

This Technical Data Sheet describes the *typical average properties* of the specified soil.

It is essentially a summary of information obtained from one or more profiles of this soil that were examined and described during the Topoclimate survey or previous surveys. It has been prepared in good faith by trained staff within time and budgetary limits. However, no responsibility or liability can be taken for the accuracy of the information and interpretations. Advise should be sought from soil and landuse experts before making landuse decisions on individual farms and paddocks. The characteristics of the soil at a specific location may differ in some details from those described here.

No warranties are expressed or implied unless stated.

## Soil name: Warepa

### Overview

Warepa soils occupy about 2,600 ha on rolling downlands and hills in eastern Southland and west and south Otago. These soils also occur in south Otago on areas not surveyed by Topoclimate. They are formed in deep wind-deposited loess derived from greywacke and schist rocks. They have silty textures and are imperfectly drained, with a dense fragipan at a depth of about 50cm which restricts water drainage. These soils respond well to mole and tile drainage and are used for sheep and dairy production, with some cropping. Climate is cool temperate with regular rain, though soils can be seasonally dry during some summers.

### Soil classification

**NZ Soil Classification (NZSC):**

Mottled Fragic Pallic; stoneless; silty

**Previous NZ Genetic Classification:**

Yellow-grey to Yellow-brown earth intergrade

### Classification explanation

The NZSC of the Warepa soils is consistent with the previous classification. Warepa soils are imperfectly drained, due to perching of water on a dense fragipan. The subsoil above the fragipan also typically has high density, which limits root growth. Warepa soils also have silty textures and P-retention of <30% throughout the profile, and are typically stone free.

### Soil phases and variants

Identified units in the Warepa soils are:

- Warepa undulating deep (WrU1): has no gravel within 90cm depth; occurs on slopes of 0–7°
- Warepa rolling deep (WrR1): has no gravel within 90cm depth; occurs on slopes of 7–15°
- Warepa hilly deep (WrH1): has no gravel within 90cm depth; occurs on slopes of 15–25°
- Warepa steep deep (WrS1): has no gravel within 90cm depth; occurs on slopes of >25°

The soil properties described in this Technical Data Sheet are based on the most common phase, Warepa undulating deep (WrU1). Values for other phases and variants can be taken as being similar. Where they differ significantly they are recorded with a separate versatility rating, e.g., Warepa hilly deep (WrH1).

### Associated soils

Some soils that commonly occur in association with Warepa soils are:

- Jacobstown: moderately deep to deep poorly drained floodplain soil
- Glenure: deep poorly drained soil formed into loess without a fragipan within 90cm depth

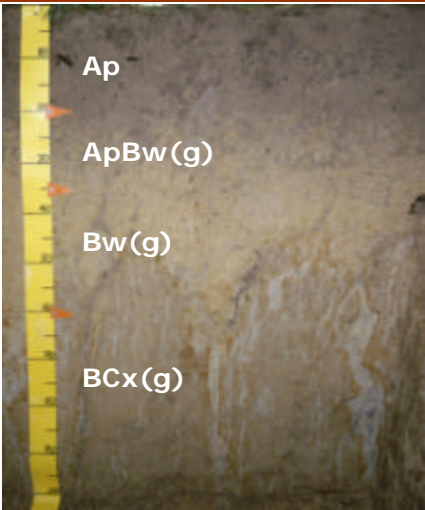
## Similar soils

Some soils that have similar properties to Warepa soils are:

- Waikoikoi: poorly drained equivalent of the Warepa soil
- Aparima: imperfectly drained Brown soil with a fragipan
- Arthurton: imperfectly drained Brown soil without a fragipan

## Typical profile features

The following is a 'generic' or composite profile description representing the most common combination of characteristics for this soil type. The actual profiles for which descriptions and data are available are listed at the end of this Technical Data Sheet.

