosion potential:	Low Water: Low to moderate, depending on slope. Wind: Moderately low on stony ground to high on sand spreads.	
		Water repellence: Rockiness: Other:	Low to slight on stony land. Strong on sand spreads. Variable to 50%, usually less than 20%. Nil on sand spreads. The higher rises are exposed.	
Summary: Shallow, stony soils of marginal fertility with deep, low fe erodible sands.		stony soils of marginal fertility with deep, low fertility, water repellent and		
NAp 2.3 Complex of well and imperfectly drained flats, low stony are sandy sediments of the Padthaway Formation, and Molines Main soils: very thick sand over sandy clay loam - H3/G2 (clay on calcrete - B7 (L) and sand over dispersive brown class stony rises as well); sand over yellow and grey saline clay -		sandy sediments of t Main soils: <u>very thick</u> <u>clay on calcrete</u> - B7 stony rises as well); <u>s</u>	imperfectly drained flats, low stony and sandy rises and swamps formed on the Padthaway Formation, and Molineaux Sands. sand over sandy clay loam - H3/G2 (E) throughout, with sand over brown (L) and sand over dispersive brown clay - G4 (L) on well drained flats (B7 on and over yellow and grey saline clay - N2/G4 (M) and sand over saline clay on on imperfectly drained flats; wet saline soils - N2a/N2b/N2c (M) in swamps.	
		Fertility: N Physical condition: N	Fandy rises - rapidly drained Higher flats - moderately well drained Poorly drained flats - imperfectly to poorly drained Fowamps - very poorly drained Moderately low (flats and stony rises) to very low (sandy rises) No structural problems with surface soils. Dispersive subsoils in G4 soils restrict	
		AWHC: L Salinity: L i Erosion potential: \	root growth. Low to moderate. Low (rises), moderate to high (flats), extreme (swamps). This land is being ncreasingly affected by rising saline watertables. Water: Low. Wind: Low to high. High (sandy rises), slight elsewhere.	



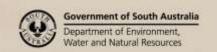


		Rockiness: I	Less than 2% surface calcrete stone on flats. Up to 10% on stony rises.	
		<u>Summary</u> : Complex of moderately well to poorly drained flats, sandy rises and swamps. Apart from marginal fertility, increasing salinity is the main issue on the flats. The rises have very low fertility but are unaffected by salinity.		
NDA	0.9	Very gently undulating plains with 10-20% low sandy or stony rises and 10-20% swamps formed on calcreted sediments of the Padthaway Formation. Groundwater tables are within two metres of the surface in places. Main soils: sand-over-brown-clay on calcrete - B7 (E) and thick-sand-over-friable-clay - G3 (E). Wet saline-soils - N2a/N2b/N2c occur in swamps.		
		Key properties: Drainage: Fertility:	Moderately well to imperfectly drained. Dispersive subsoils and/or shallow groundwater tables prevent good drainage. Moderate to moderately low.	
		Physical condition:	Surface soils usually sandy (no limitations to root growth). Subsoils are commonly dispersive, preventing even root growth.	
		AWHC Salinity:	Moderate. Moderate on flats, high in swamps, low on rises. This land is being increasingly affected by rising saline groundwater tables.	
		Erosion potential: Water repellence: Rockiness:	Water: Low. Wind: Moderately low. Slight to moderate. Less than 2% surface calcrete stone.	
		dispersive clay subsc	ndulating plains with increasing salinization, characterized by sandy soils with oils over rubbly calcrete. Drainage is impeded, fertility moderately low.	
O-A	0.5	Moderate to steep longitudinal, parabolic or jumbled siliceous sand hills, more than 12 metres high, formed on Molineaux Sand, occasionally underlain by calcreted calcarenite. Main soils: deep bleached sand - H3 (V) throughout, thick sand over friable clay - G3 (L) on lower slopes and swales, and grading to sandy clay loam - G2 (L) on low rises.		
		Key properties: Drainage: Fertility: Physical condition: AWHC: Salinity: Erosion potential: Water repellence:	Rapid. Very low. No limitations (soft to loose sand). Clayey subsoils, where present, are friable. Moderately low to moderate. Low. Water: Low. Wind: High to very high. High.	
		Rockiness: <u>Summary</u> : The land repellence and wind	Nil. is dominated by high sandhills with very low fertility, and prone to water erosion.	
OSS 22.2 Moderate to st high, with about Main soils: dee slopes and wel over calcrete -		Moderate to steep lo high, with about 10% Main soils: <u>deep blea</u> slopes and well drain <u>over calcrete</u> - B8/B	ongitudinal, parabolic or jumbled siliceous sand hills, more than 12 metres 6 swampy swales where the saline groundwater table is at the surface. ached sand - H3 (E) throughout, thick sand over friable clay - G3 (L) on lower ned swales, and sand grading to sandy clay loam - G2 (L) and shallow sand (M) on low rises, with wet saline sand - N2a (C) and sand over yellow and (G4 (C) in swampy swales.	
		Key properties: Drainage: Fertility: Physical condition:	Rapid (rises). Poor (swampy swales). Very low to low (rises). Moderate is swales. No limitations in surface soils. Clayey subsoils in some swales are dispersive and restrict root growth.	
		AWHC: Salinity: Erosion potential:	Moderately low (rises). Moderate (swales). Low (rises). Very high (swales). Water: Low. Wind: High Low to moderate in swales.	
		Water repellence. Rockiness:	Wind: High. Low to moderate in swales. High (rises). Low in swampy swales. Nil.	



