

# CUH Cunningham Land System

Elevated plains, rises, slopes and drainage depressions. This system forms part of the northerly and central sections of the Yorke Peninsula central highlands zone.

**Area:** 164.0 km<sup>2</sup>

**Landscape:** Elevated plains, rises, slopes and drainage depressions. This is an elevated area underlain by bedrock. The system has three main sections: the southern section to the southeast and east of the Central Highlands near Maitland; the central-eastern section to the northeast of the Central Highlands; and the northern section – separated from the other two sections by the Winulta Creek and the North Maitland Flat – part of which lies to the north-northeast of Winulta, another to the north of the Arthurton Highlands, and another to the north, northeast and east of the North Maitland Flat. Parts of the system are dissected by drainage depressions.

The system is mostly underlain by pre-Adelaidean Proterozoic age metamorphic rocks. Saprolitic sediments – usually loamy to clay loamy – are found at the base of many profiles. Mostly soils with clayey subsoils have formed in these sediments. Other soils, especially in low lying areas such as drainage depressions, have formed in clayey sediments. Weathered rock and rock fragments are found in and on some soils.

Accessions of wind-deposited carbonate dust have infused into profiles. Many profiles are calcareous throughout; and many include hard carbonate fragments. Wind-deposited calcareous loess (Woorinen Formation) overlies older sediments in places. It is likely that much of this system was once covered by older calcareous loess, remnants of which occur as patches of calcreted sediments.

Areas of clayey to clay loamy outwash occur on some lower slopes, plains, and drainage depressions.

**Annual rainfall:** 385 – 465 mm average

**Main soils:**

<b>C4-D3-D2-C3</b>	Clay loam to loam over red clay (around 53% of area)
<b>A6</b>	Gradational calcareous clay loam (around 21% of area)
<b>A5-A4-A2-D3b</b>	Calcareous loam (around 19% of area)

**Minor soils:**

<b>B2</b>	Shallow calcareous loam to clay loam on calcrete (approximately 4% of area)
<b>B6</b>	Shallow loam to clay loam over clay on calcrete (approximately 2% of area)
<b>E3-E2</b>	Brown-red cracking clays (less than 1% of area)

**Main features:** The system is mostly arable. The most common soils are clays to loams overlying clayey subsoil. Many soils are calcareous throughout. Many soils contain hard carbonate fragments, and some rock fragments.

Soils on sloping land, those on adjacent lower lying areas, and those in drainage depressions have potential for water erosion. This is particularly the case in sloping drainage lines and drainage ways where overland water-flow can concentrate. Texture contrast profiles are particularly prone to water erosion. It is likely that there has been some topsoil erosion in some areas since clearing and settlement. The most erodible soils are texture contrast soils with loamy surfaces. These especially occur on the slopes to the west and southwest of Arthurton, where more coarsely grained bedrock may have given rise to lighter textured surface soils.



Flooding may occur in drainage depressions, and possibly on some low lying patches on level surfaces. Saline seepage affects soils along drainage depressions and on some lower slopes – mostly resulting in raised subsoil salinity, or actual patches of seepage on some lower slopes.

Toxic accumulations of boron and sodium were not found to be a significant issue. However, the lower subsoils of many profiles have high sodium levels, and the bases of many profiles have high boron levels – mostly in soils with restricted internal drainage.

Where they occur, calcareous soils restrict the availability of certain nutrients: deficiencies of the major nutrient phosphorus and the trace element zinc are common, while deficiencies of the trace elements manganese and iron are possible. Temporary trace element deficiencies can occur in cold and wet conditions with susceptible crops. This is particularly true for those soils with highly calcareous surfaces.