Warepa profile	Horizon	Depth (cm)	Description
	Ap	0–20	Greyish yellow-brown silt loam; few brown mottles; weak soil strength; strongly developed very fine to fine polyhedral structure; abundant roots
	Ap/Bw(g)	20–35	Dull yellow-orange silt loam; common yellowish brown and few light yellow mottles; many worm casts; weak soil strength; strongly developed very fine to medium polyhedral structure; many roots
	Bw(g)	35–60	Dull yellow-orange silt loam; common yellowish brown and common light yellow mottles; few worm casts; slightly firm soil strength; moderately developed medium to coarse polyhedral structure; many roots
	BCx(g)	60–90+	Dull yellowish brown silt loam; few light grey and few bright brown mottles; light grey veins and bright brown selvedge; firm soil strength; weakly developed gross prismatic structure; common roots in veins

## Key profile features

Topsoils are 20–27cm deep and have a strongly developed structure. Subsoil structure is moderately developed. Mottles occur throughout the profile. A fragipan with a net gammate structure occurs below 60cm.

Warepa soils have a 15–25cm deep topsoil that has moderate to strongly developed structure. Subsoil structure is moderate to weak in the upper subsoil, abruptly changing in the lower subsoil to the weakly developed extremely coarse prismatic structure of the fragipan. The upper subsoil is strongly mottled, indicating the imperfect drainage caused by water perching on the fragipan.

## Typical physical properties

Note: values in *Italics* are estimates

Horizon	Depth (cm)	Bulk density	Permeability	Texture	Gravel content
Ap	0–20	High	<i>Moderate</i>	Silt loam	Gravel free
Ap/Bw(g)	20–35	Moderate – High	<i>Moderate</i>	Silt loam	Gravel free
Bw(g)	35–60	High	<i>Slow</i>	Silt loam	Gravel free
BCx(g)	60–90+	High	<i>Slow</i>	Silt loam	Gravel free

**Profile drainage:** Imperfect  
**Plant readily available water:** *Moderately high*  
**Potential rooting depth:** Slightly deep  
**Rooting restriction:** Fragipan

## Key physical properties

Warepa soils have a slightly deep potential rooting depth that is severely restricted by the fragipan at 45–60 cm depth. Plant available water is typically moderately high, but the soils are imperfectly drained, with slow permeability in the subsoil and limited aeration during sustained wet periods. Textures are typically silt loams, and topsoil clay content is typically 20–30%, and stone free.

## Typical chemical properties

Horizon	Depth (cm)	pH	P retention	CEC	BS	Ca	Mg	K	Na
Ap	0–20	Moderate	Low	Moderate	Very high	High	Low	Very low	Low
Ap/Bw(g)	20–35	Moderate	Moderate	Low	Moderate	Moderate	Low	Very low	Very low
Bw(g)	35–60	Moderate	Low	Low	Moderate	Low	Low	Very low	Very low
BCx(g)	60–90+	Moderate	Low	Low	Moderate	Low	Moderate	Very low	Low

## Key chemical properties

Topsoil organic matter levels are 4–8%; P-retention 15–30% and topsoil pH moderate (low 6s). Subsoil pH levels are lower at 5.5–5.7. Cation exchange values are moderate and base saturation high. Available calcium levels are high with magnesium and potassium levels low. Soil reserve phosphorus levels are low. Micronutrient levels are generally adequate, although molybdenum responses in legumes and boron responses in brassics can occur.

## Vulnerability to environmental degradation

**Note:** the vulnerability ratings given in the table below are generalised and should not be taken as absolutes for this soil type in all situations. The actual risk depends on the environmental and management conditions prevailing at a particular place and time. Specialist advice should be sought before making management decisions that may have environmental impacts. Where vulnerability ratings of Moderate to Very severe are indicated, advice may be sought from Environment Southland or a farm management consultant.