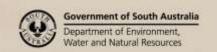


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		=	s dominated by low fertility sandhills prone to water repellence and wind les are generally confined between sandhills and the salinity is unlikely to
OSX	14.5	and flats. The rises are Swamp clays and man points of the landscal Main soils: <u>sand grad</u> low rises and lower sl <u>clay</u> - G3 (M) on bette	ing to sandy clay loam - G2 (E) and shallow sand over calcrete - B8/B7 (M) on opes, deep bleached sand - H3 (E) on higher ground, thick sand over friable er drained flats, wet saline sand - N2a (L) and sand over yellow and grey (M) on poorly drained flats, and wet saline grey clay / calcareous loam -
		Key properties: Drainage: Fertility: Physical condition: AWHC: Salinity: Erosion potential: Water repellence:	Well drained (rises). Poorly drained (flats). Very low to low (rises) to moderately low (flats). Surface soils are not limiting. Subsoils on rises are either sandy or friable clays, but on flats are dispersive and likely to impede root growth. Moderately low to moderately high. Low to moderate low (rises). High to very high (flats). Water: Low. Wind: Low (flats). Moderately high to high (rises). High on rises. Low on flats.
		=	Nil. ne land comprises deep to moderately deep low fertility sands prone to water erosion. Flats are saline with low productive potential unless sown to salt
ZS-	14.7	Saline swamps formed on calcareous clays and marls, and commonly veneered by a layer of black clay. These are natural features, representing the lowest points in the local landscape. They are usually seasonally inundated. Highly saline watertables are at or near the surface all year. Typical vegetation is tea tree, cutting grass, samphire (or commonly bare). Main soils: wet highly saline grey clay - N2b (E) and wet saline calcareous loam - N2c (E) and wet saline sand - N2a (C).	
		Fertility: Physical condition: AWHC: Salinity: Erosion potential: Water repellence:	Very poorly drained. Not relevant. Not relevant. Not relevant. Very high to extreme. Water: Lo w Wind: Low. Nil
		<u>Summary</u> : The swamps have little or no agricultural value, and where original vegetation exists, damage by livestock is likely.	
ZnG	4.3	Complex of saline flats (50%), low sand rises (40%) and swamps (10%), formed on limestones and clayey sediments of the Padthaway Formation, partially overlain by Recent windblown sands. Main soils: sand over yellow and grey saline clay - N2/G4 (E) and sand over saline clay on calcrete - B7/N2 (C) on flats, deep bleached sand - H3 (C) and sand grading to sandy clay loam - G2 (L) on sandy rises, and wet saline soils - N2a/N2b/N2c (L) in swamps.	
		Key properties: Drainage:	Imperfectly to poorly drained, due to shallow water tables and low permeability subsoils. Sandy rises are rapidly drained. Swamps are very poorly drained.
		Fertility: Physical condition: AWHC: Salinity:	Moderately low (flats) to very low (sandy rises). Surface soils - no limitations. Subsoils - dispersive clays restrict root growth. Moderate. High (flats), low (sand rises), very high to extreme (swamps). This land is





