

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: **Waihoaka**

Overview

Waihoaka soils occupy about 3,500 ha on dissected lower slopes of the Longwood Range in western Southland and Bluff Hill and are likely to cover adjacent areas not surveyed by Topoclimate. They are formed into loess. Waihoaka soils are well to imperfectly drained soils, with high available water capacity and silty textures. The soils show strong leaching, with high P-retention and are strongly acidic. The podzol features are likely to be less evident in areas that have significant development inputs. Present use is forestry with pastoral grazing with sheep and beef cattle on cleared areas. Climate is cool, with high rainfall throughout the year. Soils rarely dry out.

Soil classification

NZ Soil Classification (NZSC):

Humose Pan Podzol; stoneless; silty

Previous NZ Genetic Classification:

Very strongly leached podzolised yellow-brown earth.

Classification explanation

The NZSC of the Waihoaka soil is consistent with the previous classification. Waihoaka soils are strongly leached, with low base saturation, and are strongly acidic. The profile form is characterised by humus and iron illuviation staining the matrix and coating peds, with the development of a Bh or Bs horizon. There is a subsoil horizon that is structureless, with slightly firm or greater soil strength, that may limit root penetration, and has slow permeability that may cause waterlogging during wet periods. The soils are typically stone free and have silt loam textures to 90cm depth.

Soil phases and variants

Identified units in the Waihoaka soils are:

- Waihoaka hilly deep (WjH1): has no gravel within 90cm depth; occurs on slopes of 15–25°
- Waihoaka undulating deep (WjU1): has no gravel within 90cm depth; occurs on slopes of 0–7°
- Waihoaka rolling deep (WjR1): has no gravel within 90cm depth; occurs on slopes of 7–15°
- Waihoaka steep deep (WjS1): has no gravel within 90cm depth; occurs on slopes of >25°
- Waihoaka undulating moderately deep (WjU2): has bedrock between 45 and 90cm depth; occurs on slopes of 0–7°
- Waihoaka hilly moderately deep (WjH2): has bedrock between 45 and 90cm depth; occurs on slopes of 7–25°

The soil properties described in this Technical Data Sheet are based on the most common phase, Waihoaka hilly deep (WjH1). 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., Waihoaka undulating deep (WjU1).

Associated soils

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

- Orepuki: Shallow soil formed into thin loess overlying norite and tuffaceous greywacke bedrock
- Te Waewae: non-podzolised well to imperfectly drained Brown soil formed on marine terraces between Riverton and Tuatapere
- Colac: very poorly drained soil formed in deep peat

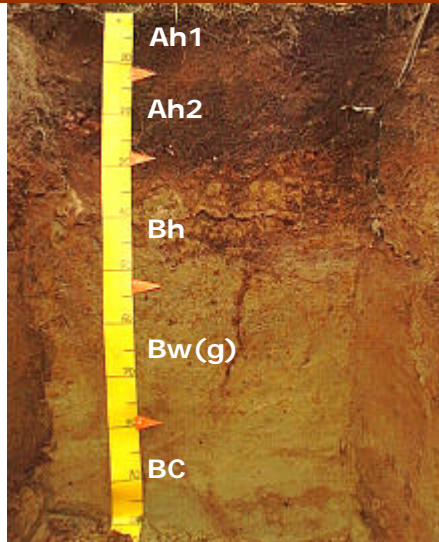
Similar soils

Some soils that have similar properties to Waihoaka soils are:

- Ashers: Podzol soil formed into deep loess on marine terraces of the Southland plain
- Traill: Podzol soil formed in moderately deep mixed loess and weathered colluvium overlying basic plutonic and basic volcanic bedrock

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.

Waihoaka profile	Horizon	Depth (cm)	Description
	Ah1	0–12	Brownish black silt loam; very weak soil strength; earthy structure; abundant roots
	Ah2	12–28	Brownish black silt loam; weak soil strength; moderately developed very fine to fine polyhedral structure; abundant roots
	Bh	28–53	Greyish brown silt loam; abundant very dark reddish brown organic coats and common dull reddish brown sesquioxide coats on ped faces; few worm casts; wavy discontinuous placic pan; very firm soil strength; moderately developed medium to coarse platy structure; many roots
	Bw(g)	53–79	Dull yellowish brown silt loam; many dull yellow and few bright brown mottles; few brown organic coats on ped faces; slightly firm soil strength; moderately developed fine to medium polyhedral structure; few roots
	BC	79–90+	Dull yellow loamy silt; few greyish brown organic coats in matrix; very few orange sesquioxide coats lining pores; weak soil strength; massive structure; few roots

Key profile features

Waihoaka soils have a dark coloured organic matter rich topsoil that is 20–30 cm deep, with weakly developed structure. In less developed sites the soils commonly have a layer of organic litter up to 50cm thick. Subsoil structure is moderately developed, grading to structureless in the lower subsoil. The dark brown colour of the Bh horizon reflects the strong accumulation of complexes of iron and organic matter that are common in the subsoil of these soils.

