

HLB Halbury Land System

Undulating rises and dunefields in the Halbury area

Area: 71.8 km²

Annual rainfall: 380 – 460 mm average

Geology: The land is underlain at variable depth by heavy clays of late Tertiary / early Pleistocene age (Hindmarsh Clay). Superimposed on the clays is an uneven coverage of medium to fine grained highly calcareous materials of the Woorinen Formation which have hardened to rubble in places. Younger windblown Molineaux Sands, reworked into dune formations overlie the landscape in discrete dune clusters. The combined actions of stream flow and reworking by wind have exposed the basal heavy clays in lower lying parts of the landscape, and on outwash fans. All three geological deposits are parent materials for modern soils.

Topography: The Halbury Land System is a gently undulating landscape of low rises over which are draped clusters of low linear dunes with a north west - south east orientation. There has been some dissection of the landscape by stream flow, with a number of water courses converging near Halbury to form a single channel which flows in a westerly direction into the adjacent Bowillia Land System. The resulting land surface is a complex of undulating rises, dune fields, flats and drainage depressions. Slopes are always less than 5%.

Elevation: 210 m in the east to 80 m in the south west

Relief: Maximum relief is 30 m

Soils: There is a range of soils including loamy texture contrast and gradational (some calcareous) on flats, calcareous sandy loams on rises and deep sands on sandhills.

Main soils

A4a Rubbly calcareous sandy loam
A4b Calcareous sandy loam
A6 Calcareous clay loam
H2 Deep sand

Minor soils

D3 Loam over dispersive red clay
D2 Sandy loam over red clay
B6 Sandy loam over red sandy clay on calcrete
G1 Loamy sand over red sandy clay
C3 Gradational loam
F2 Sandy loam over dispersive brown clay
E2 Red cracking clay
A5 Rubbly calcareous loam over clay
B2 Shallow sandy loam on calcrete



Main features: The Halbury Land System is characterized by three distinct land types. On undulating rises are highly calcareous medium to coarse textured and often rubbly soils which are well drained and friable, but with moderately low fertility and often limited waterholding capacity. They have a moderately low to moderate wind erosion potential. Dunes overlying the rises have predominantly deep sands with low fertility, water repellence and moderate to high potential for wind erosion. On the flats, water courses and fans are loamier soils with moderate to high fertility, but poorer structure, with adverse effects on water infiltration and root growth. These areas are subject to boron toxicity and marginal salinity.

Soil Landscape Unit summary: 10 Soil Landscape Units (SLUs) mapped in the Halbury Land System:

