MGP MacGillivray Plains Land System

Relatively low-lying plains with lagoons and some salinized land. This system is basically divided into two main parts by the intervening White Lagoon basin and a north-south running rise. In the south the system just touches the southern remnant dune area; the Murray Lagoon basin and slopes below plateau surfaces are to the system's west; slopes and raised plains below plateau surfaces are to the system's north; and plains with numerous lagoons border the east. The system is named after the Hundred of MacGillivray.

Area: 90.0 km^2

Annual rainfall: 510 – 555 mm average

Geology: The majority of this system is underlain by clayey Pleistocene age lacustrine/marine sediments. The lagoonal depressions consist of marly Holocene age lacustrine sediments. Some low sandy lunettes are associated with lagoonal depressions. In the west are low-lying remnant plateau areas: these consist of Pliocene-Quaternary age colluvium which has deeply weathered clayey sediments usually capped by an ironstone gravel layer: these sediments are derived from Kanmantoo Group rock. Minor near-surface expressions of early Cambrian age (Kanmantoo Group) Middleton Sandstone meta-sandstone rock occurs on low rises in the western part of the system. A small drainage depression area of recent alluvium occurs in the west of the system and drains into White Lagoon. A small area of clayey outwash occurs in the north of the system, and is derived from adjacent rises which consist of Permo-Carboniferous age unconsolidated clayey sediments. A few minor depression areas in the north of the system are underlain by Tertiary age Hallett Cove Limestone. A few calcreted remnants of Bridgewater Formation calcarenite occur in the south of the system. Recent deposits of reworked siliceous sand occur.

Topography: Relatively low-lying level to gently undulating plains with lagoonal depressions. Salinized drainage areas, flats and depressions occur, as do many small depressions with marginal salinity and poor drainage (often small and circular). Slopes are generally 0-1%. Some short slopes of 3-5% are found around lagoonal depressions. Some low linear and jumbled sand dunes, sand spreads and hummocky sand areas occur; as do some low sandy lunettes. There are only a few small isolated rises on this plain.

Elevation: 10 m to 30 m. The higher elevations occur at the edge of the system in the west and south.

Relief: Less than 10 m. Typically 0 - 5 m

Major Soils:

G4a-**G3**	Sand over sodic clay
J2-**J1**	Ironstone soil

Minor Soils:

I1-**H3**	Very thick sands
N2	Saline wet soils
B3-**B7**	Shallow soil on calcrete
G4b-**F2**	Cracking and sodic texture contrast soil
E3	Cracking clay

Main Features: Arable and some non-arable areas. Topsoils are mostly sandy, with some sandy loams. Soils are mostly sandy to loamy, some with ironstone gravel, over sodic clay. Saline areas are common. Lagoons, saline depressions and a few marginally saline areas occur. Sandy soils pose a wind erosion risk and are naturally infertile. Soils with ironstone gravel have reduced fertility due to the 'fixation' of phosphorus. Many soils have fine carbonate in their lower subsoil. Drainage is relatively poor due to low relief and relatively impermeable sodic clayey subsoils.

Soil Landscape Unit summary: MacGillivray Plains Land System (MGP)

