SHA Shaugh Land System

(Based on the description by A.K. McCord in "A Description of Land in the Southern Mallee of South Australia")

Very gently undulating plains with low dunefields in Hundreds of Shaugh and McCallum

Area: 611.4 km^2

Annual rainfall: 425 - 475 mm average

Geology: The land system is formed on Tertiary age clays which are calcified by fine carbonates, leached into the soil from aeolian deposition over a considerable time. The clays in turn are partially overlain by windblown Molineaux Sand deposits.

Topography: The Shaugh Land System comprises a tract of low sand dune country in the Upper South East, adjacent to the Victorian border. The landscape is very gently undulating, consisting of a very gently inclined plain overlain by low sand dunes which are rounded and of irregular shape, but which show a distinct east - west orientation. The flats and swales between the sand hills have variable proportions of gilgai areas. These tend to occur on lower lying flats with predominantly clay soils, while the higher flats are dominated by sand over clay soils.

Elevation: 70 - 140 m

Relief: 3 - 10 m

Soils: Sandy soils predominate. They may be deep or shallow over clayey subsoil. Hard sandy loam texture contrast soils are limited on flats, as are cracking clays.

Main soils:

Soils of sandy rises
H3 Deep bleached sand
G2 Sand grading to sandy clay loam
Soils of higher level or sandy flats
G3 Thick sand over clay
G4 Sand over dispersive brown clay
Soils of lower lying or clayey flats
E3 Hard grey cracking clay

Minor soils:

Broad flats
F2 Hard loam over dispersive brown clay
F1 Sandy loam over red brown clay
Soils of lower lying or clayey flats
E1 Black cracking clay

Vegetation: Mallee, heath and stringybark on dunes
Mallee and broombush on flats and swales

Main features: The Shaugh Land System is typical sand dune - swale country with significant changes in soil type over short distances. The sand dunes are characterized by deep, infertile water repellent sands, sometimes with seepages where they contact the intervening flats and swales. The flats between the larger dunes have sandy texture contrast soils with marginal fertility and impeded drainage. The broader flats have a wider variety of soils, with sand or

loam over dispersive clay subsoils common on higher flats and clayey soils on lower lying flats. Most of these soils are imperfectly drained. The texture contrast soils are marginally fertile; the clayey soils are more fertile but most have poorly structured surfaces. Moderate salinity and boron toxicity are likely in these soils.

Soil Landscape Unit summary: 12 Soil Landscape Units (SLUs) mapped in the Shaugh Land System

SLU	% of area	Main features #
GaA	8.9	Very gently undulating flats and swales, with limited gilgai, formed on Tertiary clays and sandy clays. Gilgai flats tend to be in the lower lying areas. Main soils: thick sand over clay - **G3** (E) on flats and higher elevation swales, with sand over dispersive brown clay - **G4** (L), hard grey cracking clay - **E3** (L) and black cracking clay - **E1** (M) on flats and lower elevation swales, and hard loam over dispersive brown clay - **F2** (L) on broader flats. Key properties: Drainage: Generally well drained, but G4 and E3 soils are imperfectly drained due to dispersive clay subsoils or heavy poorly structured clays. Fertility: Marginal (sandy soils G3 and G4) to high (black E1 clays). Physical condition: Sandy G3 and G4 soils, and black clays have loose sandy or friable surfaces which do not impede root growth. The loam over clay (F2) soils and grey E3 clays have hard surfaces which restrict emergence and root growth. All subsoil clays restrict root growth. AWHC: Moderate to high. Salinity: Moderate in subsoils. Erosion potential: Water: Low. Wind: Moderately low. Water repellence: Nil (clays) to moderate (sandy soils) Rockiness: Nil. Other: Boron toxicity may be expected in clay soils. Summary: The flats are generally well drained, but lower elevation areas are imperfectly drained due to dispersive or heavy clay subsoils. Fertility varies from marginal on sand over clay soils to high on black cracking clays. Poor surface structure may be a problem on grey clays and loamy texture contrast soils. Subsoil salinity and boron toxicity may be expected.
GbA	15.3	Very gently undulating flats formed on Tertiary clays to sandy clays, overlain by 10-30% low (up to 5 m) dunes of Molineaux Sand. Main soils: thick sand over clay - **G3** (E) with sand over dispersive brown clay - **G4** (L), sandy loam over red brown clay - **F1** (L) and hard grey cracking clay - **E3** (M) on flats, and deep bleached sand - **H3** (C) on dunes. Key properties: Drainage: Well drained (G3/F1 soils) to imperfectly drained (G4/E3 soils) on flats. Rapid drainage on sandhills. Fertility: Moderately low on flats. Very low on sandhills. Physical condition: Good in surface (except E3 cracking clays). Limited subsoil restrictions associated with G3/F1 soils, but G4 and E3 soils have fair to poor subsoil structure due to their dispersive clays. AWHC: Moderate to moderately high on flats. Moderately low on sandhills. Salinity: Moderate on flats (subsoils). Low on sandhills. Erosion potential: Water: Low. Wind: Moderately low on flats. Moderately high on sandhills. Water repellence: Moderately low to nil on flats. High on sandhills. Rockiness: Nil. Summary: The flats are generally well to moderately well drained, except for limited areas of sand over dispersive clay and grey cracking clay where drainage is imperfect due to dispersive clay subsoils. Sandy surfaces are physically favourable, but low in fertility. Soils on rises are infertile, water repellent and prone to wind erosion.

