INV Inman Valley Land System

Undulating to rolling low hills scattered between Myponga Reservoir and Hindmarsh Valley

Area: 154.4 km^2

Annual rainfall: 570 – 835 mm average

Geology: The Land System occurs within the floors of ancient (Permian age) glacial valleys. Sediments were deposited in these valleys, either by the glaciers or by associated rivers and streams. These sediments are variable, but have a characteristic appearance. They include sandstones and unconsolidated sandy clays, heavy clays and calcareous clays, weakly lithified to shales. Reworking of sandier sediments has occasionally resulted in the accumulation of sand banks. Erosion of the sedimentary beds and adjacent basement rocks from the sides of the valleys has resulted in the deposition of alluvial sediments on creek flats. These are usually clayey sands to sandy clays. There are occasional basement rock outcrops, protruding through the glacial valley sediments. These are mixed sandstones, siltstones and calcareous shales.

Topography: The landscape is one of rolling low hills separated by creek flats up to a kilometre wide, all contained within the broad deep valleys of ancient glaciers. The valleys vary from three to ten kilometres in width, and are up to 200 m deep. The sediments associated with the glaciation have been extensively eroded by streams which are still exhuming the old valleys. These streams include the Hindmarsh, Inman, Boundy, Yankalilla and Bungala Rivers, and Carrickalinga and Wattle Flat Creeks. These either flow westwards to Gulf St. Vincent, or southwards to Encounter Bay.

Elevation: 40 - 300 m

Relief: Up to 80 m

Soils: Soil variability reflects variations in parent sediments. Sandy to loamy surfaced texture contrast soils predominate, but there are significant areas of cracking clays and deep coarse to medium textured soils. With the exception of the cracking clays which are variable, the soils are acidic at the surface, but vary from acidic to alkaline at depth.

Main soils

Soils formed on clayey glacial valley sediments

G3a Loamy sand over clay
F1/F2 Sandy loam over acid - neutral brown clay
F2a Sandy loam over poorly structured brown clay

Minor soils

Soils formed on clayey glacial valley sediments

E1 Black cracking clay
E3 Grey-brown cracking clay

Soils formed over sandy glacial valley sediments

G5 Sand over acid clay
H3 Bleached siliceous sand
I2/I1 Highly leached sand
J2 Sandy ironstone soil

Soils formed on alluvial sediments

F1a Sandy loam over brown clay
F1b Clay loam over brown clay
F1c Coarse sandy loam over grey sandy clay

F2b Sandy loam over poorly structured brown clay
G3b Thick sand over clay
M1 Deep sandy loam over sandy clay loam
H3/M1 Deep loamy sand
M2a Gradational brown clay loam
M2b Deep black clay loam

Main features: The Inman Valley Land System is characterized by rolling low hills with mainly sandy to light sandy loam soils with clayey subsoils. These account for 75% of the area. The intervening flats are dominated by sandy loam texture contrast soils with clayey subsoils. Cracking clays and deep black or brown clay loams are locally significant on both slopes and flats. The soils of the slopes generally have low natural fertility and are highly susceptible to acidification. Waterlogging caused by perching of water on subsoil clays is common. Poor deep drainage on these slopes has led to widespread landslips in the past. Severe gully erosion and occasional tunnel erosion is also a feature of the slopes. Nevertheless, there is potential for more intensive uses than traditional grazing, provided soil and irrigation management are adapted to the conditions. The soils of the alluvial flats are commonly limited by waterlogging, but there are significant areas where this is not a serious problem, and there are large patches of moderately well drained, fertile loamy soils with excellent productivity potential. Stream bank erosion and sporadic salinization are locally important land management issues.

