

# WRD Ward Hill Land System

Range of undulating to steep low hills rising five km south of Mannanarie and extending to Spalding

**Area:** 130.4 km<sup>2</sup>

**Annual rainfall:** 425 - 475 mm average

**Geology:** Tillites, quartzitic shales and massive quartzites of the Appila Formation and associated quartzite members form the spine of the range giving it its relief. These rocks are flanked by softer and finer grained rocks of the Saddleworth Formation on the west and the Tindelpina Shale on the east. Between the basement rock outcrops are valleys infilled with locally derived medium to fine grained alluvium. All rocks and sediments are mantled by fine grained aeolian carbonates, cemented to rubble in places.

**Topography:** North - south range of low hills comprising a "spine" of moderately steep to steep rocky ridges with slopes of 20 - 50% and local relief of up to 90 m, undulating to rolling slopes of 3 - 20% abutting the spine, and gently inclined outwash fans with slopes of 2 - 10%.

**Elevation:** 350 m at the southern end to 670 m at the northern end

**Relief:** Maximum local relief is 90 m (commonly 20 - 60 m). Overall relief varies from 50 - 150 m (from west to east across the range).

**Soils:** The most common soils on rising ground are shallow to moderately shallow over rock, with the majority of profiles calcareous throughout. Most other soils have loam to sandy loam surfaces with red clayey subsoils. These are either shallow to moderately deep over weathering rock on rises, or deep over alluvium on lower slopes and outwash fans.

**Main soils:** *Soils formed on weathering rock on rising ground*

- A2** Shallow calcareous loam
- L1** Shallow stony loam
- D1** Hard loam over red clay on rock
- C2** Gradational loam on rock

**Minor soils:** *Soils formed on alluvium on lower slopes and flats*

- D2** Hard loam over well structured red clay
- D3** Hard loam over dispersive red clay
- C3** Gradational loam on highly calcareous clay
- M2** Gradational loam

**Main features:** The Ward Hill Land System contains a mixture of steep, rocky non arable land, semi arable moderately steep slopes, and more gently sloping fully arable land. Many soils on rising ground are shallow, with consequent moderately low waterholding capacities, although this is offset to some extent by the water retention characteristics of the predominantly siltstone bedrock. Hard setting, sealing surfaces are significant features of the loam over clay soils, predominant on gentler slopes. These lead to excessive runoff and erosion, reduced soil moisture content, difficulty in working the soil, and patchy emergence. Natural soil fertility is moderately high on these soils, and moderate on the shallow calcareous and non calcareous loams. Most soils are at least moderately well drained, and salinity is restricted to minor drainage depressions.



**Soil Landscape Unit summary:** 19 Soil Landscape Units (SLUs) mapped in the Ward Hill Land System

SLU	% of area	Main features #
AAC AAD	14.7 3.2	Rocky ridges formed mainly on the harder quartzites and tillites of the Appila Formation. <b>AAC</b> Slopes of 10-30%. <b>AAD</b> Slopes of 20-50% with relief of up to 90 m. Main soils: <u>shallow stony loam</u> - <b>L1</b> (E) and <u>shallow calcareous loam</u> - <b>A2</b> (E) with <u>hard loam over red clay on rock</u> - <b>D1</b> (L). This land is largely inaccessible, due to steep slopes and rockiness. Pasture productivity is limited mainly by shallow soils and the difficulty in undertaking improvements (sowing, fertilizing etc). There is considerable potential for erosion and landslip. Watercourses are generally stable although there are sporadic occurrences of gully erosion.
DCB DCC	1.4 14.6	Rises formed on siltstones of the Saddleworth Formation. <b>DCB</b> Rises between 10 and 30 m high with slopes of up to 4%. <b>DCC</b> Rises with slopes of 3-10%. Main soils: <u>hard loam over red clay on rock</u> - <b>D1</b> (E) with <u>shallow calcareous loam</u> - <b>A2</b> (C) and <u>gradational loam on rock</u> - <b>C2</b> (L). <u>Shallow stony loam</u> - <b>L1</b> (L) occurs where rock strata are hard. These soils are moderately fertile, well drained and have moderately high waterholding capacities. The slopes are mostly arable (except for minor rocky outcrops and dissected areas). Gradients are moderate with a consequent potential for water erosion. This is exacerbated by the predominant hard setting, poorly structured soil type which tends to seal over and shed water. Other limitations caused by poor structure are difficulty in working and patchy emergence.
DSC DSD	4.4 1.5	Rises formed on interbedded siltstones and quartzites. Rocky outcrops are common, usually in reefs. <b>DSC</b> Undulating rises up to 30 m high with slopes of 3-10%. <b>DSD</b> Rises to 40 m high with slopes of 5-20%. Main soils: <u>shallow hard loam over red clay on rock</u> - <b>D1</b> (E) and <u>shallow stony loam</u> - <b>L1</b> (E). These rises are semi-arable due to their slopes and potential for erosion. Rocky reefs and frequent watercourses also limit cropping potential.
EFC EFD	2.5 1.2	Spurs abutting the steep hills along the eastern margin of the land system, formed on rocks of the Tindelpina Formation. Relief is 10-30 m. Rocky outcrops are common. <b>EFC</b> Slopes are 4-12%. <b>EFD</b> Slopes are 10-20%. Main soils: <u>shallow calcareous loam</u> - <b>A2</b> (E) and <u>shallow stony loam</u> - <b>L1</b> (E). The soils are well drained and well structured, but are shallow and only moderately fertile due to their relatively low clay content.
EGC EGD	6.1 0.7	Rises formed on siltstones of the Saddleworth and Tindelpina Formations. <b>EGC</b> Undulating rises up to 20 m high with slopes of 5-12%. <b>EGD</b> Slopes of 10-20%. Main soils: <u>shallow calcareous loam</u> - <b>A2</b> (V), with <u>hard loam over red clay on rock</u> - <b>D1</b> (L) and <u>gradational loam on rock</u> - <b>C2</b> (L). The land is fully arable (except for minor outcrop), but because most of the soils are relatively shallow, moisture shortages may limit crops in dry finishes. Reduction of water loss and erosion through runoff is the main management issue, together with fertility maintenance. "Lime-induced" nutrient deficiencies are probable on calcareous soils.
ESC ESD	2.0 21.1	Rocky ridges formed on mixed siltstones and quartzites with 10-20% rocky outcrops. Maximum relief is 60 m. <b>ESC</b> Ridges with slopes of 5-12%. <b>ESD</b> Ridges with slopes of 10-20%. Main soils: <u>shallow gradational loam on rock</u> - <b>C2</b> (E) and <u>shallow calcareous loam</u> - <b>A2</b> (E) formed over siltstone basement rock and containing variable amounts of soft and rubbly carbonate. <u>Shallow stony loam</u> - <b>L1</b> (L) occurs in rocky areas on harder rocks. Rocky reefs, shallow stony soils. Sometimes moderate slopes limit cropping of these areas. Arable land is generally confined to strips between reefs of rock. Water erosion is a potential because of high runoff from shallow soils and rocky areas.
JEB JEC JEH JEJ JEQ	2.3 15.4 3.0 3.0 0.1	Flats and outwash fans formed on alluvial sediments. <b>JEB</b> Fans with slopes of 2-4% and well defined stable watercourses. <b>JEC</b> Fans with slopes of 3-10% and well defined stable watercourses. <b>JEH</b> Fans with slopes of 3-10% and eroded watercourses. <b>JEJ</b> Drainage depressions with eroded watercourses. Slopes are 3-7%. <b>JEQ</b> Fans with saline seepage.



