

## Soil Survey of the Dairy Demonstration Farm Wallacetown, Southland:

### 1. Background

Previous mapping was carried out by the Topoclimate South project at a scale of 1:50,000. This mapping identified the majority of soil types present on the demonstration farm. With the finer farm scale mapping the distribution of soils has changed.

Even at this finer scale of mapping there is still variation within the soil units mapped. The major variation that occurs is where there are depressions or narrow floodplains and old channels of the Tomoporakau stream, generally these features are not separated out from the overall soil unit due to their size. It can be noted where such features occur typically poorly drained soils are present, these are most closely represented by the Makarewa soil type.

Makarewa soils have been spilt into two phases deep and moderately deep. Although both soils have the same characteristics the distinguishing feature between the two is the depth to gravel. Moderately deep soils have gravels between 45 – 90cm.

### 2. Classification

Soils on the property fall into four classifications:

**Gley soils** - are poorly drained soils found predominately in low lying areas such as floodplains.

**Pallic soils** - are less permeable often with perch water tables due to subsoil pans, limiting rooting depth and less developed structure with phosphate-retention less than 30%.

**Recent soils** – are weakly developed showing minimal profile development but with a distinct topsoil, good drainage and low p-retention.

**Brown soils** - Generally have good drainage and structure with stable topsoils, phosphate-retention values are > 30%.

### 3. Soil Distribution

Soil percentages are estimated as a percentage of the whole property this also includes the roads that run through the property.

Makarewa	42%
Makarewa moderately deep	8%
Mataura	19%
Tomoporakau	16.5%
Northope	13%
Edendale	1%
Gore	0.5%

## 4. Soil Types

### 1. Makarewa (Gley soil)

Formed on the floodplains of rivers and streams from mixed alluvium. These soils are poorly drained and have slow subsoil permeability which may restrict rooting depth during wet periods. The poor drainage is caused by the raising ground water table. Typically soil texture is silty clay, although soil profiles can be layered with variable textures. Observation made on the farm indicates that Makarewa soils are more consistently silty clay throughout the profile. Soils are well structured in the top soil grading to weaker sub soil structure. Soils are typically stone free except where the moderately deep phase occurs. A moderately deep phase is present on the farm where gravels are found between 45cm – 90cm in depth.

Typical chemical properties include phosphate retention values of 30-50% although measured values across the property indicate low phosphate-retention (below 34%) values. This is typical of the soils found in the low Oreti floodplain particularly in Pallic and Recent soils. CEC values are generally moderate.

These soils are rated as a severe vulnerability to waterlogging due to poor drainage and slow sub soil permeability. Potential for structural compaction is rated as moderate but the actual risk will depend on management.

### 2. Tomoporakau (Pallic soil)

Are found on the floodplain of the lower Oreti and are formed into fine alluvium. These soils are poorly drained and have slow subsoil permeability. Poor drainage is due to water perching on a dense degraded fragi-pan which is found at around 40-60cm in depth.

Rooting depth is moderately deep to deep depending on the degree to which the fragi-pan has degraded. The fragi-pan has high density which restricts rooting depth.

Textures throughout the profile are silt loam with clay content ranging from 25-35%. Clay content of silt loam soils (by classification) ranges from 18% to 35%. The topsoil has a moderately developed structure and subsoil structure is moderately to weakly developed. Soils are typically stone free.

Typical chemical properties are low phosphate retention values of less than 30% in the topsoil. Measured values on the property in these areas are around 30%. CEC values are typically moderate.

These soils are rated as a severe vulnerability to waterlogging due to poor drainage and slow sub soil permeability. Potential for structural compaction is rated as moderate but the actual risk will depend on management.

### 3. Northope (Pallic soil)

Formed in fine alluvium on the floodplains and low terraces of the lower Oreti catchment. These soils are imperfectly well drained, this is a result of slow subsoil permeability causing limited seasonal wetness. Rooting depth is deep but will become limited in the lower subsoil due to subsoil density.

