

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: **McLeish**

Overview

McLeish soils occupy about 700 ha on the old Aparima floodplain in the Drummond district. They are formed into shallow fine alluvium over gravels that are derived from tuffaceous greywacke and basic volcanic rocks. Soils are shallow, with clayey textures, and poorly drained due to a high water table. Present use is pastoral grazing with sheep and dairy cattle and cropping. Climate is cool temperate with regular rain throughout the year. Soils rarely dry out.

Soil classification

NZ Soil Classification (NZSC):

Typic Orthic Gley; rounded-stoney, tuffaceous sandstone; clayey.

Previous NZ Genetic Classification:

Brown granular loam

Classification explanation

McLeish soils have been reclassified in this survey because the poor drainage correlates to gley soils rather than the previous classification. The soils are poorly drained due to a high groundwater table, and accumulation of sediment is sufficiently slow that subsoils show structural development. They have silty clay textures, and are shallow with less than 45cm to the gravels.

Soil phases and variants

Identified units in the McLeish soils are:

- McLeish undulating shallow (MIU3): has gravel within 45cm depth; occurs on slopes of 0–7°

The soil properties described in this Technical Data Sheet are based on the most common phase, McLeish undulating shallow (MIU3). Values for other phases and variants can be taken as being similar. Where they differ significantly they are recorded with a separate versatility rating.

Associated soils

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

- Caroline: shallow to moderately deep poorly drained soil with a cemented pan in the gravels
- Braxton: deep to moderately deep poorly drained soil

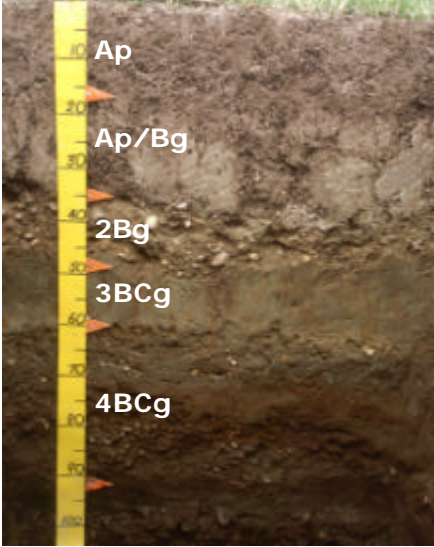
Similar soils

Some soils that have similar properties to McLeish soils are:

- Lumsden: has silty rather than clayey topsoil textures.
- Otepunu: forming predominantly into quartz gravels on stream floodplains of the Southland Plain

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.

McLeish profile	Horizon	Depth (cm)	Description
	Ap	0–17	Brownish black silty clay; weak soil strength; strongly developed very fine polyhedral structure; many roots.
	Ap/Bg	17–35	Greyish yellow-brown very slightly gravelly silty clay; common greyish yellow and few orange mottles; many wormcasts; slightly firm soil strength; strongly developed coarse prismatic structure; gravels fresh and subrounded; many roots.
	2Bg	35–48	Greyish yellow very gravelly sandy loam; common bright brown mottles; few wormcasts; weak soil strength; compact particle packing; weakly developed very fine polyhedral structure; gravels fresh and subrounded; many roots.
	3BCg	48–60	Greyish olive slightly gravelly loamy sand; common dull yellowish brown and few bright brown mottles; few wormcasts; weak soil strength; compact particle packing; massive structure; gravels subrounded and fresh; few roots.
	2Bg	35–48	Greyish yellow very gravelly sandy loam; common bright brown mottles; few wormcasts; weak soil strength; compact particle packing; weakly developed very fine polyhedral structure; gravels fresh and subrounded; many roots.
	4BCg	60–90	Greyish olive moderately gravelly loamy sand; common brown and few dark reddish brown mottles; slightly firm soil strength; compact particle packing; massive structure; common lenses of loamy sand; gravels subrounded and fresh; few roots

Key profile features

McLeish topsoils are about 15–25cm deep with a moderate to strongly developed structure. Subsoils have moderate to weak structure above the gravels. The dominance of grey colours throughout the subsoil reflects the poor drainage of the soils.

Typical physical properties

Note: values in *Italics* are estimates

Horizon	Depth (cm)	Bulk density	Permeability	Texture	Gravel content
Ap	0–17	Moderate	<i>Moderate</i>	Silty clay	Gravel free
Ap/Bg	17–35	Moderate – High	<i>Moderate</i>	Silty clay	Very slightly gravelly
2Bg	35–48	—	<i>Slow</i>	Sandy loam	Very gravelly
3BCg	48–60	—	<i>Slow</i>	Loamy sand	Slightly gravelly
4BCg	60–90	—	<i>Slow</i>	Loamy sand	Moderately gravelly

Profile drainage: Poor
Plant readily available water: *Moderate*
Potential rooting depth: Slightly deep
Rooting restriction: Gravelly subsoil

Key physical properties

McLeish soils have a slightly deep rooting depth and moderate plant available water, that is limited by the subsoil gravelliness. Permeability is slow, with poor aeration due to the high water table. Textures are silty clay grading to coarser loamy sands at depth. Topsoil clay content is 35–40% with a slight to moderate gravel content. Subsoils are very to extremely gravelly.

Typical chemical properties

Horizon	Depth (cm)	pH	P retention	CEC	BS	Ca	Mg	K	Na
Ap	0–17	Moderate	Moderate	High	Very high	Very high	Moderate	Moderate	Low
Ap/Bg	17–35	Moderate	Moderate	Moderate	Very high	High	Moderate	Very low	Low
2Bg	35–48	Moderate	Moderate	Moderate	High	Moderate	Low	Very low	Moderate
3BCg	48–60	Moderate	Moderate	Moderate	Very high	High	Moderate	Very low	Moderate
4BCg	60–90	Moderate	Low	Moderate	Very high	Moderate	Moderate	Very low	Moderate

Key chemical properties

Topsoil organic matter levels are about 12%, P-retention 40% and pH moderate (low 6s). Cation exchange values are high and base saturation very high. Topsoil available calcium levels are very high with magnesium and potassium levels moderate. Subsoils tend to have moderate available cations, except potassium, which is 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 poor drainage, offset by the moderate–high clay and organic matter content.
Nutrient leaching	moderate	These soils have a moderate vulnerability to leaching to groundwater. This rating reflects the poor drainage and slow permeability, offset by the moderate water-holding capacity.
Topsoil erodibility by water	minimal	Due to the moderate to high clay and 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	severe	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	severe	These soils have a severe vulnerability to waterlogging during wet periods. This rating reflects the poor drainage and slow permeability.

General landuse versatility ratings for McLeish 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.

MIU3 (McLeish undulating shallow)

Versatility evaluation for soil MIU3		
Landuse	Versatility rating	Main limitation
Non-arable horticulture	Limited	Aeration limitations; restricted rooting depth.
Arable	Limited	Aeration limitations; vulnerability to short-term waterlogging after heavy rain
Intensive pasture	Limited	Vulnerability to short-term waterlogging after heavy rain
Forestry	Limited	Aeration limitations; 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 of sub-surface 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 McLeish soils

Soil symbol	Profile ID	Topoclimate map sheet	Profile description available	Physical data available	Chemical data available	Profile photo available
MIU3	IT10	8	✓	✓	✓	✓

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