SLU	% of area	Main features #
HJB HJE	10.4 3.1	<p>Outwash fans and flats formed on Tertiary sandy clays and clays.</p> <p>HJB Fans with slopes of 2-4%.</p> <p>HJE Drainage depressions with slopes of 1-2%.</p> <p>Main soils: <u>sandy loam over red clay</u> - D2 (E), <u>loam over dispersive clay</u> - D3 (C) and <u>gradational loam</u> - C3 (L), with <u>rubbly calcareous sandy loam</u> - A4a (M). These soils are deep and relatively fertile, but most have poor structure leading to reduced water infiltration and some waterlogging. However, this condition is manageable with the use of gypsum and modified surface management. High boron levels are likely in the deep subsoil, and may be within potential root zone depth in places. Overall the land is potentially productive.</p>
IAE	4.2	<p>Drainage depressions and flats with water courses formed on Hindmarsh Clay, with minor stony and sandy rises. Flooding can occur after heavy rain when the water courses are running.</p> <p>Main soils: <u>calcareous clay loam</u> - A6 (E) and <u>loam over dispersive clay</u> - D3 (E) with <u>gradational loam</u> - C3 (L). In places clayey sediments from flood events overlie sandier surface D3 soils. These flats have deep, generally non rubbly loamy to clayey soils with moderate inherent fertility. Poorly structured subsoils in the D3 soils affect root growth and cause temporary waterlogging in wet seasons. The main limitations however are associated with the underlying heavy impermeable clay which prevents leaching of salts including boron. Deeper subsoils are characterized by moderate salinity, high pH and boron concentrations. Where shallower than about 75 cm these conditions affect plant productivity.</p>
IVA	16.1	<p>Gently undulating flats formed on heavy Tertiary clays (Hindmarsh Clay), overlain in places by Woorinen Formation deposits (soft to rubbly carbonates).</p> <p>Main soils on flats: <u>loam over dispersive clay</u> - D3 (E), with <u>sandy loam over dispersive brown clay</u> - F2 (C), <u>calcareous clay loam</u> - A6 (C) and <u>red cracking clay</u> - E2 (L),</p> <p>Main soils on rises: <u>calcareous clay loam</u> - A6 (E) and <u>rubbly calcareous sandy loam</u> - A4a (E). These soils are deep and moderately fertile, but underlain by heavy, impermeable alkaline clays with associated high boron and moderate salinity levels. Poor soil structure in the D3 soils restricts infiltration and causes some waterlogging. The cracking clays are especially prone to wetness, but have high fertility. Reduced fertility and water holding capacity can be expected on the rises. The land has high productive potential, provided that the underlying heavy clay is deeper than 75 cm, and that poor soil structure is ameliorated. Lower lying areas are prone to inundation in wet years.</p>
SWA SWB	4.5 34.1	<p>Rises formed on soft and rubbly medium textured carbonates of the Woorinen Formation.</p> <p>SWA Very gentle slopes of less than 2%.</p> <p>SWB Undulating rises with slopes of 2-5%.</p> <p>Main soils: <u>rubbly calcareous sandy loam</u> - A4a (E), <u>calcareous sandy loam</u> - A4b (C) and <u>sandy loam over red sandy clay on calcrete</u> - B6 (C), with <u>loamy sand over red sandy clay</u> - G1 (L), <u>rubbly calcareous loam over clay</u> - A5 (M) and <u>shallow sandy loam over calcrete</u> - B2 (M). These soils are mostly alkaline to the surface (except the G1 and B6 soils), with moderate fertility and in the case of the rubbly soils, variable and often low water holding capacity. All soils, and particularly the sand over sandy clay, are prone to wind erosion, and must be kept covered.</p>



U-C	1.1	Individual moderate sand dunes. Main soils: <u>deep sand - H2 (V)</u> with <u>loamy sand over red sandy clay - G1 (L)</u> and <u>calcareous sandy loam - A4b (L)</u> . These dunes are at moderate risk of wind erosion and have low fertility soils - cropping should be restricted.
UEJ	9.7	Dunefields superimposed on a very gently undulating landscape of Woorinen Formation soft to rubbly carbonates, overlying heavy clay sediments (Hindmarsh Clay) in swales. Dunes are low to moderate with a coverage of 30-60%. Main soils: <u>deep sand - H2 (E)</u> and <u>loamy sand over red sandy clay - G1 (L)</u> on mid to upper dune slopes, and <u>calcareous clay loam - A6 (C)</u> , <u>calcareous sandy loam - A4b (C)</u> and <u>rubbly calcareous sandy loam - A4a (L)</u> in swales. Frequent changes in soil types across the landscape make this land difficult to manage. Control of wind erosion is the main concern on the sandy rises, along with fertility maintenance and encouragement of plants with deep root systems to maximize water use efficiency. On the more clayey swales, there is a range of minor limitations mainly associated with the underlying Hindmarsh Clay. These include boron toxicity, waterlogging, poor soil structure, salinity and restricted nutrient availability, particularly of the highly calcareous soils.
UIb UIf	7.3 9.5	Dunefields superimposed on an undulating landscape of highly calcareous Woorinen Formation sediments. The landscape consists of sand ridges formed on Molineaux Sand, separated by swales underlain by soft and rubbly carbonates. UIb Moderate dunes with a coverage of 60-90%. UIf Low dunes with a coverage of 30-60%. Main soils: <u>deep sand - H2 (E)</u> , with <u>loamy sand over red sandy clay - G1 (L)</u> and <u>calcareous sandy loam - A4b (L)</u> on mid to upper slopes, with <u>calcareous sandy loam - A4b (C)</u> , <u>rubbly calcareous sandy loam - A4a (C)</u> , and <u>calcareous clay loam - A6 (L)</u> on lower slopes and swales. This land has a repeating pattern of very sandy, low fertility soils with high wind erosion potential on low sand ridges, and heavier more fertile calcareous soils with moderately low wind erosion potential in swales. Maintenance of fertility and retention of cover are the key elements of management on these soils. Amelioration of water repellence may be required in places.

