

# BNH Bagnall Hill Land System

Rises, low hills, summit surfaces, and slopes, with some depression areas and drainage depressions. This system forms the western-most extension of the Yorke Peninsula central highlands zone.

**Area:** 146.6 km<sup>2</sup>

**Landscape:** Rises, low hills, summit surfaces, and slopes, with some depression areas and drainage depressions. Drainage is mostly toward the west and southwest. Large drainage depressions connect with the Agery Basin. The system is dominated by clayey sediments. These have probably formed in situ, from underlying bedrock. Some clayey subsoils grade into deeply weathered saprolitic sediments. Wind-deposited calcareous loess (Woorinen Formation) overlies the clayey sediments in many places, particularly on the western parts of the system. Some older calcareous loess is calcreted, particularly in the south of the system. Calcrete remnants occur on some rises.

**Annual rainfall:** 395 – 480 mm average

**Main soils:** **A6** Gradational calcareous clay loam (around 46% of area)  
**A5-A4** (Rubbly) calcareous loam (around 38% of area)

**Minor soils:** **B2** Shallow calcareous loam on calcrete (around 10% of area)  
**C3-D2** Clay loam to loam over clay (around 6% of area)

**Main features:** The system is mostly arable. The most common soils are calcareous clay loams grading into clayey subsoil. Significant areas of deep to moderate depth calcareous loams occur. Many soils with clayey subsoils are imperfectly drained, even on summit surfaces. Numerous areas are prone to waterlogging. Temporary flooding may even occur in low lying areas. Toxic accumulations of boron and sodium typically occur in clayey subsoils or substrates. Toxic elements especially occur where a clayey subsoil or substrate restricts drainage.

Calcareous soils limit 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 the case in the highly calcareous deep to moderate depth calcareous loams.

Water erosion is a potential problem on many slopes. Many slopes in the northwest of the system are gentle but long. The length of slope adds to the erosion potential. Vague drainage ways on these slopes can carry water flow over long distances in very wet years. Steeper slopes in the southwest of the system show signs of erosion, with rills and drainage lines indicating where erosive water flows have occurred. It is probable that sheet erosion has also occurred.

Saline seepage is evident in parts of depression areas/drainage depressions, and on sections of the slopes along the western side of the system.

Soils with hard carbonate rubble and/or shallow depth to calcrete have reduced effective water holding capacities, and hence reduced production potentials. Also surface rubble interferes with some farming operations.



**Soil Landscape Unit summary:** Bagnall Hill Land System (BNH)

SLU	% of area	Main features #
IAB IAC IAE IAEg IAZ	9.3 1.7 5.4 0.4 1.0	Land dominated by soils formed in clayey sediments. Main soils: <i>gradational calcareous clay loam A6</i> including some <i>clay loam to loam over clay C3-D2</i> . <b>IAB</b> slopes and some summit surfaces (slopes 0.5-2.5%). <b>IAC</b> slopes (slopes 1-5%). <b>IAE</b> depression with vague drainage lows (slopes 0-1%). <b>IAEg</b> drainage depressions with drainage lines (slopes 0-1%). <b>IAZ</b> summit surface (slopes 0-1%).
ICA ICB ICZ	1.9 1.9 0.3	Land dominated by soils formed in clayey sediments. Main soils: <i>gradational calcareous clay loam A6</i> . With limited to common areas of <i>calcareous loam A5-A4</i> . <b>ICA</b> gently undulating plains (slopes 0-1.5%). <b>ICB</b> slopes with very vague drainage ways (slopes 0.5-3.5%). <b>ICZ</b> summit surface (slopes 0-1%). Limited to common areas of <i>shallow calcareous loam on calcrete B2</i> with clay loam surface soil occur in this unit.
IDB IDO IDZ IDZw	9.2 0.8 3.4 2.8	Land dominated by soils formed in clayey sediments. Main soils: <i>gradational calcareous clay loam A6</i> . <b>IDB</b> slopes with some vague drainage ways (slopes 0.5-2.5%). <b>IDO</b> depression with vague drainage line (slopes 0-1%). Probably with some vertic (reactive) subsoils. <b>IDZ</b> summit surface (slopes 0-1%). <b>IDZw</b> imperfectly drained summit surface (slopes 0-1%).
IFB	0.9	Land dominated by soils formed in clayey sediments. Main soils: <i>gradational calcareous clay loam A6</i> with vertic (reactive) clayey subsoils, possibly including some <i>clay loam over clay C3</i> with vertic subsoils. With limited to common <i>calcareous brown-red cracking clay E3-E2</i> . <b>IFB</b> gently undulating plains and slight slopes (0-2%).
IHB IHC	0.4 0.3	Land dominated by soils formed in clayey sediments and calcareous loess. Main soils: <i>gradational calcareous clay loam A6</i> including some <i>clay loam to loam over clay C3-D2</i> , and extensive areas of <i>rubbly calcareous loam A5-A4</i> . <b>IHB</b> slopes (0.5-2.5%). <b>IHC</b> slopes with vague drainage ways (slopes 1-4%).
IJA	0.6	Land dominated by soils formed in clayey sediments. Main soils: <i>gradational calcareous clay loam A6</i> . With limited to common areas of <i>shallow calcareous loam on calcrete B2</i> . <b>IJA</b> summit surface depression (slopes 0-1%).
IMB IMZ	4.8 1.3	Land dominated by soils formed in clayey sediments. Main soils: <i>gradational calcareous clay loam A6</i> including <i>clay loam to loam over clay C3-D2</i> . With limited to common areas of <i>calcareous loam A5-A4</i> . <b>IMB</b> slopes and summit surfaces with vague drainage ways, probably eroded in northern unit (0.5-2.5%). <b>IMZ</b> summit surface (slopes 0-1%).
IOB IOC IOZ	1.0 0.3 1.2	Land dominated by soils formed in clayey sediments. Main soils: <i>gradational calcareous clay loam A6</i> including <i>clay loam to loam over clay C3-D2</i> , and extensive areas of <i>calcareous loam A5-A4</i> . <b>IOB</b> slopes (slopes 0.5-2.5%). <b>IOC</b> concave slopes with vague drainage ways, probably eroded (slopes 0.5-3%). <b>IOZ</b> summit surface (slopes 0-1%).
IRB IRE IRZ	0.6 1.0 1.8	Land dominated by soils formed in clayey sediments. Main soils: <i>gradational calcareous clay loam A6</i> . With limited to common areas <i>calcareous loam A5-A4</i> , and <i>shallow calcareous loam on calcrete B2</i> . <b>IRB</b> upper slopes (slopes 0.5-2.5%). <b>IRE</b> drainage depression (slopes 0-1%). <b>IRZ</b> gently undulating summit surface (slopes 0-1.5%).
ITB	1.0	Land dominated by soils formed in clayey sediments. Main soils: <i>gradational calcareous clay loam A6</i> including some <i>clay loam to loam over clay C3-D2</i> . With limited to common areas <i>calcareous loam A5-A4</i> , and <i>shallow calcareous</i>



