

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: Te Mara

### Overview

Te Mara soils occupy about 2,300 ha on undulating to rolling downs and hills in the mid Waiau valley and adjacent to Winton. They are formed into mixed loess and fine colluvium from limestone and calcareous siltstone. Soils are imperfectly drained, with deep rooting depth and moderately high plant available water. Present use is pastoral grazing with sheep and cattle and some deer. Climate is cool temperate with regular rainfall.

### Soil classification

**NZ Soil Classification (NZSC):**

Mottled-Melanic Argillic Pallic; stoneless; clayey

**Previous NZ Genetic Classification:**

Weak to moderateley gleyed yellow-brown earth.

### Classification explanation

Te Mara soils have been reclassified from the previous classification and are now classified as intergrades between Pallic and Melanic soils. The intergrade properties reflect the fact that the dominant parent material is loess, but that calcareous limestone has had a significant influence. Te Mara soils are naturally fertile, with good structure in the upper horizons (Melanic properties), but have compact lower subsoils that are slowly permeable and causes the soils to be imperfectly drained (Pallic properties). The soils are typically stonefree, with clayey textures that tend to increase in the subsoil due to the accumulation of translocated clay.

### Soil phases and variants

Identified units in the Te Mara soils are:

- Te Mara hilly deep (TcH1): has no gravel within 90cm depth; occurs on slopes of 15–25°
- Te Mara rolling moderately deep (TcR2): has bedrock between 45 and 90cm depth; occurs on slopes of 7–15°
- Te Mara rolling deep (TcR1): has no gravel within 90cm depth; occurs on slopes of 7–15°
- Te Mara undulating moderately deep (TcU2): has bedrock between 45 and 90cm depth; occurs on slopes of 0–7°
- Te Mara undulating deep (TcU1): has no gravel within 90cm depth; occurs on slopes of 0–7°

The soil properties described in this Technical Data Sheet are based on the most common phase, Te Mara hilly deep (TcH1). 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., Te Mara undulating deep (TcU1).

## Associated soils

Some soils that commonly occur in association with Te Mara soils are:

- Pukemutu: deep, poorly drained soil due to water perching on a fragipan
- Isla Bank: deep, well drained soil formed into loess overlying limestone
- Kauana: shallow soil onto limestone bedrock
- Mclvor: shallow soil onto limestone in the Monowai area, and should be correlated into the Kauana series

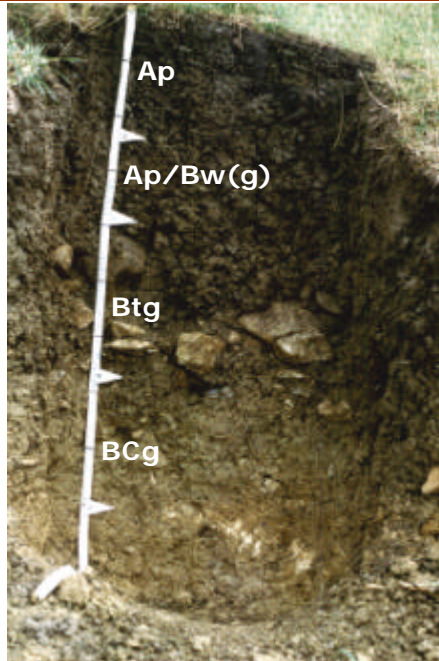
## Similar soils

Some soils that have similar properties to Te Mara soils are:

- Aparima: imperfectly drained soil formed into deep loess with 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.

Te Mara profile	Horizon	Depth (cm)	Description
	Ap	0–23	Greyish yellow-brown silty clay; weak soil strength; strongly developed fine polyhedral and blocky structure; abundant roots
	Ap/Bw(g)	23–38	Dull yellowish brown silty clay; few dull yellow mottles; many worm casts; slightly firm soil strength; moderately developed fine to coarse blocky structure; many roots
	Btg	38–67	Greyish olive silty clay; common dull brown and few bright brown mottles; common clay coats; common worm casts; firm soil strength; moderately developed coarse blocky structure; common roots
	BCg	67–90+	Greyish olive silty clay; common dull brown and common bright brown mottles; few worm casts; firm soil strength; massive structure; few roots
	BCg	67–90+	Greyish olive silty clay; common dull brown and common bright brown mottles; few worm casts; firm soil strength; massive structure; few roots

## Key profile features

Te Mara topsoils are about 20–30cm deep and have a strong structure. Subsoil structure is moderately developed in the upper horizons, becoming structureless and firm in the lower subsoil.

