SECTION 3 - SOIL SURVEY METHODS

3.1 Soil Mapping

Aerial photographs at a scale of 1:8,800 were used in this survey. Interpretations of their photo-patterns and photo-tones were made before attempting the field work. In the field, observations were made regarding the landscape, topography and soils. The soils were described from borings, using a spade and a 10 cm diameter Jarret soil auger. Changes in topography and soils, aided by photo-interpretations were the basic criteria in delineating map unit boundaries.

The soils were mapped in the field on the basis of soil series, type and phase.

A soil series consists of one or more soil types which have essentially similar profiles, particularly as regards subsoil conditions, but differ in the texture of the surface soil. A soil type may include one or more soil phases wherein a particular feature such as depth of surface soil or stoniness is emphasised. The soil types and their corresponding series have been given similar names, for example, Concongella series has two types, Concongella loam and Concongella sandy clay loam. Stony profile and deep surface phases occur within these soil types.

Some areas with rapid changes over small distances, however, were mapped as complexes. Similarly, due to the scale of mapping, no attempt was made to separately map the gully soils which were found to be particularly variable. On the other hand, soils of limited occurrence in the area surveyed have been regarded as “minor soil types” and referred to by number, for example, Minor Type 2 (M.T.2).

Detailed descriptions were obtained for selected sites representing the mapping units. These descriptions included topography, condition of the surface soil and the morphological features of a 100 cm soil profile. At some sites, however, boring was abandoned at shallower depths due to the presence of rocks. Profile samples were collected for subsequent laboratory examination and the soils were classified using the Factual Key Classification System (Northcote, 1979), see Appendix G.

The density of the recorded sites varied according to the degree of complexity of the area surveyed and ranged from 0.5 to 3.5 ha/site (average 2.5 ha/site). It should be appreciated, however, that any unit shown on the soil maps may have, intermixed with its main soils, small areas of other soil types or phases, but not to a greater extent than one tenth of the occurrence.

3.2 Sampling

3.2.1 Soil Sampling

At each site, sampled were collected from the main morphological horizons of the soil profile. All samples were dried at 40oC (forced draught) for 48 hours before being sub-sampled and prepared for the various physical and chemical analyses.

At selected sites, representing the different soil types, separate samples were taken from the surface layer (0-7.5 cm) for the determination of bulk density and degree of stoniness.

3.2.2 Water Sampling

In late spring-early summer, water samples were collected from all existing water sources currently used, or considered for future use, for irrigating the vineyards. These samples were analysed to assess their salinity levels.

3.3 Analyses

Listed below are the various determinations conducted on the soil and water samples with a reference to the methods used. Full details of the analytical methods, however, are described in the “Chemical Methods Handbook” published by the Division of Agricultural Chemistry, Department of Agriculture (Vic.), except where indicated otherwise.

3.3.1 Soil Analyses

(a) ***<u>Surface soils (0-7.5 cm)</u>***

On these soils, bulk density was determined using soil cores and the method outlined by McIntyre and Loveday (1974). Mineral fractions coarser than 2 mm were sieved and weighed. Their volume was estimated (a density of 2.7 was assumed). On the fine earths (soil material < 2 mm), water retentions at –15 bar (approximately ‘Wilting Point’) and $-^{1}/_{3}$ bar (approximately ‘Field Capacity’) were determined as outlined by McIntyre (1974) using a ceramic plate pressure unit (Soil-Moisture Equipment Co., California).

(b) ***Soil profile samples***

All samples were analysed for pH, electrical conductivity (EC) and chloride contents using a 1:5 soil (< 2 mm aggregates) – water suspension shaken for one hour. A glass electrode was used for the pH determinations and a conductivity cell and meter for the EC. Chloride, as % sodium chloride was determined by the electrometric titration method (Best 1931).

Water retentions at –15 bar and $-{}^{1}/_{3}$ bar were also determined on all soil samples.

Aggregate structural stability was determined on 3-5 mm soil aggregates using the Emerson (1967) and Loveday (1974) dispersion tests.

(c) ***Representative soil profiles***

For each soil type, a representative soil profile was chosen for additional analyses; i.e.

- Particle – size analysis – Estimating the distribution (%) of coarse sand, fine sand, silt and clay – sized fractions in the soil mass, using the Plummet balance method. The procedure also measures the loss on acid treatment of soils.

- Total Nitrogen – The Kjeldahl method was used.

- Organic Carbon – The wet combustion method of Walkley and Black was used. Results have been multiplied by an empirical recovery factor of 1.25.

- Exchangeable Cations – The extraction method of Tucker (1974) was used for the removal of soluble salts and for leaching the cations, but at least three extractions were carried out for removal of soluble salts.

  In the leachate calcium, magnesium and potassium were determined by atomic absorption spectrophotometry. Sodium was determined by flame emission spectrophotometry. The individual cations have been expressed as milligram equivalents per 100 g of soil.

- Exchangeable Acidity – This is Mehlich's barium chloride – triethanolamine method (reference point pH 8.0), using the modification of Peech et al. (1962). This method is applicable only to soils below pH 8.0.

3.3.2 Water Analyses

The water samples were analysed for the following:-

- Electrical Conductivity
- Total Soluble Salts
- Chloride
- Soluble Calcium, Magnesium and Sodium