Textures are generally heavy silt loam throughout the profile with up to 35% clay content. Topsoil structure is moderately developed grading to weakly developed in the lower subsoil. Soils are gravel free although moderately deep soils have gravels below 45cm. From survey observations moderately deep phases are present on the property, they have not been separated and are included in the Northope soil units.

Typical chemical properties, are low phosphate retention values of less than 30% in the topsoil with measured values on the property on these soils around 30%. CEC values are typically moderate with organic carbon generally medium (4-6%). These soils are rated as a moderate vulnerability to waterlogging due to imperfect drainage and moderate sub soil permeability. Potential for structural compaction is rated as moderate but the actual risk will depend on management.

#### **4.Mataura (Recent soil)**

Formed in mostly moderately deep to deep fine alluvium on accumulating floodplains. These soils are generally well drained although imperfect variants can occur due to depression areas or under lying slow permeability. Rooting depth is deep with no major limitation to root extension. Textures are typically silt loam to loamy silt with low clay content of generally less than 20%. Soils are moderately to weakly structured in the topsoil and have little structural development in the subsoil.

Soils are gravel free although moderately deep soils have gravels below 45cm.

Typical chemical properties, are low phosphate retention values of less than 20%. Measured values on the property on these soils around 20%. CEC values are typically low which is a reflection of low clay content, with organic carbon generally medium (4-7%).

These soils are rated as a slight vulnerability to waterlogging due to good drainage, although this maybe moderate in areas of imperfect drainage. Potential for structural compaction is rated as very severe due to low clay content and phosphate retention in the topsoil which effects structural stability.

#### **5.Edendale (Brown soil)**

Formed in deep wind blown loess on intermediate terraces, they are well drained and structured. Soils are stone free with a deep rooting depth although this maybe restricted by a subsoil horizon that is structureless, this horizon occurs at around 60cm. Textures are silt loam through out the profile with a clay content of 25-30%. Phosphate retention values are typically between 50% and 70%. CEC values are moderate. Edendale soils generally have low risk of water logging due to their good drainage characteristics. Potential for structural compaction is rated as low but the actual risk will depend on management.

#### **6. Gore (Brown Soil)**

Formed on low terraces on the Oreti river . One small area has been mapped on the property a low remnant terrace adjacent to Price road. Gore soils are formed in gravelly alluvium and are well drained with good structure in the topsoil. Rooting depth is moderately deep with gravels restricting root extension. Gravels are present in the subsoil and are commonly very gravelly, some gravels may also be present in the topsoil for this reason these soils have rapid permeability and limited water holding capacity. Textures are silt loam in the top soil (clay content 20-30%) to loamy sand in the subsoil.

Typical chemical properties are moderate phosphate retention values (30-40%). Measured values in paddock 62, where Gore soil is mapped are 25%. CEC values are typically moderate grading to low below the top soil due to increasing gravel percentage.

These soils are rated as a very severe vulnerability to nutrient leaching due to good drainage and rapid permeability. Potential for structural compaction is rated as moderate due to low clay content and phosphate retention in the topsoil which effects structural stability.

Waterlogging is rated as low due good drainage and permeability.

## 5. Management Practices That May Improve Soil Versatility

### **Makarewa & Tomoporakau**

- 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 carefully managed 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 depth and moisture condition can be of benefit.

### **Mataura**

- Cultivation and intensive stocking or heavy vehicular traffic use should be carefully managed during wet periods.
- Long-term cultivation should be carefully managed to minimise structural degradation.
- Organic matter levels should be carefully managed and enhanced.
- Management of nutrient applications that minimise leaching losses.

### **Northope**

- Careful management of stocking and minimal cultivation when soils are wet.
- Installation of artificial drainage to remove excess water during wet periods.
- If compaction occurs, aeration at the correct depth and moisture condition can be of benefit.

### **Aeration:**

Aeration of the soil is used to help correct soil compaction caused by treading. Aeration at the right soil water content not only maximises vertical and horizontal shattering of the soil, but also minimises pasture disturbance and surface heave. Soil moisture conditions are too wet for aeration if you can roll a worm 50 mm long and 3 mm thick in the palm of your hand without it cracking.

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