### Soil Landscape Unit summary: Cunningham Land System (CUH)

SLU	% of area	Main features
HMA HMB HMC HMZ HME HMEg HML HMO HMOg	0.2 6.4 0.8 1.8 1.0 2.4 1.6 1.7 1.0	Land dominated by soils formed in clayey or saprolitic sediments. Main soils: <i>clay loam to loam over red clay</i> <b>C4-D3</b> , often grading to <i>gradational calcareous clay loam</i> <b>A6</b> , especially in drainage areas. With limited to common areas of <i>calcareous loam</i> <b>A5-A4</b> . And with some calcareous weak texture contrast soil overlying saprolitic sediments in non drainage areas: <i>loam over clay loam</i> <b>D3b-A2</b> . Patches of <i>brown-red cracking clays</i> <b>E3-E2</b> can occur in drainage depressions. <i>Slopes, rises and elevated plains:</i> <b>HMA</b> – somewhat elevated plain with some drainage lows (slopes 0-1%). <b>HMB</b> – slopes and rises with ill-defined drainage ways (slopes 0.5-2.5%). <b>HMC</b> – slopes with some vague drainage lows (slopes 1-5%). <b>HMZ</b> – elevated plain with drainage lows (slopes 0-1%). <i>Drainage areas – drainage depressions and lower slopes:</i> <b>HME</b> – drainage depressions (slopes <1%). <b>HMEg</b> – drainage depression with a central drainage line (slopes 0-2%). <b>HML</b> – lower slopes and relatively low lying concave drainage areas with drainage lines and ill-defined drainage ways, and some saline seepage ('magnesia' patches) on lower slope areas (slopes 0-2%). With minor areas of <i>brown-red cracking clays</i> <b>E3-E2</b> . <b>HMO</b> – drainage depression (slopes 0-1%). <b>HMOg</b> – drainage depressions typically with a central drainage line (slopes 0-1.5%). Possibly with patches of <i>brown-red cracking clays</i> <b>E3-E2</b> .
HRA HRB HRC HRZ	2.7 9.8 1.1 1.2	Land dominated by soils formed in saprolitic or clayey sediments. Main soils: <i>clay loam to loam over red clay</i> <b>D2-C3</b> grading to <i>gradational calcareous clay loam</i> <b>A6</b> . With limited to common areas of <i>calcareous loam</i> <b>A5-A4</b> , and <i>shallow loam to clay loam over clay on calcrete</i> <b>B6</b> to <i>shallow calcareous loam to clay loam on calcrete</i> <b>B2</b> . <b>HRA</b> – elevated plain with drainage lows (slopes 0-1%). <b>HRB</b> – slopes and a crest area with some drainage ways and broader drainage areas (slopes 0-2.5%). <b>HRC</b> – slopes with some drainage ways (slopes 1.5-6%). <b>HRZ</b> – elevated plain/summit surface (slopes <1%).
HVA HVB HVC HVCw HVZ	2.3 5.4 2.1 0.3 2.0	Land dominated by soils formed in saprolitic or clayey sediments. Main soils: <i>clay loam over red clay</i> <b>D3-C4</b> with some hard carbonate rubble, with some <i>gradational calcareous clay loam</i> <b>A6</b> , overlying saprolitic sediments. With limited to common areas of <i>rubbly shallow calcareous loam</i> on saprolitic sediments <b>A2</b> . <b>HVA</b> – somewhat low lying gently undulating plain/drainage area with ill-defined drainage ways: water can flow onto this area from adjacent highland areas to the west and northwest (slopes 0.5-2%). <b>HVB</b> – slopes and rises/summit surfaces with some ill-defined drainage ways (slopes 0.5-2%). <b>HVC</b> – slopes with some ill-defined drainage ways (slopes 1-3.5%). <b>HVCw</b> – relatively low lying drainage area (slopes 1-3%).