SLU	% of area	Main features #
OZD OZK OZR OZKr OZRr	1.6 1.0 0.2 - 0.3	Semi-arable siliceous sand deposits. Main soil: very thick sands - deep to moderate depth bleached sand **I1**-**H3** (*Podosol-Tenosol*) **OZD** – linear with a few jumbled low dunes (<5m) **OZK** – sand spreads, hummocky sand areas or extremely low linear dunes (<2m) **OZR** – hummocky sand areas or extremely low linear dunes (<2m) with <10% saline seepage (2s) **OZKr** – low rise or lunette(?) (slopes 3-5%) **OZRr** – sand spreads on slopes with <10% saline seepage (slopes 3-5%, 2s) Summary: low fertility sandy areas with moderately high wind erosion risk and strong water repellence.
OYR	0.6	Semi-arable siliceous sand deposits; with some areas of shallow soil on calcrete. Lower slope and flat areas around lagoonal depression. Main soils: very thick sands - deep to moderate depth bleached sand on sandy rises and flats **I1**-**H3** (*Podosol-Tenosol*). With 10-30% sandy shallow soil on calcrete on flats **B3** (*Petrocalcic Tenosol*). **OYR** - low rises and flats with <10% saline seepage (2-3s) Summary: mostly low fertility sandy areas with moderately high wind erosion risk and strong water repellence; and some areas of shallow stony soil.
MqA MqB Mqa Mqb Mqe	0.5 0.2 0.7 0.1 0.2	Semi-arable calcreted plains, depressions and low rises; with some areas of sandy topsoil over sodic clay. Main soils: shallow soil on calcrete - sandy topsoil over sandy to sandy clay loam on calcrete **B3**-**B7** (*Petrocalcic Tenosol-Chromosol*). With 10-30% sand over sodic clay - medium to very thick sandy topsoil over sodic clayey subsoil **G4a**-**G3** (*Brown Sodosol*). With 0-10% very thick sands - moderate to deep bleached siliceous sand **I1**-**H3** (*Podosol-Tenosol*). **MqA** – gently undulating plains **MqB** – low rise (slopes 3-5%, IIe) **Mqa** – plains with <10% saline seepage (3s) **Mqb** – low rise with <10% saline seepage (slopes 3%, II-Ie, 2s) **Mqe** – depression with <10% saline seepage (2s) Summary: mostly shallow stony soils with low water holding capacity; and some areas of sand over sodic clay with relatively infertile topsoils over relatively impermeable sodic clayey subsoils.
MsA	0.6	Semi-arable calcreted plains; with some areas of sand over sodic clay and some siliceous sand spreads. Partially calcreted very gently inclined slopes at the base of a rise. Main soils: shallow soil on calcrete - sandy topsoil over sandy to sandy clay loam on calcrete **B3**-**B7** (*Petrocalcic Tenosol-Chromosol*). With 10-30% sand over sodic clay - medium to very thick sandy topsoil over sodic clayey subsoil **G4a**-**G3** (*Brown Sodosol*). With 10-30% very thick sands - moderate to deep bleached siliceous sand **I1**-**H3** (*Podosol-Tenosol*)