Typical physical properties

Note: values in *Italics* are estimates

Horizon	Depth (cm)	Bulk density	Permeability	Texture	Gravel content
Ah1	0–12	Low – Moderate	<i>Moderate</i>	Silt loam	Gravel free
Ah2	12–28	Moderate	<i>Moderate</i>	Silt loam	Gravel free
Bh	28–53	Moderate – High	<i>Moderate</i>	Silt loam	Gravel free
Bw(g)	53–79	Moderate – High	<i>Slow</i>	Silt loam	Gravel free
BC	79–90+	Moderate – High	<i>Slow</i>	Loamy silt	Gravel free

Profile drainage:	Moderately well
Plant readily available water:	<i>Very high</i>
Potential rooting depth:	Deep
Rooting restriction:	Subsoil acidity and aluminium toxicity may be limiting

Key physical properties

Waihoaka soils have a deep rooting depth and very high plant available water, although the subsoil acidity and aluminium toxicity may be limiting (particularly on less developed sites). Soils are well to imperfectly drained, with slowly permeable subsoils that may cause short-term waterlogging after heavy rain. Textures are silt loams throughout the profile, but topsoil texture may be slightly peaty to peaty where peat is present. Topsoil clay content is about 15–25%. No stones or gravels occur in these soils.

Typical chemical properties

Horizon	Depth (cm)	pH	P retention	CEC	BS	Ca	Mg	K	Na
Ah1	0–12	Moderate	Moderate	Moderate	High	Moderate	Very high	Very low	High
Ah2	12–28	Moderate	High	High	Moderate	Moderate	High	Very low	Moderate
Bh	28–53	Moderate	Very high	High	Low	Low	High	Very low	High
Bw(g)	53–79	Moderate	High	Moderate	Very low	Very low	Low	Very low	Moderate
BC	79–90+	—	—	—	—	—	—	—	—

Key chemical properties

Topsoil organic matter levels are variable depending on the occurrence of peat and range from 15 to >50%; P-retention values 38–50% and pH low to moderate (mid 4s to mid 5s). Cation exchange values are moderate and base saturation high. Available calcium levels are moderate, magnesium levels high and potassium levels low. Soil reserve phosphorus levels are low. Micronutrient levels are generally adequate.

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
Structural compaction	moderate	These soils have a moderate vulnerability to structural degradation by long-term cultivation, or compaction by heavy stocking and vehicles. This rating reflects the moderate drainage, clay content and P-retention, offset by the high organic matter content. Soils with very high organic matter content will have slight to minimal vulnerability.
Nutrient leaching	moderate	These soils have a moderate vulnerability to leaching to groundwater. This rating reflects the moderate drainage, offset by the very high water-holding capacity and slow subsoil permeability.
Topsoil erodibility by water	minimal	Due to the high organic matter content, topsoil erodibility in these soils is minimal. Erodibility is highly dependent on management, particularly when there is no vegetation cover.
Organic matter loss	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).
Waterlogging	slight	These soils have a slight vulnerability to waterlogging during wet periods. This rating reflects the moderately good drainage but slow permeability. The hilly and steep phases will have nil vulnerability.

General landuse versatility ratings for Waihoaka 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.

WjH1 (Waihoaka hilly deep)

Versatility evaluation for soil WjH1		
Landuse	Versatility rating	Main limitation
Non-arable horticulture	Unsuitable	Hilly slopes
Arable	Unsuitable	Hilly slopes
Intensive pasture	Limited	Hilly slopes
Forestry	Moderate	Hilly slopes

WjH2 (Waihoaka hilly moderately deep)

Versatility evaluation for soil WjH2		
Landuse	Versatility rating	Main limitation
Non-arable horticulture	Unsuitable	Hilly slopes
Arable	Unsuitable	Hilly slopes
Intensive pasture	Limited	Hilly slopes
Forestry	Limited	Restricted rooting depth

WjS1 (Waihoaka steep deep)

Versatility evaluation for soil WjS1		
Landuse	Versatility rating	Main limitation
Non-arable horticulture	Unsuitable	Steep slopes
Arable	Unsuitable	Steep slopes
Intensive pasture	Limited	Steep slopes
Forestry	Limited	Steep slopes

WjU1 (Waihoaka undulating deep)

Versatility evaluation for soil WjU1		
Landuse	Versatility rating	Main limitation
Non-arable horticulture	Moderate	Risk of short-term waterlogging after heavy rain
Arable	Moderate	Vulnerability to topsoil structural degradation by cultivation and compaction; risk of short-term waterlogging after heavy rain.
Intensive pasture	Moderate	Vulnerability to leaching to ground water; subsoil acidity.
Forestry	High	Few limitations

WjR1 (Waihoaka rolling deep)

Versatility evaluation for soil WjR1		
Landuse	Versatility rating	Main limitation
Non-arable horticulture	Moderate	Rolling slopes; risk of short-term waterlogging after heavy rain
Arable	Limited	Rolling slopes
Intensive pasture	Moderate	Vulnerability to leaching to ground water; subsoil acidity.
Forestry	High	Few limitations

WjR2 (Waihoaka rolling moderately deep)

Versatility evaluation for soil WjR2		
Landuse	Versatility rating	Main limitation
Non-arable horticulture	Limited	Restricted rooting depth
Arable	Limited	Rolling slopes
Intensive pasture	Moderate	Vulnerability to leaching to ground water; subsoil acidity.
Forestry	Moderate	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 incidence of short-term waterlogging.
- Management of fertiliser nutrient applications to minimise leaching losses

Soil profiles available for Waihoaka soils

Soil symbol	Profile ID	Topoclimate map sheet	Profile description available	Physical data available	Chemical data available	Profile photo available
WjU1	LT26	41	✓	✓	✓	✓
WjH1	OCT 2	40	✓	✓	✓	✓
WjU1	176/887/095	40	✓			
WjH1	176/943/173	40	✓			

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

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