Soil Landscape Unit summary: 24 Soil Landscape Units (SLUs) mapped in Inman Valley Land System:

SLU	% of area	Main features #
AiC	0.6	Geology: Metasandstones of the Backstairs Passage Formation. **AiC** Rolling low hills and slopes with relief of 50-100 m and slopes of 16-30%. **AiD** Steep to very steep rocky hillslopes of 80-200 m relief and slopes of 30-80%. Main soils: Acidic sandy loam over brown clay on rock - **K4a** (E) Acidic sandy loam over red clay on rock - **K3** (E) Shallow sandy loam on rock - **L1a** (L) on steeper and rocky slopes Deep loam over brown clay - **K2/F1** (M) on lower slopes
AvC AvD	0.4 0.9	Moderately steep to steep ridges of basement siltstones, sandstones and calcareous shales, occurring as "islands" projecting from the floor of an old glacial valley. The steeper slopes have up to 20% surface stone and sporadic rocky outcrop. **AvC** Rounded low hills, up to 60 m high with slopes of 15-30%. **AvD** Steep elongate ridges to 10m high with narrow crests and slopes of 30-100%. Soils are shallow to moderately deep and include thick sandy loam over brown and red clay, medium thickness loam to clay loam over red or brown clay, shallow crumbly loam over semi hard carbonate, and shallow stony sandy loam to loam over rock. These soils are inherently fertile and well drained, and are generally moderately deep. The slopes of **AvD** restrict its potential uses to grazing, but easier access on **AvC** provides potential for pasture improvement and perennial crops.
HYII HYJJ HYLL	1.8 0.9 3.7	Eroded land formed on sandy clays and clays of Permian glacial valleys where landslips and/or gully erosion are significant features. **HYII** Moderately steep to steep hillsides of 20% to 30% slope, with stable or unstable branching erosion gullies. **HYJJ** Individual gullied water courses. **HYLL** Hillslopes up to 60 metres high with gradients of 20% to 30% (but up to 60% in places), affected by landslips in the past and/or with high potential for future mass movement. Watercourses are usually gullied. There is a mixture of sand to loam over yellow and brown mottled clays, and black and grey clay soils. Main soils: Sandy loam over poorly structured brown clay - **F2a** (E) Sandy loam over acid-neutral brown clay - **F1/F2** (C) Loamy sand over clay - **G3a** (L) Black cracking clay - **E1** (L) Grey-brown cracking clay - **E3** (L)

		Although these soils are inherently fertile and deep (although prone to waterlogging), the fragility of the land restricts land use options. Even once stabilized, the severely damaged areas are always vulnerable to renewed erosion.
LBD	0.2	Lower slopes, drainage depressions and creek flats, formed on alluvial clays, sandy clays and minor sands and gravels, derived from the erosion and subsequent deposition of soil and rock material from hillslopes of Barossa Complex rocks. **LBD** Moderately inclined lower slopes; slopes 8-15%. The soils are deep, and mostly have sandy to loamy surfaces overlying slowly permeable mottled clay subsoils. There are some better drained red gravelly and stony soils formed on colluvium, usually on sloping ground. Main soils: Sandy loam over brown or red clay - **F1c** (V) on slopes Gradational red loamy sand - **M1a** (L) on slopes Sandy loam over brown mottled clay - **F1a** and **F1b** (L) on creek flats These soils are deep, moderately fertile and imperfectly drained (flats) to moderately well drained (slopes). All are susceptible to acidification and all are erodible. Most of the land is used for grazing. More intensive development requires erosion control.
LKB LKC	0.2 3.9	Lower slopes formed on sandy clays and clays derived from the localized reworking of upslope glacial valley sediments. Slopes are up to 6%. **LKB** Slopes of less than 3% **LKC** Slopes of 3-6%. The soils are predominantly sandy with clayey subsoils, but there are some heavier types. Main soils: Thick sand over clay - **G3b** (V) Sandy loam over brown clay - **F1a** (M) Deep black clay loam - **M2b** (M) These soils are deep but inherently infertile and imperfectly drained. They are also susceptible to acidification (having low buffering capacities), erosion (to both wind and water) if exposed, and may be water repellent. The land provides good grazing with potential for irrigation of fodder crops, and has some scope for horticultural development where drainage problems can be overcome.
LNA LNE LNJ LNO	3.2 0.6 4.2 0.3	Flats and drainage depressions of the major water courses including the Inman, Bungala and Yankalilla and Rivers. Medium to fine grained alluvial sediments underlie the soils. **LNA** Broad alluvial flats. **LNE** Drainage depressions. **LNJ** Drainage depressions with eroded water courses. **LNO** Drainage depressions with up to 10% saline seepages. The soils are typically variable, but fall into three main groups: - loam over clay soils: sandy loam over brown clay - **F1a** (C); sandy loam over grey sandy clay - **F1c** (C); sandy loam on poorly structured brown clay - **F2b** (C); clay loam over brown clay - **F1b** (M) - gradational soils: deep black clay loam - **M2b** (L); deep loamy sand - **H3/M1** (L); gradational brown clay loam - **M2a** (M) - sandy soils: thick sand over clay - **G3b** (L); deep sandy loam over sandy clay loam - **M1** (M) These soils are deep but frequently imperfectly drained due to their clayey subsoils. However, thick surface soils reduce this problem. The M2 soils are highly fertile, the F1, F2 and M1 soils are moderately fertile and the G3 and H3/M1 soils have low fertility. Stream bank erosion is a widespread problem and particularly difficult to manage on large water courses. Salinity, waterlogging and occasional flooding are local problems. Apart from these issues, the land has high productive potential, usually enhanced by availability of supplementary water.
LPA	1.4	Flat alluvial plains in the upper Carrickalinga Creek catchment, formed on gritty alluvial sands and sandy clays derived from erosion of glacial valley sediments. The main soil has a thick gritty sandy loam surface over a grey sandy clay loam to sandy clay subsoil. Main soils: Coarse sandy loam over grey sandy clay - **F1c** (V) Gradational brown clay loam - **M2a** (L) These soils are deep, but subject to waterlogging. Natural fertility is moderately low, and the surface soils are prone to acidification. There is some irrigation of fodder crops, but potential for horticulture is limited by impeded drainage.
LiA	0.1	Low lying flats with slopes of less than 1% formed on alluvial clays. The soils are deep with heavy clay subsoils. Main soils: Sandy loam over brown clay - **F1a** (E)

