

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: **Berwen**

### Overview

Berwen soils occupy about 500 ha on fan and lower hill slopes in the upper Mataura river valley, near Garston. They are formed into gravelly alluvium derived from schist rocks. They are shallow, well drained soils with loamy silt textures. At present they are used for pastoral grazing with sheep and beef cattle. Winters are cold and soils can be dry in the summer.

### Soil classification

**NZ Soil Classification (NZSC):**

Typic Argillic Pallic; angular-stony, schistic; silty

**Previous NZ Genetic Classification:**

Yellow-grey earth

### Classification explanation

The NZSC of Berwen soils is consistent with the previous classification. Berwen soils have a moderately developed B horizon, P-retention of <30%, and evidence of clay accumulation in the lower subsoil. Berwen soils have silty textures, and angular shaped schist gravel within 45cm depth.

### Soil phases and variants

Identified units in the Berwen soils are:

- Berwen undulating shallow (BwU3): has gravel above 45cm depth; occurs on slopes of 0–7°
- Berwen rolling shallow (BwR3): has gravel above 45cm; occurs on slopes of 7–15°
- Berwen hilly shallow (BwH3): has gravel above 45cm; occurs on slopes of 15–25°

The soil properties described in this Technical Data Sheet are based on the most common phase, Berwen undulating shallow (BwU3). 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., Berwen hilly shallow (BwH3).

### Associated soils

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

- Arthurton: deep, imperfectly drained soil with Brown-Pallic intergrade properties; formed in loess
- Riversdale: shallow, well drained Recent floodplain soil
- Nokomai: deep, well drained Pallic soil; formed in loess

## Similar soils

Some soils that have similar properties to Berwen soils are:

- Lintley: shallow, well drained Brown soil; formed in greywacke fan gravels.
- Pukerangi: moderately deep, well drained Pallic soil; formed in loess overlying schist gravels
- Dome: shallow, well drained Recent soil; formed on the floodplains of fans from greywacke

## 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.

Berwen profile	Horizon	Depth (cm)	Description
<b>No profile photo available</b>	0–20	Ap	Dark greyish brown very slightly gravelly silt loam; slightly firm soil strength; strongly developed very fine polyhedral structure; gravels slightly weathered and angular; many roots.
	20–33	Ap/Bw	Dark greyish brown very slightly gravelly silt loam; weak soil strength; strongly developed very fine polyhedral structure; gravels slightly weathered and angular; many roots.
	33–51	2Bw	Light yellowish brown very gravelly loamy silt; weak soil strength; moderately developed medium blocky structure; gravels highly weathered and angular; common roots.
	51–90	2BCt	Light olive brown extremely gravelly sand; compact particle packing; massive structure; gravels highly weathered and angular; many clay coats on gravel surfaces; few roots.

## Key profile features

Berwen soils have a topsoil about 20cm deep, with strongly developed structure. Subsoil structure has moderate development which grades to massive structure at depth. Gravel content increases with depth. The gravel weathering and clay accumulation indicates that significant soil development has occurred.

## Typical physical properties

Note: values in *Italics* are estimates

Horizon	Depth (cm)	Bulk density	Permeability	Texture	Gravel content
Ap	0–20	<i>Moderate</i>	<i>Moderate</i>	Loamy silt	Very slightly gravelly
Ap/Bw	20–33	<i>Moderate</i>	<i>Moderate</i>	Loamy silt	Very slightly gravelly
2Bw	33–51	<i>Moderate</i>	<i>Rapid</i>	Loamy silt	Very gravelly
2BCt	51–90	<i>Moderate – High</i>	<i>Rapid</i>	Sand	Extremely gravelly

**Profile drainage:** Well  
**Plant readily available water:** *Moderate*  
**Potential rooting depth:** Slightly deep  
**Rooting restriction:** Extremely gravelly subsoil

## Key physical properties

Berwen soils have slightly deep rooting depth, limited by the subsoil gravelliness. The soils are well drained, with good aeration, and moderate plant available water. Textures are loamy silt to light silt loam in the topsoil grading to sandy textures in the subsoil. Topsoil clay content is 15–20%, and typically contains gravel. Subsoils are commonly very to extremely gravelly from 30cm depth.