## Typical physical properties

Note: values in *Italics* are estimates

Horizon	Depth (cm)	Bulk density	Permeability	Texture	Gravel content
Ap	0–23	Moderate	<i>Moderate</i>	Silty clay	Gravel free
Ap/Bw(g)	23–38	Moderate – High	<i>Moderate</i>	Silty clay	Gravel free
Btg	38–67	Moderate – High	<i>Slow</i>	Silty clay	Gravel free
BCg	67–90+	High	<i>Slow</i>	Silty clay	Gravel free

<b>Profile drainage:</b>	Imperfect
<b>Plant readily available water:</b>	<i>Moderately high</i>
<b>Potential rooting depth:</b>	Deep
<b>Rooting restriction:</b>	No major restriction

## Key physical properties

Te Mara soils have a deep rooting depth and moderately high plant available water. The soils have compact lower subsoils that are slowly permeable, causing the soils to be imperfectly drained. Textures through the profile are heavy silt loam to silty clays, with a topsoil clay content of 30–45%. Deep soils are stone free, with bedrock or gravelly colluvium between 45 and 90cm in moderately deep soils.

## Typical chemical properties

Horizon	Depth (cm)	pH	P retention	CEC	BS	Ca	Mg	K	Na
Ap	0–23	Moderate	Moderate	High	High	Very high	Moderate	Very high	Very low
Ap/Bw(g)	23–38	Moderate	Moderate	High	Very high	Very high	Very low	High	Very low
Btg	38–67	Very high	Moderate	High	Very high	Very high	Moderate	Moderate	Low
BCg	67–90+	Very high	Moderate	High	Very high	Very high	Moderate	Low	Very low

## Key chemical properties

Topsoil organic matter levels are 6–10%, P-retention 30–40% and pH high (>6.4). Soil pH increases down the profile. Cation exchange is high and base saturation very high because of the limestone influence. Available calcium, magnesium and potassium levels are all moderate to very high. Reserve phosphorus levels are low. Micronutrient levels are generally adequate. The soil fertility will vary depending on the amount of fine limestone colluvium in the profile.

## 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 high clay content, offset by imperfect drainage and low P-retention.
<b>Nutrient leaching</b>	moderate	These soils have a moderate vulnerability to leaching to groundwater. This rating reflects the moderate water-holding capacity and imperfect drainage.
<b>Topsoil erodibility by water</b>	minimal	Due to the high clay content, 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 Te Mara 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.

### TcH1 (Te Mara hilly deep)

Versatility evaluation for soil TcH1		
Landuse	Versatility rating	Main limitation
Non-arable horticulture	Unsuitable	Hilly slopes
Arable	Unsuitable	Hilly slopes
Intensive pasture	Limited	Hilly slopes
Forestry	Moderate	Restricted rooting depth

### TcU1 (Te Mara undulating deep)

### TcU2 (Te Mara undulating moderately deep)

Versatility evaluation for soil TcU1, TcU2		
Landuse	Versatility rating	Main limitation
Non-arable horticulture	Moderate	Inadequate aeration during wet periods; vulnerability to sustained waterlogging
Arable	Moderate	Inadequate aeration during wet periods; vulnerability to sustained waterlogging
Intensive pasture	Moderate	Inadequate aeration during wet periods; vulnerability to sustained waterlogging
Forestry	Moderate	Vulnerability to sustained waterlogging; restricted rooting depth in the moderately deep phase

**TcR1 (Te Mara rolling deep)****TcR2 (Te Mara rolling moderately deep)**

Versatility evaluation for soil TcR1, TcR2		
Landuse	Versatility rating	Main limitation
Non-arable horticulture	Moderate	Inadequate aeration during wet periods; vulnerability to sustained waterlogging
Arable	Limited	Rolling slopes
Intensive pasture	Moderate	Inadequate aeration during wet periods; vulnerability to sustained waterlogging
Forestry	Moderate	Vulnerability to sustained waterlogging; restricted rooting depth in the moderately deep phase

**Management practices that may improve soil versatility**

- Careful management after heavy rain and wet periods will reduce the impact of short-term waterlogging.
- Installation and maintenance of subsurface mole and tile drains will reduce the the risk of sustained waterlogging and improve aeration during wet periods.

**Soil profiles available for Te Mara soils**

Soil symbol	Profile ID	Topoclimate map sheet	Profile description available	Physical data available	Chemical data available	Profile photo available
TcH1	MT 1	7	✓	✓	✓	✓
TcR1	XT7	13	✓	✓	✓	✓

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