		Deep grey clay loam - **M2** (E) This land is generally poorly drained due to its low lying position and slowly permeable clayey subsoils. Parts are inundated for extensive periods in most years. However, the soils are deep and fertile, although marginally saline in places.
LmC LmD	0.2 0.2	Gently sloping alluvial fans adjacent to basement rock highs of the neighbouring Strangways Land System. They are underlain by mixed sandy and clayey alluvial sediments derived from the erosion of glacial valley sediments and basement rocks. **LmC** Alluvial fans with slopes of 3-10%. **LmD** Alluvial fans with slopes of 10-18%. Strongly texture contrast soils are predominant. These have sandy to sandy loam surfaces and medium to fine grained subsoils. Main soils: Sandy loam over brown clay - **F1a** (E) Thick sand over clay - **G3b** (E) Deep sandy loam over sandy clay loam - **M1** (E) Soils are deep but imperfectly drained, a limitation compounded by the additional water received from adjacent steep slopes. Erosion potential is consequently high, so disturbance should be minimized.
LoB LoF	0.7 1.4	Broad flat to gently sloping alluvial plains formed on alluvial clays, sandy clays and minor sands and grits derived from the erosion of glacial valley sediments and basement rocks. Slopes are up to 4%. **LoB** Alluvial flats and gentle slopes at Hay Flat with slopes of 1-4%. **LoF** Alluvial flats of Boundy River with slopes of 0-2%. The characteristic soil is a brown clay loam over clay. Sub dominant soils are variable, but all deep over alluvium. Main soils: Gradational brown clay loam - **M2a** (E) Deep black clay loam - **M2b** (L) Deep loamy sand - **H3/M1** (L) Sandy loam over brown clay - **F1a** (L) Main soils are deep, fertile and moderately well drained. Although there are waterlogged areas, the land overall is potentially highly productive, with a range of grazing and horticultural land use options. Stream bank erosion is a localized problem in **LoF**.
PtD PtF	4.9 1.3	Rolling low hills formed on sandstones and unconsolidated sandy clays. Slopes are up to 30% and relief is up to 80 m. The landscape is broken by well defined creek-lines and swamps, and by ferricrete (ironstone) rises. **PtD** Gently rolling low hills with slopes of 8-16%. **PtF** Rolling low hills with slopes of 16-30%. The soils are predominantly sandy surfaced, with variable subsoils, including firm heavy clays, friable sandy clays, coffee rock and loose sand. The range of soils in these landscapes reflects this subsoil variability. Main soils: Sand over clay - **G3a** (E) } all on slopes Sand over acid clay - **G5** (L) } Sandy ironstone soil - **J2** (L) } Highly leached sand - **I2/I1** (L) } Bleached siliceous sand - **H3** (M) } Thick sand over clay - **G3b** (L) on lower slopes These soils are relatively sandy with well developed clayey subsoils. These help prevent nutrient leaching, but also cause water to perch, so waterlogging is a limitation on this land. The soils are highly susceptible to acidification, particularly with their low buffering capacities. Although most of the land has been traditionally used for grazing, it has potential for horticulture / floriculture on better drained sites. Erosion hazard is high where soil is disturbed, especially on steeper slopes.
PuC PuD PuF	0.3 33.4 35.2	Undulating rises with slopes from 4% and relief of less than 30 metres to rolling low hills with slopes of up to 30% and relief of up to 80 metres formed on sandy clays and calcareous clays, weakly lithified to shales in places. The steeper slopes are subject to landslip and tunnel erosion. Narrow water courses, which are often gullied, dissect the landscape. **PuC** Undulating rises with slopes of 4-6%. **PuD** Undulating low hills with slopes of 6-12%. **PuF** Gently rolling to rolling low hills with slopes of 12-30%. Most soils have strongly texture contrast profiles with sandy to loamy surfaces and clayey subsoils, which vary in structure, particle size and colour depending on the nature of the parent sediments. There are minor clay soils. Main soils: Sand over clay - **G3a** (E)