## Typical chemical properties

Horizon	Depth (cm)	pH	P retention	CEC	BS	Ca	Mg	K	Na
Ap	0–20	<i>Moderate</i>	<i>Low</i>	<i>Low</i>	<i>Moderate</i>	<i>Low</i>	<i>Very low</i>	<i>Low</i>	<i>Low</i>
Ap/Bw	20–33	<i>Moderate</i>	<i>Low</i>	<i>Low</i>	<i>Low</i>	<i>Low</i>	<i>Very low</i>	<i>Very low</i>	<i>Low</i>
2Bw	33–51	<i>Moderate</i>	<i>Moderate</i>	<i>Low</i>	<i>Low</i>	<i>Very low</i>	<i>Very low</i>	<i>Very low</i>	<i>Low</i>
2BCt	51–90	<i>Moderate</i>	<i>Low</i>	<i>Moderate</i>	<i>High</i>	<i>Moderate</i>	<i>Moderate</i>	<i>Moderate</i>	<i>Low</i>

## Key chemical properties

Topsoil organic matter levels are estimated as being low (no measurements recorded); P-retention values 15–20% and pH values moderate (high5s). Cation exchange values are low, with base saturation values moderate. Available calcium and potassium levels are moderate and magnesium levels low. Reserve phosphorus and sulphur levels are low. Micronutrient levels are generally adequate although molybdenum responses in legumes are likely.

## 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 low clay content and P-retention values.
<b>Nutrient leaching</b>	severe	These soils have a severe vulnerability to leaching to groundwater. This rating reflects the moderate to rapid permeability and moderate water holding capacity.
<b>Topsoil erodibility by water</b>	moderate	Due to the low clay and organic matter levels, topsoil erodibility of these soils is slight. Erodibility is highly dependent on management, particularly when there is no vegetation cover.
<b>Organic matter loss</b>	moderate	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>	slight	These soils have a slight vulnerability to waterlogging during wet periods. This rating reflects the good drainage and moderate permeability.

## General landuse versatility ratings for Berwen 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.

### BwU3 (Berwen undulating shallow)

Versatility evaluation for soil BwU3		
Landuse	Versatility rating	Main limitation
Non-arable horticulture	Limited	Restricted rooting depth
Arable	Moderate	Vulnerability to topsoil structural degradation by cultivation and compaction; restricted rooting depth.
Intensive pasture	Moderate	Vulnerability to topsoil structural degradation by cultivation and compaction; vulnerability to leaching to groundwater
Forestry	Limited	Restricted rooting depth

### BwR3 (Berwen rolling shallow)

Versatility evaluation for soil BwR3		
Landuse	Versatility rating	Main limitation
Non-arable horticulture	Limited	Restricted rooting depth
Arable	Limited	Rolling slope
Intensive pasture	Moderate	Vulnerability to topsoil structural degradation by cultivation and compaction; vulnerability to leaching to groundwater
Forestry	Limited	Restricted rooting depth

**BwH3 (Berwen hilly shallow)**

Versatility evaluation for soil BwH3		
Landuse	Versatility rating	Main limitation
Non-arable horticulture	Unsuitable	Hilly slope
Arable	Unsuitable	Hilly slope
Intensive pasture	Limited	Hilly slope
Forestry	Limited	Restricted rooting depth.

**Management practices that may improve soil versatility**

- Long-term cultivation should be carefully managed to minimise structural degradation
- Organic matter levels should be carefully maintained and enhanced
- Management of nutrient applications so as to minimise leaching losses

**Soil profiles available for Berwen soils**

Soil symbol	Profile ID	Topoclimate map sheet	Profile description available	Physical data available	Chemical data available	Profile photo available
BwU3	G523	4	✓	✓	✓	

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

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Crops for Southland  
PO Box 1306, Invercargill. New Zealand



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