		Main soils: <u>hard loam over well structured red clay</u> - <b>D2</b> (E) and <u>hard loam over dispersive red clay</u> - <b>D3</b> (E) with <u>gradational loam (on highly calcareous clay)</u> - <b>C3/M2</b> (E) all formed over alluvium. The soils are deep, inherently fertile and generally moderately well drained. The main limitations are poor surface (and subsurface in D3 soils) structure. Poor surface structure causes reduced water infiltration resulting in increased erosion potential and surface waterlogging, working difficulty and seedling emergence problems. Dispersive subsoils in the D3 soils cause more prolonged waterlogging. Watercourse erosion is significant in <b>JEH</b> and <b>JEJ</b> . Saline seepage is minor, but it is likely that subsoil salinity levels are moderate and that saline water tables occur in places.
JYC JYH	0.7 2.1	Complex of very gently undulating basement rock rises interspersed with flats formed on alluvium. Slopes are 3-8%. <b>JYC</b> Watercourses are stable. <b>JYH</b> Watercourses are eroded. Main soils: <u>hard loam over well structured red clay</u> - <b>D2</b> (E) and <u>gradational loam on highly calcareous clay</u> - <b>C3</b> (C) on alluvium, and <u>shallow calcareous loam</u> - <b>A2</b> (C), <u>shallow stony loam</u> - <b>L1</b> (M) and <u>gradational loam on rock</u> - <b>C2</b> (M) on rises. Flats are similar to <b>JEC</b> and the rises are similar to <b>EGC</b> .

# PROPORTION codes assigned to soils within Soil Landscape Units (SLU):

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|--|---------------------------------------|
| (D) Dominant in extent (>90% of SLU)         | (C) Common in extent (20–30% of SLU)  |
| (V) Very extensive in extent (60–90% of SLU) | (L) Limited in extent (10–20% of SLU) |
| (E) Extensive in extent (30–60% of SLU)      | (M) Minor in extent (<10% of SLU)     |

### Detailed soil profile descriptions:

- A2** Shallow calcareous loam (Paralithic, Calcic / Lithocalcic Calcarosol)  
Medium thickness calcareous loam over soft (Calcic or Hypercalcic) to rubbly (Supracalcic or Lithocalcic) carbonate grading to weathering siltstone within 100 cm. In 10% of soils the carbonate layer is in sheet rock form.
- C2** Gradational loam on rock (Calcic / Supracalcic, Red Dermosol)  
Medium thickness loam to clay loam grading to a well structured red clay with soft (occasionally rubbly) carbonate at depth, overlying weathering rock within 100 cm of the surface.
- C3** Gradational loam on highly calcareous clay (Hypercalcic / Supracalcic, Red Dermosol)  
Medium thickness loam to clay loam grading to a well structured red clay with soft (occasionally rubbly) carbonate at depth, overlying alluvium.
- D1** Hard loam over red clay on rock (Calcic, Red Chromosol)  
Medium thickness hard massive sandy loam to clay loam abruptly overlying a well structured friable red clay grading to soft carbonate merging with weathering basement rock within 100 cm.
- D2** Hard loam over well structured red clay (Calcic, Red Chromosol)  
Medium thickness hard massive sandy loam to clay loam abruptly overlying a well structured red clay grading to soft carbonate merging with alluvium.
- D3** Hard loam over dispersive red clay (Calcic, Red Sodosol)  
Medium thickness hard massive sandy loam to clay loam abruptly overlying a poorly structured and dispersive red clay grading to soft carbonate merging with alluvium.
- L1** Shallow stony loam (Lithic, Leptic Tenosol / Rudosol)  
Shallow stony loam grading to hard basement rock within 50 cm. Soft carbonate commonly occurs in fissures in the rock.
- M2** Gradational loam (Calcic Red Dermosol)  
Medium thickness loam to clay loam grading to a well structured red clay with minor fine carbonate at depth, overlying alluvium.

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

