

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: **Waianiwa**

### Overview

Waianiwa soils occupy about 1,500 ha on intermediate and high terraces of the Southland Plain between Riverton and Hedgehope. They are formed in deep loess deposits derived from tuffaceous greywacke rock. They have heavy silt loam textures, and are imperfectly drained, with a dense fragipan between 60 and 90cm depth which restricts water drainage. Waianiwa series was originally defined and published prior to the investigation of the Aparima map units, and should be correlated into the Aparima soils. They respond well to mole and tile drainage and are used for intensive sheep, dairy and deer production with some cropping. Regular summer rainfall occurs though inland soils may be seasonally dry.

### Soil classification

**NZ Soil Classification (NZSC):**

Mottled acidic, Firm, Brown; stoneless silty over clayey.

**Previous NZ Genetic Classification:**

Yellow-grey earth

### Classification explanation

Waianiwa soils have been reclassified from the previous classification based on the soil properties being more similar to Brown soils than Pallic soils, with P-retention of >30% throughout the profile. Waianiwa 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. Waianiwa soils have silty textures throughout, but the lower subsoil is typically more clayey due to the accumulation of clay in or above the fragipan. The soils typically have pH of <5.5 in the upper subsoil, and are stone free.

### Soil phases and variants

Identified units in the Waianiwa soils are:

- Waianiwa undulating deep (WbU1): has no gravel within 90cm depth; occurs on slopes of 0–7°
- Waianiwa undulating moderately deep (WbU2): has gravel between 45 and 90cm depth; occurs on slopes of 0–7°
- Waianiwa rolling deep (WbR1): has no gravel within 90cm depth; occurs on slopes of 7–15°
- Waianiwa steep deep (WbS1): 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, Waianiwa undulating deep (WbU1). 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., Waianiwa steep deep (WbS1).

## Associated soils

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

- Oteramika: shallow soil occurring on shoulder and side slopes where loess has been eroded away
- Waikiwi: well drained deep Brown soil
- Pebbly Hills: shallow soil forming into quartz gravels

## Similar soils

Some soils that have similar properties to Waianiwa soils are:

- Aparima: same soil – Waianiwa should be correlated into the Aparima series. Waianiwa series was originally defined and published prior to the investigation of the Aparima map units. Occurs on high terraces east of the Aparima River.
- Pukemutu: poorly drained equivalent of the Aparima soil
- Woodlands: 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.

Waianiwa profile	Horizon	Depth (cm)	Description
	Ap	0–25	Greyish yellow brown silt loam; weak soil strength; strongly developed medium to coarse polyhedral structure; abundant roots
	Ap/Bw(f)	25–34	Dull yellow-orange; very slightly gravelly silt loam; few bright brown mottles; weak soil strength; strongly developed coarse polyhedral breaking to very fine to medium polyhedral structure; gravels highly weathered and rounded; many roots
	Bw(g) 1	34–58	Bright yellowish brown very slightly gravelly silt loam; common bright brown and few light yellow mottles; weak soil strength; strongly developed coarse to very coarse prismatic breaking to fine to coarse polyhedral structure; gravels highly weathered and rounded; many roots
	Bw(g) 2		
	Bw(g) 2	58–74	Dull yellow-orange very slightly gravelly silty clay; common bright brown and few light grey mottles; common dull yellow-orange clay coats on faces of peds and pores; slightly firm soil strength; moderately developed coarse to very coarse prismatic and fine to coarse polyhedral structure; gravels highly weathered and rounded; common roots
	BCtx(g)	74–90+	Bright brown moderately gravelly silty clay; many light grey mottles as veins; common black Mn/Fe segregations and clay coats on plate faces; firm soil strength; weakly developed coarse platy breaking to medium to coarse blocky structure; gravels highly weathered and rounded; few roots