Vulnerability factor	Rating	Vulnerability compared to other Southland soils
<b>Structural compaction</b>	severe	These soils have a severe vulnerability to structural degradation by long-term cultivation, or compaction by heavy stocking and vehicles. This rating reflects the imperfect drainage, but low organic matter, clay content and P-retention.
<b>Nutrient leaching</b>	slight	These soils have a slight vulnerability to leaching to groundwater. This rating reflects the imperfect drainage, slow permeability and moderately high water holding capacity.
<b>Topsoil erodibility by water</b>	moderate	Due to the moderate to low organic matter and clay content, topsoil erodibility in these soils is moderate. Erodibility is highly dependent on management, particularly when there is no vegetation cover.
<b>Organic matter loss</b>	slight	Vulnerability to long-term decline in soil organic matter levels is partly dependent on soil properties and highly dependent on management practices (e.g., crop residue management and cultivation practices).
<b>Waterlogging</b>	moderate	These soils have a moderate vulnerability to waterlogging during wet periods. This rating reflects the imperfect drainage and slowly permeable subsoil.

## General landuse versatility ratings for Warepa soils

**Note:** The versatility ratings in the table below are indicative of the major limitations for semi-intensive to intensive landuse. These ratings differ from those used in the past in that sustainability factors are incorporated in the classification.

Refer to the Topoclimate district soil map or property soil map to determine which of the soil symbols listed below are applicable, then check the versatility ratings for that symbol in the appropriate table.

### WrU1 (Warepa undulating deep)

Versatility evaluation for soil WrU1		
Landuse	Versatility rating	Main limitation
Non-arable horticulture	Limited	Risk of short-term waterlogging after heavy rain; restricted rooting depth.
Arable	Limited	Restricted aeration; risk of short-term waterlogging
Intensive pasture	Limited	Risk of short-term waterlogging
Forestry	Limited	Restricted rooting depth.

### WrR1 (Warepa rolling deep)

Versatility evaluation for soil WrR1		
Landuse	Versatility rating	Main limitation
Non-arable horticulture	Limited	Risk of short-term waterlogging after heavy rain; restricted rooting depth.
Arable	Limited	Rolling slopes; risk of short-term waterlogging
Intensive pasture	Limited	Risk of short-term waterlogging
Forestry	Limited	Restricted rooting depth.

**WrH1 (Warepa hilly deep)**

Versatility evaluation for soil WrH1		
Landuse	Versatility rating	Main limitation
Non-arable horticulture	Unsuitable	Hilly slopes
Arable	Unsuitable	Hilly slopes
Intensive pasture	Limited	Hilly slopes; risk of short-term waterlogging
Forestry	Limited	Restricted rooting depth.

**WrS1 (Warepa steep deep)**

Versatility evaluation for soil WrS1		
Landuse	Versatility rating	Main limitation
Non-arable horticulture	Unsuitable	Steep slopes
Arable	Unsuitable	Steep slopes
Intensive pasture	Limited	Steep slopes; risk of short-term waterlogging
Forestry	Limited	Steep slopes: restricted rooting depth.

**Management practices that may improve soil versatility**

- Careful management after heavy rain and wet periods will reduce the impact of short-term waterlogging. Intensive stocking, cultivation and heavy vehicular traffic use should be minimised during these periods.
- Installation and maintenance of subsurface mole and tile drains will reduce the risk of short-term waterlogging.
- If compaction occurs, aeration at the correct soil moisture content and depth can be of benefit.

**Soil profiles available for Warepa soils**

Soil symbol	Profile ID	Topoclimate map sheet	Profile description available	Physical data available	Chemical data available	Profile photo available
WrU1	QT11	42	✓	✓	✓	✓
WrU1	H5	3	✓	✓	✓	✓
WrU1	TT1	23	✓	✓	✓	✓
WrU1	K1272	42	✓			
WrU1	SB09117	27	✓	✓	✓	

Published by Crops for Southland with financial support from Environment Southland.

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