		Sandy loam over acid-neutral brown clay - **F1/F2** (E) } all on slopes Sandy loam over poorly structured brown clay - **F2a** (L) } Thick sand over acid clay - **G5** (L) } Grey-brown cracking clay - **E3** (M) } Thick sand over clay - **G3b** (M) } on lower slopes and narrow alluvial flats Sandy loam over brown clay - **F1a** (M) } These soils are more susceptible to waterlogging than the related soils of **PtD** / **PtF**, with their heavier clay subsoils. Apart from high sheet/rill erosion potential, the steeper slopes are prone to landslip and tunnel erosion. Any activities which concentrate or increase subsoil water could activate mass movement, gully or tunnel erosion. Land use options are therefore limited on **PuF** and to some extent on **PuD**. Natural fertility is low to moderate, and the soils are highly susceptible to acidification.

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:

E1 Black cracking clay (Endohypersodic-Endocalcareous, Self-mulching, Black Vertosol)
Medium thickness black clay with strong granular structure and a self-mulching, cracking surface, overlying a black to dark grey heavy clay with strong blocky structure and variable amounts of soft calcareous segregations. The soil is formed over a grey, strongly slickensided clay (Hindmarsh Clay equivalent), usually deeper than 100 cm.

E3 Grey-brown cracking clay (Episodic-Endocalcareous, Epipedal, Brown Vertosol)
Medium thickness grey clay with coarse subangular blocky structure and surface cracks, overlying a grey to brown heavy clay with strong coarse prismatic structure and up to 50% soft carbonate segregations at variable depth. The soil is formed on a grey heavy clay with well developed slickensides (Hindmarsh Clay equivalent), usually shallower than 100 cm.

F1a Sandy loam over brown clay (Bleached-Mottled, Hypocalcic, Brown Chromosol)
Thick loamy sand to sandy clay loam with a strongly bleached A2 horizon, sharply overlying a yellowish brown, grey and red mottled clay grading to fine grained alluvium.

F1b Clay loam over brown clay (Bleached-Mottled, Hypocalcic, Brown Chromosol)
Thick greyish brown clay loam with a bleached A2 layer, overlying a yellowish brown, grey and red heavy clay with strong blocky structure, grading to a light grey and yellow clay with some carbonate segregations.