		MsA – gently undulating plain. Summary: mostly shallow stony soils with low water holding capacity; with some areas of sand over sodic clay with relatively infertile topsoils over relatively impermeable sodic clayey subsoils; and some areas of low fertility deep sands with high wind erosion risk and strong water repellence.
JCO	0.8	A mostly arable drainage depression. Low-lying area with alluvial deposits from adjacent clayey rises with some areas of slight gilgai relief (mounds and depressions). Main soils: cracking and sodic texture contrast soil - sandy topsoil over cracking and sodic clayey subsoil **G4b** (*Vertic Grey-Brown Sodosol*). With approx. 30% cracking clay soil with fine carbonate in lower subsoil **E3** (*Grey-Brown Vertosol*). **JCO** – depression with <10% saline seepage (3-4s) Summary: the main issues are waterlogging, subsoil physical condition, and some saline seepage.
FGA	3.4	Arable plains: with medium thickness and some thick sandy topsoil with ironstone gravel. Low-lying plateau remnant. Main soils: ironstone soil - medium thickness, with some thick sandy topsoil with ironstone gravel over sodic clay **J2**-**J1** (*Ferric Brown Sodosol*). **FGA** – gently undulating plains. Summary: the main issues are reduced fertility due to ironstone gravel (causing phosphorous fixation) and due to the presence of relatively infertile sandy topsoils; and the presence of relatively impermeable sodic subsoils.
FFA FFB FFK FFZ	4.0 0.3 3.8 0.1	Mostly arable plains, slopes and the summit surface of a low rise: with medium thickness and some thick sandy to sandy loam topsoil with ironstone gravel. Mostly low-lying plateau remnants. Main soils: ironstone soil - medium thickness, with some thick sandy to sandy loam topsoil with ironstone gravel over sodic clayey subsoil **J2**-**J1** (*Ferric Brown Sodosol*). **FFA** – gently undulating plain. **FFB** – slopes (3%, II-Ie) **FFK** – gently undulating plain with <10% saline seepage (3-2s) **FFZ** – gently undulating summit surface (27m above mean sea-level). Summary: the main issues are reduced fertility due to ironstone gravel (causing phosphorous fixation) and due to the presence of relatively infertile sandy topsoils in some areas; and the presence of relatively impermeable sodic subsoils.
FMA	0.5	Mostly arable plains: with medium thickness and some thick sandy topsoil with ironstone gravel; and with some areas of shallow soil on calcrete. Low-lying plateau remnant. Main soils: sand over sodic clay - medium thickness with some thick sandy topsoil, with ironstone gravel, over sodic clay **J2**-**J1** (*Ferric Brown Sodosol*). With 10-30% shallow soil on calcrete - sandy topsoil over sandy to sandy clay loam on calcrete **B3**-**B7** (*Petrocalcic Tenosol-Chromosol*). **FMA** – gently undulating plain. Summary: the main issues are reduced fertility due to ironstone gravel (causing phosphorous fixation) and due to the presence of relatively infertile sandy topsoils; and the presence of relatively impermeable sodic subsoils; also some areas of shallow stony soils occur which have low water holding capacity.
PaA PaB	1.8 0.1	Mostly arable plains: with thick sandy topsoil. Raised sandy plain or lunette adjacent to the White Lagoon basin. Main soils: sand over sodic clay - thick sandy topsoil over sodic clayey subsoil **G3** (*Brown Sodosol*). **PaA** – level to gently undulating plain **PaB** – slopes (3-5%, IIe) Summary: these areas have relatively infertile sandy topsoils with some wind erosion risk, and relatively impermeable sodic clayey subsoils.