		<b>HVZ</b> – crests/elevated plains with some vague drainage lows (slopes 0-1%).
HWB	3.2	Land dominated by soils formed in saprolitic or clayey sediments. Main soils: <i>loam to clay loam over red clay D3-C4</i> with some hard carbonate rubble. With common to extensive areas of <i>calcareous loam A4-A5</i> . <b>HWB</b> – slopes and gently undulating plains with ill-defined drainage ways (slopes 0-2.5%).
IFB	0.7	Land dominated by calcareous soils formed in clayey sediments. Main soils: <i>gradational calcareous clay loam A6 to clay loam over red clay C4</i> , with vertic (reactive) clayey subsoils. With limited to common calcareous <i>red-brown cracking clay E2-E3</i> <b>IFB</b> – slopes with some drainage lows and small crabholes (slopes 0.5-2%).
IHB	0.3	Land dominated by calcareous soils formed in clayey or saprolitic sediments.
IHZ	1.4	Main soils: <i>gradational calcareous clay loam A6</i> with some <i>clay loam over red clay C4-D3</i> . With common to extensive areas of <i>rubbly calcareous loam A5-A4</i> . <b>IHB</b> – slopes with ill-defined drainage ways (slopes 0.5-2.5%). <b>IHZ</b> – rises and elevated plains with ill-defined drainage lows (slopes 0-1.5%)
IMB	0.7	Land dominated by calcareous soils formed in clayey or saprolitic sediments.
IMLg	1.5	Main soils: <i>gradational calcareous clay loam A6 to clay loam over red clay C4-D3</i> . With limited to common areas of <i>calcareous loam A5-A4</i> . <b>IMB</b> – somewhat low lying drainage area with ill-defined drainage ways (slopes 0.5-1.5). <b>IMLg</b> – relatively low lying plain and slopes with drainage depressions, drainage lines, and broader/more vague drainage areas (slopes 0-2%).
IOE	0.3	Land dominated by calcareous soils formed in clayey sediments. Main soils: <i>gradational calcareous clay loam A6</i> with some <i>clay loam over red clay D3-C4</i> , some with vertic (reactive) subsoils. And extensive areas of <i>calcareous loam A5-A4</i> . <b>IOE</b> – depressions, with a few patches of crabholes (slopes <1%).
IXA	1.3	Land dominated by calcareous soils formed in clayey or saprolitic sediments.
IXAr	0.9	Main soils: <i>gradational calcareous clay loam A6 to clay loam over red clay C4-D3</i> . With common to extensive areas of <i>calcareous loam A5-A4</i> . Also with minor to limited areas of <i>shallow calcareous loam to clay loam on calcrete B2</i> .
IXB	18.1	
IXBg	0.5	
IXC	5.9	<b>IXA</b> – relatively low lying gently undulating plains with drainage lows (slopes 0-1%).
IXCc	0.7	<b>IXAr</b> – somewhat low lying gently undulating plains/drainage area with ill-defined drainage ways (slopes 0-1%).
IXZ	7.5	<b>IXB</b> – slopes, rises and gently undulating to undulating plains with ill-defined drainage lows and some drainage ways (slopes 0-2.5%). <b>IXBg</b> – concave drainage area with drainage ways (slopes 1-2.5%). <b>IXC</b> – slopes with some ill-defined drainage ways (slopes 1-3.5%). <b>IXCc</b> – slopes with some contour banking (slopes 1-4%). <b>IXZ</b> – elevated gently undulating plains/crests with some drainage lows (slopes 0-1.5%).
KKB	0.3	Land dominated by calcareous soils formed in clayey outwash sediments. Main soils: <i>gradational calcareous clay loam A6</i> with vertic (reactive) subsoils, grading to <i>brown-red cracking clay E3-E2</i> . With minor to limited areas of <i>clay loam over red clay C3-D2</i> with vertic (reactive) subsoil. <b>KKB</b> – outwash slopes/plains with gilgai microrelief (slopes 0-1.5%).
KOb	1.0	Land dominated by calcareous soils formed in outwash or saprolitic sediments.
KOK	1.1	Main soils: <i>calcareous loam A4-A5</i> to <i>gradational calcareous clay loam A6</i> . With minor to limited areas of <i>clay loam to loam over red clay D2-C3</i> .
KOL	0.3	
KOO	1.0	<b>KOb</b> – lower slopes with drainage lines and some 'magnesia' patches (saline seepage) in lower parts (slopes 0.5-2.5%). <b>KOK</b> – gently undulating plains (slopes 0-1%). <b>KOL</b> – lower slopes/footslopes (slopes 0.5-2%). <b>KOO</b> – low lying plains/drainage areas (slopes 0-1%).
KRE	0.2	Land dominated by calcareous soils formed in clayey outwash sediments. Main soils: <i>brown-red cracking clays E3-E2</i> and some <i>gradational calcareous clay loam A6</i> . <b>KRE</b> – drainage depression with a short drainage line (slopes 0-1%). There is no obvious gilgai microrelief.
QfA	0.1	Land dominated by shallow calcareous soils on calcrete. Main soils: <i>shallow calcareous loam to clay loam on calcrete B2</i> . With areas of <i>rubbly calcareous loam A5-A4</i> , <i>gradational calcareous clay loam A6</i> , and <i>shallow clay loam over clay on calcrete B6</i> grading to <i>clay loam to loam over red clay D2</i> . QfA – level to gently undulating plains (slopes 0-1%).