F1c Coarse sandy loam over grey sandy clay (Sodic, Eutrophic, Grey Chromosol)
30 - 70 cm dark grey gritty coarse sandy loam with a bleached A2 horizon, overlying a dark grey sandy clay loam grading to a dark grey and yellow mottled sandy clay to clay.

F1/F2 Sandy loam over acid - neutral brown clay (Eutrophic, Brown Kurosol / Chromosol)
Medium thickness firm to hard loamy sand to sandy loam with a bleached A2 layer, abruptly overlying a dark brown, yellowish brown and red blocky clay, grading to a massive clayey sand to sandy clay.

F2a Sandy loam over poorly structured brown clay (Hypocalcic, Subnatric, Brown Sodosol)
Medium thickness dark brown sand to sandy clay loam with a bleached and hard A2 horizon, overlying a dark grey brown and yellow brown mottled heavy clay with strong prismatic structure, grading to a light grey, yellow and red massive sandy clay to clay with minor soft carbonate segregations from 85 cm.

F2b Sandy loam over poorly structured brown clay (Eutrophic, Mottled-Subnatric, Brown Sodosol)
Thick grey brown hard sandy loam with a bleached A2 horizon, overlying a yellow brown, brown and red massive sandy clay loam to sandy clay with coarse columnar structure.

G3a Loamy sand over clay (Bleached-Mottled, Eutrophic Brown Kurosol)
Medium thickness grey brown loamy sand to light sandy clay loam with a bleached A2 horizon, overlying a yellow brown, grey and red mottled clay with coarse prismatic structure, grading to grey and yellow mottled sandy clay from 100 cm.

G3b Thick sand over clay (Bleached-Mottled, Eutrophic, Brown Kurosol)
Thick greyish brown sand to light sandy loam with a bleached A2 horizon, overlying a grey and yellow mottled sandy clay loam, grading to a yellow brown and grey mottled clay with coarse blocky structure.

G5 Sand over acid clay (Bleached, Mesotrophic, Brown Kurosol)
Thick grey sand to light sandy loam with a bleached A2 horizon containing variable quartz, sandstone and ironstone gravel, overlying a yellow and brown massive sandy clay loam to light clay, grading to weakly indurated yellow, grey and red sandstone.

H3 Bleached siliceous sand (Acidic, Regolithic, Bleached-Orthic Tenosol)
Very thick white sand overlying yellow sand.

I2/I1 Highly leached sand (Parapanic, Humosesquic, Semiaquic Podosol)
Grey sand with a very thick bleached A2 horizon, overlying a coffee rock pan, grading to a brown and yellow massive sandy clay loam to light clay forming on soft sandstone at about 150 cm.

J2 Sandy ironstone soil (Bleached-Ferric, Mesotrophic, Brown Kurosol)
Thick grey sand to sandy loam with a bleached and ironstone gravelly A2 horizon, overlying an ironstone gravelly yellow brown and red sandy clay loam to clay, grading to grey, red and yellow sandy clay loam forming in highly weathered kaolinized sandstone deeper than 150 cm.

M1 Deep sandy loam over sandy clay loam (Bleached-Mottled, Mesotrophic Grey Kandosol)
Very thick grey soft loamy sand to sandy loam with a bleached A2 horizon, grading to a grey to brown sandy clay loam, becoming sandier with depth.

H3/M1 Deep loamy sand (Regolithic, Grey-Orthic / Bleached-Orthic Tenosol)
Very thick grey brown loamy sand to sand, grading to a mottled clayey sand to sandy clay loam below 100 cm, over variable coarse to medium textured and gritty alluvium.

M2a Gradational brown clay loam (Eutrophic, Brown Dermosol)
Thick brown clay loam with granular structure, often with gritty lenses, overlying a dark brown well structured light clay, grading to a greyish brown massive clayey sand to sandy clay loam from 75 cm.

M2b Deep black clay loam (Melanic, Calcic, Black Dermosol)
Medium thickness black clay loam to light clay with strong granular structure, overlying a very dark clay with blocky structure and variable amounts of soft calcareous segregations.

Further information: DEWNR Soil and Land Program