		<i>loam on calcrete</i> <b>B2</b> . <b>ITB</b> slopes with vague drainage ways (slopes 0.5-2%).
QDC	0.6	Land dominated by calcreted soils and soils formed in calcareous loess. Main soils: <i>shallow calcareous loam on calcrete</i> <b>B2</b> , and extensive areas of <i>calcareous loam</i> <b>A4-A5</b> . With limited to common areas of <i>gradational calcareous clay loam</i> <b>A6</b> in lows/depressions. <b>QDC</b> rise and slopes (slopes 0.5-4%).
QHB	0.2	Land dominated by calcreted soils. Main soils: <i>shallow calcareous loam on calcrete</i> <b>B2</b> . <b>QHB</b> low rise (slopes 0-2%).
QIA	0.3	Land dominated by calcreted soils.
QIB	1.1	Main soils: <i>shallow calcareous loam on calcrete</i> <b>B2</b> . With limited to common areas of
QIZ	0.1	<i>gradational calcareous clay loam</i> <b>A6</b> in lows/depressions. <b>QIA</b> low lying plain (slopes 0-1%). <b>QIB</b> rises, summit surfaces, and slopes (slopes 0.5-2.5%). <b>QIZ</b> summit surface (slopes 0-1.5%).
QKB	3.0	Land dominated by calcreted soils.
QKZ	2.0	Main soils: <i>shallow calcareous loam on calcrete</i> <b>B2</b> . With limited to common areas of <i>calcareous loam</i> <b>A4-A5</b> . <b>QKB</b> slopes (slopes 0.5-3%). <b>QKZ</b> summit surface (slopes 0-1%).
SDB	4.4	Land dominated by soils formed in calcareous loess and clayey sediments. Main soils: <i>calcareous loam</i> <b>A5-A4</b> , and extensive areas of <i>gradational calcareous clay loam</i> <b>A6</b> including some <i>clay loam to loam over clay</i> <b>C3-D2</b> in lows/depressions. <b>SDB</b> slopes with some vague drainage ways (slopes 0.5-2.5%).
SdB	0.3	Land dominated by soils formed in rubbly calcareous loess.
SdH	2.2	Main soils: <i>rubbly calcareous loam</i> <b>A4-A5</b> . With limited to common areas of <i>gradational calcareous clay loam</i> <b>A6</b> including <i>clay loam to loam over red clay</i> <b>C3-D2</b> , and <i>shallow calcareous loam on calcrete</i> <b>B2</b> grading to <i>shallow loam on calcrete</i> <b>B3</b> .
SdL	1.7	<b>SdB</b> lower slopes with drainage lows (0.5-2.5%).
SdMe	1.4	<b>SdH</b> slopes with drainage liens/rilling (slopes 0.5-3%). <b>SdL</b> slopes with an intricate pattern of drainage ways, probably eroded (slopes 0.5-3%). <b>SdMe</b> slopes with an intricate pattern of drainage ways, with rilling and drainage lines (slopes 1-3.5%).
SeB	2.3	Land dominated by soils formed in rubbly calcareous loess.
SeZ	0.2	Main soils: <i>rubbly calcareous loam</i> <b>A4-A5</b> . With limited to common areas of <i>gradational calcareous clay loam</i> <b>A6</b> , and <i>shallow calcareous loam on calcrete</i> <b>B2</b> . <b>SeB</b> slopes and rises with vague drainage lows (slopes 0.5-2.5%). <b>SeZ</b> somewhat raised level plain with vague drainage lows (slopes 0-1%).
ShB	1.3	Land dominated by soils formed in rubbly calcareous loess.
ShC	1.2	Main soils: <i>rubbly calcareous loam</i> <b>A4-A5</b> . With limited to common areas of <i>shallow calcareous loam on calcrete</i> <b>B2</b> . <b>ShB</b> summit surface and slopes (slopes 0.5-2%). <b>ShC</b> slopes (1-4%).
SMA	0.5	Land dominated by soils formed in calcareous loess.
SMBg	12.1	Main soils: <i>calcareous loam</i> <b>A4-A5</b> . With minor areas of <i>gradational calcareous clay loam</i>
SMC	0.2	<b>A6</b> in lows/depressions.
SMCg	0.3	<b>SMA</b> somewhat elevated level to gently undulating plain (slopes 0-1%). <b>SMBg</b> somewhat elevated gently undulating plains, slopes, and rises with drainage lows (slopes 0-2%). <b>SMC</b> concave slope with vague drainage way (slopes 0.5-2.5%). <b>SMCg</b> slope with drainage line/rilling (slopes 0.5-2.5%).
SPC	0.5	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>gradational calcareous clay loam</i> <b>A6</b> including <i>clay loam to loam over red clay</i> <b>C3-D2</b> , and <i>shallow calcareous loam on calcrete</i> <b>B2</b> grading to <i>shallow loam on calcrete</i> <b>B3</b> . <b>SPC</b> concave slopes with drainage line (slopes 0.5-3%).
SRB	1.0	Land dominated by soils formed in calcareous loess. Main soils: <i>calcareous loam</i> <b>A5-A4</b> . With limited to common areas of <i>gradational calcareous clay loam</i> <b>A6</b> , and <i>shallow calcareous loam on calcrete</i> <b>B2</b> . <b>SRB</b> slopes (slopes 0.5-2%).