MHB	0.02	Isolated low rises formed on calcarenite.
O-A O-B	0.1 3.4	Isolated high to moderate jumbled sand dunes. **O-A** High sand dunes. **O-B** Moderate sand dunes. Main soils: deep bleached sand - **H3** (V) with sand grading to sandy clay loam - **G2** (L). Key properties: Drainage: Rapid. Fertility: Very low. Physical condition: No limitations (soft to loose sand). Clayey subsoils, where present, are friable. AWHC: Moderately low to moderate. Salinity: Low. Erosion potential: Water: Low. Wind: High. Water repellence: High. Rockiness: Nil. Summary: The land is dominated by moderate to high sandhills with very low fertility, and susceptibility to water repellence and wind erosion.
OBF OBG OBI OBJ OBq OBt	6.9 2.0 3.9 39.9 5.4 5.2	Gently undulating land comprising flats formed on Tertiary clays and sandy clays, and low to moderate jumbled sand dunes up to 10 metres high formed on Molineaux Sand. **OBF** 60-90% moderate sand dune coverage. **OBG** 60-90% low sand dune coverage. **OBI** 30-60% moderate sand dune coverage. **OBJ** 30-60% low sand dune coverage. Occasional swales are susceptible to seepage. **OBq** 60-90% low sand dune coverage with up to half of swales affected by seepage. **OBt** 30-60% low sand dune coverage with up to 25% of swales affected by seepage. Main soils: deep bleached sand - **H3** (V-E) on dunes, sand grading to sandy clay loam - **G2** (M-C) on swales and dunes, and thick sand over clay - **G3** (M-L), sand over dispersive brown clay - **G4** (M-L) and hard grey cracking clay - **E3** (M) in swales. Key properties: Drainage: Rapid (sand dunes). Well to imperfectly drained in swales, depending on the nature and depth of the subsoil. Subsoils of G4 and E3 cause water to perch and clay soils, once wet, have low permeability throughout. The swales of **OBq** and **OBt** which are susceptible to seepage are imperfectly to poorly drained. Fertility: Very low (sand hills). Moderately low (swales). Physical condition: Good in surface soils. Subsoils generally are not limiting except in the G4 and E3 soils where dispersive clays restrict root growth. G2 and H3 subsoils are not limiting. AWHC: Moderately low (sandhills) to moderate in G2 and G4 soils, moderately high in G3 soils and high in E3 soils. Salinity: Low (sand hills). Moderately low (swales). Erosion potential: Water: Low. Wind: Moderate to high (sandhills). Moderately low (swales). Water repellence: High (sandhills), moderate (swales). Rockiness: Nil. Summary: Deep very infertile water repellent sands on dunes. Marginal fertility sand over clay soils with good moisture holding capacity dominate the swales, and are associated with sand over clay and cracking clay soils with impeded drainage and poor root growth conditions.
TTA	9.0	Low lying flats and swales, with extensive gilgai formed on clayey sediments of Tertiary age. Main soils: hard grey cracking clay - **E3** (E) and hard loam over dispersive brown clay - **F2** (C), with black cracking clay - **E1** (L) in gilgai areas, and sand over dispersive brown clay - **G4** (L) and sandy loam over red brown clay - **F1** (M) elsewhere. Key properties: Drainage: Imperfect to poor due to heavy poorly structured clays and / or dispersive clay subsoils. Fertility: Moderate to high (heavier textured soils) to moderately low (G4 soils). Physical condition: The loam over clay soils and grey clays have hard surfaces which restrict emergence and root growth. Sand over clay and black clays have loose sandy or

		friable surfaces which do not impede root growth. All subsoil clays restrict root growth. AWHC: Moderate to high. Salinity: Moderately high in subsoils. Patchy seepage occupies less than 5% of area. Erosion potential: Water: Low. Wind: Moderately low. Water repellence: Nil (clays) to moderate (sand soils) Rockiness: Nil. Other: Boron toxicity may be expected in clay soils. Summary: The flats are generally imperfectly to poorly drained due to heavy and / or dispersive clay soils at or near the surface. Fertility varies from moderate to high for the heavier soils to moderately low on sand over clay soils. Poor surface structure is widespread. Subsoil salinity and boron toxicity may be expected.

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 (Self-mulching, Black Vertosol)
Black self-mulching seasonally cracking clay, becoming coarser structured, greyer and calcareous with depth.

E3 Hard grey cracking clay (Epipedal, Grey Vertosol)
Hard coarse blocky seasonally cracking grey clay, calcareous and prismatically structured at depth.

F1 Sandy loam over red brown clay (Hypercalcic, Brown / Red Chromosol)
Thin to medium brown loamy sand to sandy loam with a bleached A2 layer abruptly overlying a brown to red clay, calcareous from 30 cm.

F2 Hard loam over dispersive brown clay (Hypercalcic, Brown Sodosol)
Medium thickness hard setting loamy sand to loam abruptly overlying a coarsely structured grey brown, yellow and red clay grading to soft carbonate.

G2 Sand grading to sandy clay loam (Mesotrophic, Brown Kandosol)
Thick to very thick bleached sand, organically darkened at surface, grading to a yellowish brown and red friable massive sandy clay loam.

G3 Thick sand over clay (Eutrophic / Calcic, Brown / Red Chromosol)
Thick to very thick bleached sand to loamy sand with an organically darkened surface abruptly overlying a friable yellowish brown or red sandy clay, with or without soft carbonate accumulations over Tertiary sand or Blanchetown Clay.

G4 Sand over dispersive brown clay (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.

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.

Further information: DEWNR Soil and Land Program