PbAk PbBk PbEk PbLk PbOk PbUk PbA PbE PbK PbO PbU	28.4 2.0 0.5 0.7 1.8 0.8 10.1 0.2 - 1.5 0.6	Mostly arable plains, slopes and depressions: with thick to medium thickness sandy topsoil. On the plains with 'thick and some medium thickness sandy topsoils' there are (<1%) small, usually circular non-arable depressions with marginal salinity and poor drainage (many have been mapped out), and small sand spreads and low linear dunes (<2m high). Main soils: sand over sodic clay - thick, with some medium thickness sandy topsoil over sodic clayey subsoil **G3**-**G4a** (*Brown Sodosol*). With 2-5% very thick sands - deep to moderate depth bleached sand on sand dunes and sand spreads **I1**-**H3** (*Podosol-Tenosol*). On the plains with 'thick and some medium thickness sandy topsoils' there are 0-1% small depression areas with sandy topsoil over wet sodic clay: **G3** or **N2** (*Brown-Grey Sodosol* or *Hydrosol*). Thick, and some medium thickness sandy topsoils: **PbAk** – level to gently undulating plains. **PbBk** – slopes with 0-5% saline seepage (slopes 3-5%, IIe, 2-1s). Slopes down to lagoons and drainage areas. **PbEk** – depression **PbLk** – slopes with <10% saline seepage (slopes 3-5%, IIe, 3-2^{o}s). Slope running down to saline drainage depression, or else on a low rise. **PbOk** – depression with <10% saline seepage (3-2s or 3-2^{+}s-3-2^{o}s) **PbUk** – depression with marginal salinity (4s) Medium thickness, and some thick sandy topsoils: **PbA** – gently undulating plains **PbE** – depression **PbK** – plains with <10% saline seepage (3^{o}s-3^{+}s) **PbO** – depression with <10% saline seepage (3s). Probably an old lake floor. **PbU** – depression with 10-20% saline seepage (4-3*s) Summary: these areas have relatively infertile sandy topsoils with some wind erosion risk, and relatively impermeable sodic clayey subsoils; also some waterlogging occurs, and some areas are affected by saline seepage.
PkA PkB PkE PkO PkU PkKz	16.5 0.2 0.9 0.9 1.0 0.1	Mostly arable plains, slopes and depressions: with medium thickness, and some thick sandy to loamy soil. Main soils: sand over sodic clay - medium thickness, with some thick sandy to sandy loam topsoil over sodic clayey subsoil **G4a**-**G3** (*Brown Sodosol*). **PkA** – gently undulating plains. **PkB** – slopes (3-5%, IIe) **PkE** – depression. Maybe some soil over calcrete in this depression. **PkO** – depression with <10% saline seepage (3-2s^{+}s) **PkU** – depression with 10-50% saline seepage (4-3*s: drainage lines are saline) **PkKz** – gently undulating plain with <10% saline seepage and >50% scalded land (3s). Summary: there are many areas with relatively infertile sandy topsoils with some wind erosion risk; while subsoils are relatively impermeable sodic clays; also some waterlogging occurs, and some areas are affected by saline seepage.
HZK	0.3	Mostly arable plains: with medium thickness and some thick sandy loam topsoils. Drainage area and slight slopes adjacent to a lagoon area. The original sandy topsoil has mostly been washed off leaving behind somewhat heavier textured topsoils. Main soils: medium thickness with some thick sandy loam, over sodic clay **F2b**-**F1** (Brown Sodosol). **HZK** - gently undulating plain with <10% saline seepage (2s) Summary: this area only has minor limitations, with the main feature being the relatively impermeable sodic clay subsoils.
ZA- ZB-	1.0 1.4	**ZA-** – non-arable saline flats and drainage depressions (Vs). Mostly covered with salt tolerant grasses and with some bare patches. These areas are salinized and low-lying, and include drainage depressions and areas bordering lagoons.

		Main soils: sand over sodic clay **G4a**-**G3** (*Brown-Grey Sodosol*) **ZB-** – non-arable saline drainage depressions and lagoon margins (VII). Mostly covered with samphire and bare ground but with some areas of salt tolerant grass. Main soils: sand over sodic clay and sandy saline wet soils: **G4a**-**G3** or **N2** (*Grey-Brown Sodosol* or *Hydrosol*). Summary: non-arable salinized land.
ZO- ZQ- ZR- ZS- ZX-	2.3 2.1 0.7 3.4 1.8	Small depressions. **ZO-** – non-arable to semi-arable small depressions with poor drainage (Vw) and marginal salinity (IVs). Mostly covered with salt/waterlogging tolerant grasses, reeds and/or bottle brush shrubs. These depressions are usually small and circular, or sometimes elongated, or very occasionally actual open drainage depressions. Main soils: sand over sodic clay and sandy saline wet soils: **G4a**-**G3** or **N2** (*Brown-Grey Sodosol* or *Hydrosol*). Lagoonal depressions. Main soils: saline wet soils - sandy topsoils over grey clay or marl, often calcareous throughout **N2** (*Hydrosol*): a few areas with shallow and calcareous saline wet soils on calcrete **N2** (*Petrocalcic Hydrosol*). With some very thick sands **I1**-**H3** (*Podosol-Tenosol*) and sandy shallow soil on calcrete **B3**-**B7** (*Petrocalcic Tenosol-Chromosols*) on lunettes. **ZQ-** – lagoon or lagoon margin (Vs). Mostly covered with melaleuca and with some samphire: sometimes submerged. With some low sandy lunettes and some areas with shallow calcareous soils on calcrete. **ZR-** – lagoon (VIIs). Mostly samphire and bare ground: sometimes submerged. With some minor areas of low sandy lunettes. **ZS-** – lagoon (VIIIs). Mostly bare ground with some samphire: often submerged. **ZX-** – complex of lagoons (VIIs) and low lunettes (<5m). Samphire and bare ground. Lunettes with melaleuca and sometimes mallee trees. Lunettes often form an interior arc within lagoon. Summary: highly saline lagoons and marginally saline depressions with some lunettes; lagoons and depressions are subject to seasonal inundation.
ZL7	0.2	Lunettes. Covered with melaleuca and sometimes mallee vegetation. Main soils: very thick sands **I1**-**H3** (*Podosol-Tenosol*) and sandy shallow soil on calcrete **B3**-**B7** (*Petrocalcic Tenosol-Chromosol*). **ZL7** – low sandy lunettes (2-5m) Summary: infertile sandy soils and shallow stony soils.

