APPENDIX 3. SPECIFIC METHODOLOGY

3.1 Map unit determination

Map units were delineated according to geology and slope category (McDonald *et al.* 1984) using geological mapping, topographical mapping, aerial photography and field survey techniques.

3.2 Field observations

Most field descriptions (refer Table A13) are based on definitions used in 'Australian soil and land survey field handbook' (McDonald *et al.* 1984) or 'A factual key for the recognition of Australian soils' (Northcote 1979). The definition for soil horizon boundaries is listed below.

Boundaries

S	Sharp	< 5 mm
Α	Abrupt	5-20 mm
С	Clear	20-50 mm
G	Gradual	50-100 mm
D	Diffuse	> 100 mm
+	Continuing	

3.3 Field tests

3.3.1 Saturated hydraulic conductivity

Site selection:

Considerable time and effort is required to obtain meaningful permeability (K_{sat}) values. It is imperative that sites are chosen carefully prior to the day of measurement. The sites should have nil, or at most, minimal disturbance.

Procedure:

- Insert five small (35 cm diameter) and five large (40 cm diameter) infiltration rings with the small rings placed inside the large rings, so that each ring is approximately 100 mm into the main clay horizon. Remove some topsoil if necessary but care should be taken to cause minimal soil disturbance.
- Rings need to be at least two metres apart and located at random. Relocate rings if obstacles such as stones or roots prevent an even downward movement of the ring into the soil.
- iii) Fill rings with water and set up reservoir tanks so that water is added when the level drops below the outlet tube. Record the time and date on field sheets.
- iv) Place lids on rings to minimise evaporation and interference.

- Check that all containers are full and will last overnight to allow soil to saturate and conductivity rate to equilibrate.
- vi) Record water levels at various times during the day (depending upon infiltration rate), and leave for 24 hour period without any interruptions to the water flow, if possible.
- vii) Next day dig out each ring taking care not to disturb the soil contained within the ring. Up-end the ring and record the proportion of soil area that has been transmitting water for each ring and record if water movement has been evenly distributed or confined to root/worm holes or structural cracks. Note any other differences, ie. rocks, sand, clay patches.

3.4 Laboratory analysis

v)

Samples collected for each soil horizon were air dried, ground using a mortar and pestle and sieved to 2 mm. Physical analyses and soil pH, EC and Cl⁻ measurements were conducted at Keith Turnbull Research Institute and chemical analyses at the State Chemistry Laboratory. All results are expressed in terms of oven dry soil.

3.4.1 Physical properties

i) Particle size analysis

Based on a method by Hutton (1956), silt and clay percentages are determined by plummet balance readings on a 2% suspension, and sand percentages are determined by hand decantation followed by sieving.

Coarse sand	2 - 0.2 mm
Fine sand	0.2 - 0.002 mm
Silt	0.02 - 0.002 mm
Clay	< 0.002 mm

ii) Atterberg Limits

Methods based on the Australian Standard AS 1289

3.4.2 Chemical Properties

i) Soil pH

1:5 soil-water suspension shaken for 1 hour and allowed to reach room temperature. Measured with a glass electrode and digital pH meter.

ii) Electrical conductivity

Measurements on the above suspension using a dip-cell and direct reading meter.

iii) Chloride ion

Measurements on the above suspension using a silver nitrate titration.

iv) Exchangeable Ca, Mg, Na, K

Gillman and Sumpter's method of extraction for acidic soils method no. 024 (State Chemistry Laboratory 1991) and Tuckers method for alkaline soils method no. 006 (State Chemistry Laboratory 1991). The extracts were analysed using Inductively Coupled Plasma atomic emission spectroscopy.

v) Exchangeable Al and Mn

Extracted with 0.1 m KCl and concentrations determined by calorimetry and atomic absorption spectrophotometry respectively method no. 001 (State Chemistry Laboratory 1991).

vi) Oxidizable Organic Carbon

Walkley and Black method no. 014 (State Chemistry Laboratory 1991).

vii) Phosphorus

Olsen method method no. 010 (State Chemistry Laboratory 1991).

viii) Potassium

Skene method no. 011 (State Chemistry Laboratory 1991).

ix) Total Nitrogen

Method no. 007 (State Chemistry Laboratory 1991).

x) Exchangeable H

Method no. 005 (State Chemistry Laboratory 1991)

Table A13. Location of detailed soil-sampling sites

Site Number	Land Unit	Easting	Northing
4	Dsc	385130	5869430
5	Dsg	385430	5869200
41	Qa1	384710	5864980
57	Qam	388500	5870980
73	Dsb	383950	5867130
77	Dgb	393500	5864250
78	Dse	389480	5869700
81	Tfe	388230	5866920
82	Tfc	385930	5863800
84	Tfc	390330	5866700
87	Tfe	385950	5866250
90	Tfe	388480	5854600
96	Dge	385850	5857880
98	Dgf	385730	5859490
103	Tff	385730	5867730
109	Dsc	387530	5858430
123	Qam	390700	5870000
125	Dgb	387700	5856250
127	Dsc	383500	5858130
135	Dsc	385400	5854750
136	Dse	384950	5854830
137	Dgc	387900	5856500
138	Tfg	386000	5866150
139	Qa2	385800	5869180
140	Qam	384530	5870280