SUMMARY AND CONCLUSIONS

Soil types

There are 6 soil types differentiated for the Reefton experimental area and these are related to the aspects of the dissected topography.

Red gradational (‘wet’) soils occupy the wetter lower and mid slopes with southerly aspects, are the deepest soils in the area (> 1 metre), and are also well-structured.

Brown gradational and **forest brown** (‘wet’ transitional) soils occupy drier sites further upslope and generally with southerly aspects; these soils are well structured and are moderately deep, varying around 1 metre or often deeper.

Yellow brown/brown gradational (‘dry’ transitional) soils are stony and relatively shallow and occur on drier upper and mid slopes with generally northerly aspects. These soils may have a significant humic surface layer and/or some significant oxidisation depending on topography and relative position. They have well structured B horizons.

Yellow brown gradational (‘dry’) soils, have developed in-situ on crests and on most ridges with northerly aspects. They have well-structured b horizons, as have all the soils but are very stony (25-30% stones in B horizon) and depth to solid rock varies up to 1 metre, typically being 50 cm on crests. Other characteristics are thinner and paler coloured A horizon with less structure and less organic accumulation than other soil types.

Organic-dominated soils with varying clay content are associated with lower slopes adjacent to drainage lines, and other depressions where deposition has occurred. Stoniness varies with distribution and site. Moderate blocky structure occurs with depth and the bulk density is low compared with the other soils. Colour remains relatively dark throughout.

Gley soils occupy part of the lower slopes of catchment 1 and appear to be the result of deposition from surrounding slopes. The solum is relatively uniform with a high bulk density and mottled throughout.

Thus the distribution of soils can be related to the general moisture regime as determined by aspect and topographical position. The ‘wet’ soils have deeper profiles, deeper organic horizons and greater friability.

Soil physical parameters

Bulk density

Bulk densities are generally low, ranging from 0.75 g/cm^3 for an organic surface horizon to 1.56 g/cm^3 for a dense clay B horizon. An average value for A horizons is approximately 0.95 g/cm^3 and 1.35 g/cm^3 for B horizons. There is generally little difference in bulk densities between the main soil types though the related depths may vary.

Porosity

Macro porosity is greatest for the ‘wet; soil type and the organic soil, as the amount of organic matter is correlated with pore space. Generally there is a similar amount of solid material in all major soil types, though there is more in the gley soil. Micro porosity varies according to the macro porosity, given the relatively constant solids content. Porosity is correlated with bulk density, as a comparison of figures indicates.

Soil Water Retention

Field capacity, wilting point and saturation measurements were taken for all major soil types. There is a lower moisture content at all suctions for ‘dry’ soil and gley soil types compared with ‘wet’ soil. Moisture content potential increases with depth for ‘dry’ soil but decreases with depth for ‘wet’ soils.

Available water holding capacity

This is much greater for ‘wet’ and organic soils than for ‘dry’ soils, and is further reduced for the latter by the presence of stone 9approximately 30% volume in the B horizon).

Infiltration and hydraulic conductivity

Infiltration

Infiltration measurements indicate a range for all soil types but geometric means indicate significant differences between ‘wet’ (0.744 m/s) and dry soils (0.315 mm/s), with a gradation in between. A similar trend applies to sorptivity rates which are derived from infiltration data (12.28 mm/s$^{1/2}$, wet soil; 7.6 mm/s$^{1/2}$ dry soil).

Hydraulic Conductivity

This property has a large range of values for all soil types. Geometric means were similar, though the mean for the ‘wet’ transitional soil type was slightly higher than for the other soils. The overall geometric mean was 0.267 m/s (10^{-5}). Some of the data distributions were variable as shown by classifying the data into the USDA classification. This is also shown by the log/probability diagrams, also used to portray the infiltration and sorptivity data.

Erodibility

The factors considered in assessing erodibility include: texture, cation exchange capacity (CEC), organic matter, aggregate stability (Emerson test), erodibility factor (K), pH, electrical conductivity and chloride ion content.

Texture was similar for most soils, the high silt content being a notable characteristic. Textures ranged from loam to silty loam for surface horizons and clay to silty clay at depth.

Cation exchange capacities were generally in the 20 –50 milli-equivalent (%) range. Values were generally high for ‘wet’ soils and those with higher organic contents.

The CEC for clay dominated horizons in an indication of the clay mineral present i.e. for above range illite and some kaolinite are the most likely minerals present. The base saturation is low but high levels of hydrogen ion are present which are also reflected by the low pH values.

Organic matter varied considerably between soil types, ‘wet’ soil types having the greatest amount with the majority concentrated in the surface horizons.

Emerson tests carried out indicated that all samples were within class 5, but could be distinguished into sub-groups. The more dispersive samples were ‘dry’ soil samples.

Erodibility factors (K;USLE) were generally higher for surface horizons, decreasing down the profile. This was particularly marked for the ‘dry’ soil type which had an average value of 0.62 for the A horizon but only 0.313 for B horizon. The B horizon of the gley soil also had a high K value of 0.548.

Electrical conductivity ranged between 77.6 μS/cm (milli Siemens/centimetre) for the ‘wet’ soil A horizon to 21 US/cm for approximately 35 μS/cm for most B horizons. Therefore overall values are very low.

Chloride ion concentration were low indicating low sodium ion levels and low electrical conductivity levels recorded.

Linear shrinkage is greater for B horizons than A horizons for all soil types, reflecting the greater clay content. ‘Wet’ soils have the highest shrinkage of 16%.

Another chemical test indicated a greater percentage of free iron oxide in the ‘wet’ soil compared with the ‘dry’ soil.