Classes in the 'Soil Landscape Unit summary' table (eg. 2-1e, 3w, 2y, etc) describe the predominant soil and land conditions, and their range, found in Soil Landscape Units. The number '1' reflects minimal limitation, while increasing numbers reflect increasing limitation. Letters correspond to the type of attribute:

a - wind erosion	e - water erosion	f - flooding	g - gullying
r - surface rockiness	s - salinity	w - waterlogging	y - exposure

Detailed soil profile descriptions:

Major Soils:

G4a-**G3** Sand over sodic clay (*Brown Sodosol*). Medium thickness to thick with a few very thick, sand to light sandy loam (with some sandy loam), with a bleached sub-surface layer of sand to clayey sand; over olive-brown to yellow-brown sodic clay with some olive or grey and maybe some red mottles. Sometimes some ironstone nodules occur in the bleached layer directly overlying the clayey subsoil. Often there is fine carbonate in the lower subsoil. Found on plains, depressions and slopes.

J2-**J1** Ironstone soil (*Ferric Brown Sodosol*). Medium thickness to thick loamy sand to sandy loam, with a bleached sub-surface layer of sand to light sandy loam with abundant ironstone gravel; over yellow-brown to olive-brown sodic clay (which may not always be dispersive in distilled water) with some olive and red mottles. Occasionally there is fine carbonate in the lower subsoil. Found on plains, slopes and summit surface.

Minor Soils:

I1-**H3** Very thick sands (*Podosol-Tenosol*). Deep to moderate depth, neutral to acid loamy sand to sand, with a bleached sub-surface layer of sand; over yellow-brown sandy soil usually with accumulations of iron and organic compounds. This is underlain by a clayey substrate or sometimes calcrete. Linear low dunes, jumbled low dunes, hummocky sandy areas, sand spreads and low sandy lunettes.

N2 Saline wet soils (*Hydrosol*). Sandy to sandy loam topsoil, over grey to olive sodic clay or marl. A few topsoils directly overlie calcrete. The soil can be calcareous throughout, and has abundant fine carbonate in the lower subsoil. Found in saline lagoons and depressions.

B3-**B7** Shallow soil on calcrete (*Petrocalcic Tenosol-Chromosol*). Sandy topsoil over a layer of yellow-brown loamy sand to sandy clay loam; overlying calcrete. Found on plains, a low rise, flats and lunettes.

G4b-**F2** Cracking and sodic texture contrast soil (*Vertic Brown-Grey Sodosol*). Thin to medium thickness sandy to loamy topsoil, usually with a thin bleached sub-surface layer; over grey to yellow-brown mottled cracking and sodic clay with fine carbonate in the lower subsoil. Found in an alluvial depression with slight gilgai relief (mounds and depressions).

E3 Cracking clay (*Brown-Grey Vertosol*). Cracking clay soil which is sodic in the subsoil and has fine carbonate in the lower subsoil. Found in an alluvial depression with slight gilgai relief (mounds and depressions).

Further information: DEWNR Soil and Land Program