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:

- A4a** Rubbly calcareous sandy loam (Regolithic, Supracalclitic / Lithocalclitic Calcarosol)
10 - 30 cm soft calcareous sandy loam grading to a brown highly calcareous light sandy clay loam over rubbly Class III B / C carbonate at 35 cm, with very highly calcareous fine sandy clay loam continuing below 120 cm.
- A4b** Calcareous sandy loam (Regolithic, Hypercalclitic Calcarosol)
10 - 30 cm calcareous loamy sand to sandy loam grading to a highly calcareous brown light sandy clay loam with abundant soft carbonate (sandy clay loam texture) from 45 cm, continuing below 120 cm.
- A5** Rubbly calcareous loam over clay (Regolithic, Supracalclitic Calcarosol)
Calcareous loam over rubbly Class III B carbonate at shallow depth, grading to a very highly calcareous sandy clay loam, over heavy clay from about 100 cm.
- A6** Calcareous clay loam (Regolithic / Pedal, Hypercalclitic Calcarosol)
15 - 20 cm calcareous clay loam to light clay grading to a brown highly calcareous friable light clay with abundant soft carbonate from 45 cm over heavy clay from 100 cm.
- B2** Shallow sandy loam on calcrete (Petrocalclitic, Calcic Calcarosol)
Up to 40 calcareous sandy loam over calcrete.



- B6** Sandy loam over red sandy clay on calcrete (Petrocalcic / Lithocalcic, Red Chromosol)
15 - 40 cm firm sandy loam over a red sandy clay loam to light clay on rubbly calcrete at about 45 cm.
- C3** Gradational loam (Hypercalcic, Red Dermosol)
10 - 20 cm friable loam grading to a well structured red light clay with abundant soft carbonate from 50 cm with heavy clay from about 100 cm.
- D2** Sandy loam over red clay (Hypercalcic, Red Chromosol)
15 - 25 cm firm sandy loam over a well structured red light clay, calcareous from about 40 cm.
- D3** Loam over dispersive red clay (Hypercalcic, Red Sodosol)
10 - 30 cm sandy loam to clay loam abruptly overlying a coarsely structured dispersive red clay with abundant soft carbonate from 50 cm grading to heavy clay from 90 cm.
- E2** Red cracking clay (Red Vertosol)
10 - 15 cm strongly structured seasonally cracking calcareous light clay over a red, coarsely structured heavy clay, with soft carbonate from 35 cm and slickensided heavy clay from 60 cm.
- F2** Sandy loam over dispersive brown clay (Calcic, Brown Sodosol)
10 cm hard sandy loam to sandy clay loam over a coarsely structured brown dispersive clay, calcareous from about 50 cm over heavy clay from about 70 cm.
- G1** Loamy sand over red sandy clay (Calcic / Lithocalcic, Red Chromosol)
15 - 40 cm soft loamy sand to sandy loam abruptly overlying a weakly structured red sandy clay loam to light clay with soft to rubbly carbonate at 45 cm, continuing below 100 cm.
- H2** Deep sand (Calcareous, Arenic / Regolithic, Red-Orthic Tenosol)
20 cm to more than 100 cm loose sand to loamy sand over a soft red clayey sand with abundant soft to rubbly carbonate from about 100 cm.

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