SVB	0.8	Land dominated by soils formed in calcareous loess.
SVC	3.1	Main soils: <i>calcareous loam A4-A5</i> . With limited to common areas of <i>shallow calcareous loam on calcrete B2</i> .
SVCc	0.5	
SVL	5.0	<b>SVB</b> slight slopes with drainage lows (slopes 0.5-1.5%).
SVZ	0.3	<b>SVC</b> slopes (slopes 0.5-4%).
		<b>SVCc</b> concave slopes with drainage ways and contour banks (slopes 0.5-2.5%).
		<b>SVL</b> slopes with vague drainage ways with a few patches of saline seepage evident at the land surface (slopes 0.5-2.5%; salinity 3-2s°).
		<b>SVZ</b> summit surface (slopes <1%).

# 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:

#### Main soils:

**A6** *Gradational calcareous clay loam* [Pedal Hypercalcic Calcarosol]  
Medium thickness to thin calcareous grey brown to brown clayey to loamy topsoil grading to a yellowish, brown, reddish or grey clayey subsoil with abundant fine carbonate. This is underlain by a clayey substrate (Hindmarsh Clay equivalent) or deeply weathered saprolitic sediments. The most common surface texture is clay loam to light clay. Some soils have reactive clay (vertic) subsoils which shrink and swell on wetting and drying. These soils grade to **C3-D2** soils. Particularly found in lows/depressions when associated when **A5-A4** or **B2** soils.

**A5-A4** (*Rubbly*) *calcareous loam* [Regolithic Hypercalcic-Lithocalcic Calcarosol]  
Grey brown to brown medium thickness calcareous loamy to clay loamy topsoil grading to light clayey to loamy subsoil with abundant fine carbonate. Profiles range from having minor to abundant carbonate rubble. Many of these soils are underlain by a clayey substrate within 120 cm of the surface (**A5** soil).

#### Minor soils:

**B2** *Shallow calcareous loam on calcrete* [Petrocalcic Calcarosol]  
Grey brown to brown calcareous loams or clay loams overlying calcrete at shallow depth. The calcrete can be weakly to moderately cemented and massive, or strongly cemented and nodular – the type more typical of calcrete over the Peninsula. Calcrete layers, especially the more weakly cemented types can be as little as 20 or 30 cm thick. Found on summit surfaces and slopes, and as remnants of calcrete – which was evidently once more extensive.

**C4-D3** *Clay loam to loam over red clay* [Sodic Hypercalcic Red Dermosol-Chromosol]  
Red brown medium thickness to thin non-calcareous to slightly calcareous clayey to loamy topsoil over reddish clayey subsoil, grading into clayey lower subsoil with abundant fine carbonate. This is underlain by clayey substrate (Hindmarsh Clay equivalent) or deeply weathered saprolitic sediments. Closely related to soil **A6**, but either texture contrast, or gradational with non calcareous to slightly calcareous surfaces.

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