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			affected by rising saline groundwater tables.
		Erosion potential:	Water: Low Wind: Low (flats). High (sand rises)
		Water repellence: Rockiness:	Slight to nil (flats). High (sand rises) Nil.
			ly to poorly drained saline flats, with low infertile sandy rises. Productive depends on establishment of salt tolerant species.
ZnJ	7.5	•	sional small (unmappable) swamps, and sandy or stony rises formed on clayey
Znj	10.1	and limestone sediments of the Padthaway Formation. The land is seasonally waterlogged and affected by saline groundwater tables. Znj is land where salinity is higher and which is subject to inundation in wet years. Main soils: sand over yellow and grey saline clay - N2/G4 (E), sand over saline clay on calcrete - B7/N2 (C) and sand over dispersive brown clay - G4 (L-C), with variable wet saline soils - N2a, N2b, N2c (L-C) in swamps. Sand grading to sandy clay loam - G2, thick sand over friable clay - G3 and sand over dispersive brown clay - G4 are limited in better drained areas.	
		Key features:	
		Drainage:	Imperfectly to poorly drained, due to shallow water tables and dispersive clay subsoils.
		Fertility:	Moderately low.
		Physical condition:	Surface soil is not limiting. Dispersive subsoils prevent satisfactory root growth.
		AWHC: Salinity:	Moderate. High (ZnJ) to very high (Znj). This land is influenced by rising saline
			groundwater tables.
		Erosion potential:	Water: Low Wind: Low.
		Water repellence: Rockiness:	Nil.
		=	poorly drained saline soils requiring salt tolerant species for productive clovers and conventional perennial grasses will not persist on most of this
ZnM	1.1	•	ng plains with occasional small (unmappable) swamps, and approximately 25%
Znm	1.3	of the area covered limestone sediments The land is seasonall Znm is land where s Main soils: sand over B7/N2 (C) and sand	by sandy rises up to two metres high. The land is formed on clayey and of the Padthaway Formation, partially overlain by Recent windblown sands. It is waterlogged and affected by saline groundwater tables. It is alinity is higher and which is subject to inundation in wet years. It is yellow and grey saline clay - N2/G4 (E), sand over saline clay on calcrete - over dispersive brown clay - G4 (L-C) on flats and swamp areas, with deep (L) and sand grading to sandy clay loam - G2 (L) on rises.
		Key features:	
		Drainage:	Imperfectly to poorly drained, due to shallow water tables and dispersive clay subsoils. Well drained on rises.
		Fertility:	Moderately low. Very low on rises.
		Physical condition:	Surface soil is not limiting. Dispersive subsoils prevent satisfactory root growth. No limitations on rises.
		AWHC:	Moderate.
		Salinity:	Flats: High (ZnM) to very high (Znm). Rises: Low
		Erosion potential: Water repellence: Rockiness:	Water: Low. Wind: Low. High on rises. Nil on flats. High on rises. Nil.
		pasture growth (i.e. o	poorly drained saline soils requiring salt tolerant species for productive clovers and conventional perennial grasses will not persist on most of this ot salt affected, but have very low fertility, water repellent soils.
ZoP	20.5	Complex landscape of flats and swamps interspersed with sand dunes and rises. The ratio of flats	
		and swamps to dunes and rises is about 50:50. The land is formed on sandy sediments of the Padthaway Formation and calcareous clays and marls (swamp sediments), partially overlain by	





Recent windblown sands.