QLA	0.03	Land dominated by shallow calcareous soils on calcrete. Main soils: <i>shallow calcareous loam to clay loam on calcrete</i> <b>B2</b> . With limited to common areas of <i>gradational calcareous clay loam</i> <b>A6</b> , and <i>calcareous loam</i> <b>A5-A4</b> . <b>QLA</b> – slight rise (slopes 0-1%).
QIA QIB	0.1 1.2	Land dominated by shallow calcareous soils on calcrete. Main soils: <i>shallow calcareous loam to clay loam on calcrete</i> <b>B2</b> to <i>shallow loam to clay loam over clay on calcrete</i> <b>B6</b> . With limited to common areas of <i>clay loam over red clay</i> <b>D3-C4</b> grading to <i>gradational calcareous clay loam</i> <b>A6</b> , in lows. <b>QIA</b> – gently undulating elevated plains/slight rises (slopes 0-1%). <b>QIB</b> – slight rises with drainage lows (slopes 0-2%)
SOB SOZ	1.1 0.4	Land dominated by soils formed in calcareous loess. Main soils: <i>calcareous loam</i> <b>A4-A5</b> . With limited to common areas of <i>loam to clay loam over red clay</i> <b>D3-C4</b> grading to <i>gradational calcareous clay loam</i> <b>A6</b> . <b>SOB</b> – slopes and rises with ill-defined drainage lows (slopes 0-2.5%). <b>SOZ</b> – rise surface/elevated plain (slopes 0-1.5%).
TPA TPAs TPB	3.3 0.5 2.7	Land dominated by soils formed in clayey sediments with clay loam to light clay surfaces. Main soils: <i>clay loam to loam over red clay</i> <b>C4-D3</b> grading to <i>gradational calcareous clay loam</i> <b>A6</b> . <b>TPA</b> – somewhat elevated plains with broad low areas (slopes 0-1%). <b>TPAs</b> – plains and slight slopes (slopes 0-1.5%). <b>TPB</b> – slopes with drainage lows (slopes 0.5-3%).

### Detailed soil profile descriptions:

#### Main soils:

- C4-D3-D2-C3** *clay loam to loam over red clay* [Haplic-Effervescent-Sodic Hypercalcic-Lithocalcic Red-Brown Dermosol-Chromosol]  
Red brown to brown thin to thick clayey to loamy topsoil overlying red to brown clayey subsoil grading to clay with abundant fine carbonate. This is underlain by loamy to clay loamy saprolitic sediments, or clayey sediments. Profiles often include some hard carbonate fragments, and sometimes some rock fragments. Topsoils can be slightly calcareous when the profile is gradational (grading to soil **A6**), and slightly to highly calcareous when the profile is texture contrast. Texture contrast soils with loamy topsoils are typically highly erodible.
- A6** *gradational calcareous clay loam* [Pedal Hypercalcic-Lithocalcic Calcarosol]  
Calcareous grey brown, brown or red brown medium thickness to thin clayey to loamy topsoil overlying red brown to yellow brown clayey subsoil with abundant fine carbonate. Fine carbonate content increases with depth. This is underlain by loamy to clay loamy saprolitic sediments, or clayey sediments. Profiles often include some hard carbonate fragments, and sometimes some rock fragments.
- A5-A4-A2-D3b** *calcareous loam* [Regolithic-Paralithic Hypercalcic-Lithocalcic Calcarosol and a few Effervescent-Haplic Brown-Red Chromosols]  
Grey brown to brown medium thickness calcareous loamy to clay loamy topsoil grading to loamy to light clayey subsoil with abundant fine carbonate. Profiles, especially shallower variants, can contain abundant carbonate rubble. Profiles are underlain by calcareous loess, clayey sediments (soil **A5**), or loamy to clay loamy saprolitic sediments. Those formed on saprolitic sediments grade to texture contrast soils with loamy topsoils and brown to red brown clay loamy to light clayey subsoils (soil **D3b**).



**Minor soils:**

- B2** *shallow calcareous loam to clay loam on calcrete* [Petrocalcic Calcarosol]  
Grey brown to red brown calcareous loams or clay loams overlying calcrete at shallow depth. Profiles can contain abundant hard carbonate rubble.
- B6** *shallow loam to clay loam over red clay on calcrete* [Sodic-Effervescent-Haplic Petrocalcic Red-Brown Chromosol]  
Red brown to brown medium thickness loamy to clay loamy topsoil overlying red brown clayey subsoil. Lower subsoil layers typically contain abundant hard carbonate rubble. Underlying this is a calcrete layer, which overlies some unconsolidated highly calcareous loamy sediments and then highly calcareous saprolitic sediments. Topsoils can be calcareous.
- E3-E2** *brown-red cracking clays* [Brown-Red Vertosol]  
Cracking and calcareous brown to red brown light clayey surface soil grading to yellow brown to red brown clayey subsoils with abundant fine carbonate which shrink on drying and swell on wetting. Found in a few drainage depressions, outwash fans, and slopes. Typically associated with gilgai microrelief – mounds, flats, and crabholes – however, these become obscured after years of cultivation. The Brown Vertosols occur in drainage depressions, and it is likely that Red Vertosols occur on higher elevation situations.

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