## Key profile features

Waianiwa soils have a 20–30cm deep topsoil that has strongly developed structure. Subsoil structure is moderate above a compact fragipan. The fragipan is distinctive from the fragipans of other soils by the bright brown colour, and having a densely packed blocky or platy sub-structure. Mottles are common in the upper subsoil, 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	0–25	Moderate	<i>Moderate</i>	Silt loam	Gravel free
Ap/Bw(f)	25–34	Moderate – High	<i>Moderate</i>	Silt loam	Gravel free
Bw(g) 1	34–58	Moderate – High	<i>Slow</i>	Silt loam	Very slightly gravelly
Bw(g) 2	58–74	Moderate – High	<i>Slow</i>	Silty clay	Very slightly gravelly
BCtx(g)	74–90+	Moderate – High	<i>Slow</i>	Silty clay	Very slightly gravelly

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

## Key physical properties

Waianiwa soils have a moderately deep rooting depth that is restricted by the fragipan at 60–90cm depth. The depth of the fragipan means the Waianiwa soils typically have moderately high to high plant available water. The soils are imperfectly drained with slow permeability through the fragipan. Textures are heavy silt loams but tend towards silty clays in the lower subsoil. Topsoil clay content is 20–30%, and stonefree.

## Typical chemical properties

Horizon	Depth (cm)	pH	P retention	CEC	BS	Ca	Mg	K	Na
Ap	0–25	Moderate	Moderate	Moderate	High	High	Low	Very low	Low
Ap/Bw(f)	25–34	Moderate	Moderate	Low	High	Moderate	Very low	Very low	Low
Bw(g)1	34–58	Moderate	Moderate	Low	High	Moderate	Very low	Very low	Low
Bw(g)2	58–74	Moderate	Moderate	Low	Moderate	Low	Moderate	Very low	Low
BCtx(g)	74–90+	Low	Moderate	Moderate	Moderate	Low	High	Very low	Low

## Key chemical properties

Topsoil organic matter level is about 7%, P-retention 25–30% and pH values moderate (high 5s). Subsoil pH values are low (low 5s). Cation exchange values are moderate and base saturation values high. Available calcium is high, with magnesium and potassium low. Soil reserve phosphorus is low. Micronutrient values 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
<b>Structural compaction</b>	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 imperfect drainage and medium P-retention.
<b>Nutrient leaching</b>	moderate	These soils have a moderate vulnerability to leaching to groundwater. This rating reflects the imperfect drainage, slow subsoil permeability and moderately high water-holding capacity.
<b>Topsoil erodibility by water</b>	slight	Due to the moderate clay and organic matter levels, topsoil erodibility in these soils is slight. 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 slow permeability.

## General landuse versatility ratings for Waianiwa 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.

### WbU1 (Waianiwa undulating deep)

### WbU2 (Waianiwa undulating moderately deep)

Versatility evaluation for soil WbU1, WbU2		
Landuse	Versatility rating	Main limitation
Non-arable horticulture	Moderate	Risk of short-term waterlogging after heavy rain; restricted rooting depth
Arable	Moderate	Inadequate aeration during wet periods; vulnerability to structural compaction
Intensive pasture	Moderate	Inadequate aeration during wet periods; vulnerability to structural compaction
Forestry	Moderate	Vulnerability to sustained waterlogging; restricted rooting depth

**WbR1 (Waianiwa rolling deep)**

Versatility evaluation for soil WbR1		
Landuse	Versatility rating	Main limitation
Non-arable horticulture	Moderate	Vulnerability to sustained waterlogging; restricted rooting depth
Arable	Limited	Rolling slopes
Intensive pasture	Moderate	Inadequate aeration during wet periods; vulnerability to topsoil structural degradation by cultivation and compaction.
Forestry	Moderate	Vulnerability to sustained waterlogging ; restricted rooting depth

**WbS1 (Waianiwa steep deep)**

Versatility evaluation for soil WbS1		
Landuse	Versatility rating	Main limitation
Non-arable horticulture	Unsuitable	Steep slopes
Arable	Unsuitable	Steep slopes
Intensive pasture	Limited	Steep slopes
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 moisture condition and depth can be of benefit.

**Soil profiles available for Waianiwa soils**

Soil symbol	Profile ID	Topoclimate map sheet	Profile description available	Physical data available	Chemical data available	Profile photo available
WbU1	IT2	8	✓	✓	✓	✓
WbU1	UT3	14	✓	✓	✓	✓

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