Main soils: wet saline sand - N2a (C), sand over yellow and grey saline clay - N2/G4 (L), and wet saline grey clay / calcareous loam - N2b/N2c (L) on flats and in swamps, deep bleached sand - H3 (C) and sand grading to sandy clay loam - G2 (C) on rises, and sand over dispersive brown clay - G4 (M), very thick sand over sandy clay loam - H3/G2 (M) and sand over brown clay on calcrete - B7 (M) on better drained flats.

Key features:

Drainage: Poor to very poor (flats and swamps). Rapid (rises and dunes).

Fertility: Moderately low (flats). Very low to low (rises).

Physical condition: Surface soils have no limitations. Subsoils on flats are dispersive and restrict

root growth. Subsoil structure not limiting on rises (sandy or friable).

AWHC: Moderate (flats) to moderately low (rises).
Salinity: High to extreme (flats and swamps). Low (rises).

Erosion potential: Water: Low.

Wind: Low (flats). Moderate to high (rises).

Water repellence: Low (flats) to high (rises).

Rockiness: Nil.

<u>Summary</u>: Complex of saline flats, saline swamps and sandy rises with very low fertility, water repellent, but non saline sands. This is very difficult land to manage because of a) the severity of limitations, and b) the complexity of the landscape.

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:

Soils of moderately well drained flats

- Sand over brown clay on calcrete (Petrocalcic, Brown Chromosol)
 Medium thickness sand overlying a yellowish brown clay on limestone or calcreted sandy clay within 50 cm.
- Thick sand over friable 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, sometimes underlain by calcreted calcarenite below 100 cm.
- G4 Sand over dispersive brown clay (Lithocalcic / Petrocalcic, Brown Sodosol)

 Medium thickness sand sharply overlying a coarsely structured dispersive brown and yellow mottled clay over rubbly or sheet calcrete.
- H3/G2 Very thick sand over sandy clay loam (Eutrophic, Brown Chromosol)

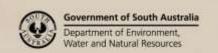
Very thick grey sand with a bleached A2 layer abruptly overlying a thin band of brown fine sandy clay loam with a limestone layer capping sandy Padthaway Formation sediments within 100 to 150 cm.

Soils of poorly drained flats and swamps (soils commonly veneered by black clay)

- N2/G4 Sand over yellow and grey saline clay (Hypercalcic / Lithocalcic, Grey Sodosol OR Sodosolic, Salic Hydrosol)

 Medium thickness loamy sand abruptly overlying a grey and yellow brown mottled clay (seasonally saturated), with rubbly to soft carbonate at depth.
- **B7/N2** Sand over saline clay on calcrete (Petrocalcic, Sodosolic, Salic Hydrosol)

 Bleached sand overlying a coarsely structured mottled grey sandy clay loam to clay, with a calcrete pan





within 50 cm and a saline water table at depth.

N2a Wet saline sand (Sandy Calcarosolic / Tenosolic Salic Hydrosol)

Thick bleached (calcareous) sand over a grey and yellow mottled clayey sand in a water table at about 100 cm.

N2b Wet highly saline grey clay (Dermosolic, Salic 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.

N2c Wet saline calcareous loam (Loamy Calcarosolic, Salic 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.

Soils of sandy rises

B8/B7 Shallow sand over calcrete (Petrocalcic, Bleached-Leptic Tenosol / Petrocalcic, Brown Chromosol)

Medium to thick bleached sand with variable thin (often absent) brown clayey sand to sandy clay loam subsoil, over calcreted calcarenite within 50 cm.

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, sometimes underlain by calcreted calcarenite below 100 cm.

H3 Deep bleached sand (Basic, Arenic, Bleached-Orthic Tenosol)

Thick to very thick bleached sand, organically darkened at the surface over yellow sand continuing below 100 cm, sometimes underlain by calcreted calcarenite.

Further information: DEWNR Soil and Land Program

