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APPENDIX I

SOURCES OF INFORMATION IN LAND TYPE TABLES

Climate

There are relatively few temperature and rainfall recording stations in the study area. Rainfall figures used in the tables have been taken from the rainfall isohyets given in the Land Conservation Council reports for the Alpine and North-east Study Areas (Land Conservation Council 1977, 1984), Rowe (1967) and Figure 2.1 in this report which has been derived from extrapolation of rainfall information using the ESOCLIM software. Consequently they give only the broad range for each land type. Similar data for temperature (isotherms) are not available.

Geology

The age and lithology are given as per the following Geological Survey maps:

1:250 000	Tallangatta Geology Sheet (SJ 55-3)
1:50 000	Cravensville Geology Sheet
1:50 000	Hume Geology Sheet

Physiography

Elevation Range: Taken from the 1:100 000 topographic maps for Rosewood, Holbrook, Tallangatta, Corryong, Bogong and Benambra.

Relative Relief: This was derived from the above topographic maps by determining differences in elevation between streams and the adjacent ridges and hill or mountain crests.

Landform: This was determined from field observations, the 1:100 000 topographic maps listed above and the 1:80 000 aerial photographs. Delineation of mountains, hills and low hills mostly followed McDonald *et al.* (1984) with mountains >300 m, hills between 90 and 300 m and low hills <90 m in elevation.

Slope Range: Slopes have been divided into five classes -

<3%	flat
3 - 10%	gentle
11 - 20%	moderate
21 - 32%	steep
>32%	very steep

The upper and lower values given in the tables for the slope range are the upper and lower values of the slope classes found within the land type or land component. For example, a land type or component with slopes in the gentle to steep classes, would have the slope range 3 - 32%.

Soil

Soil descriptions and data on condition of surface soil, consistency, exposed rock and surface stone, subsoil slaking tendency, and depth to rock are on the basis of profile descriptions made in the field. Use has also been made of data collected by Rowe (1967 and unpublished records) and Imhof *et al*. (1996) where possible. Soils have been classified using ‘A Factual Key for the Recognition of Australian Soils’ (Northcote 1979) and ‘A Handbook of Australian Soils’ (Stace *et al*. 1968). The more recently described soil profiles which were sampled for chemical analyses, have been classified according to the Australian Soil Classification (Isbell 1996).

Descriptions and ranges for the different properties given in the tables are the descriptions and class ranges used in McDonald *et al*. (1984). The descriptions and ranges in McDonald *et al*. (1984) are repeated here for 'condition of surface soil', 'consistence' and 'exposed rock and surface stone' for easy reference.

Condition of surface soil: the options for surface soil condition are given in tabular form below. These conditions are not necessarily mutually exclusive.

Periodic cracking	cracks 6 mm or more wide, 300 mm or more deep and at least one crack per m^2. Cracks may lie below a massive surface.
Self-mulching	highly pedal loose surface mulch forms on drying.
Loose	incoherent mass of individual particles or aggregates. Surface easily disturbed by pressure of forefinger.
Soft	coherent mass of individual particles or aggregates. Surface easily disturbed by pressure of forefinger.
Firm	coherent mass of individual particles or aggregates. Surface disturbed or indented by moderate pressure of forefinger.
Hard setting	compact, hard, apparently apedal condition forms on drying. Surface not disturbed or indented by pressure of forefinger. Surface seal is not necessarily associated with hard setting.
Surface crust	thin surface layer or flake, usually less than 10 mm thick, separates from, and can be lifted off, soil below on drying.
Trampled	soil that has been extensively trampled under dry conditions by hoofed animals.
Poached	soils that has been extensively trampled under wet conditions by hoofed animals.
Recently cultivated	effect of cultivation is obvious.
Saline	surface has visible salt, or salinity is evident from the absence or nature of the vegetation, or from soil consistence. These conditions are characterised by their notable difference from adjacent non-saline areas.

Consistence: consistence refers to the strength of cohesion and adhesion in soil. Strength will vary according to soil water status and hence this is also recorded with soil strength. Strength of soil is the resistance to breaking or deformation. Strength is determined by the force just sufficient to break or deform a 20 mm diameter piece of soil when a compressive shearing force is applied between thumb and forefinger. The 20 mm piece of soil may be a ped, part of a ped, a compound ped or a fragment.

Loose	no force required. Separate particles such as sands.
Very weak	very small force, almost nil.
Moderately weak	small but significant force.
Moderately firm	moderate or firm force.
Very firm	strong force but within power of thumb and forefinger.

Moderately strong	beyond power of thumb and forefinger. Crushes underfoot on hard flat surface with small force.
Very strong	crushes underfoot on hard flat surface with full body weight of average man applied slowly.
Rigid	cannot be crushed underfoot by weight of average man applied slowly.

Exposed rock and surface stone: percent ranges are given below.

No surface coarse fragments	0
Very few coarse fragments	<2%
Few coarse fragments	2% - 10%
Coarse fragments common	10% - 20%
Many coarse fragments	20% - 50%
Abundant coarse fragments	50% - 90%
Very abundant coarse fragments	>90%

Slaking tendency: The partial breakdown of soil aggregates in water due to the swelling of clay and the expulsion of air from pore spaces. (Charman and Murphy, 1991)

Depth to rock: Where soil overlies rock, the depth to rock has been given in metres.

Soil Permeability: (No measurements have been made in the field.) Data given are estimates only, based on profile morphology, in particular, on texture, structure and the relationships between horizons. In making these estimates, use was made of "Estimating Saturated Hydraulic Conductivity from Soil Morphology" in McKeague *et al.* (1982), Tables 2 and 3 in Talsma and Hallam (1980), Table 3 in Talsma and Northcote (1982) and unpublished data.

Lack of data on the shrink/swell tendency of subsoils has meant that this factor has not been considered in the estimates of soil permeability; it is most likely to affect the permeability of some of the duplex soils. Due to this and the greater variability within duplex profiles, the estimates for the duplex soils are the most approximate.

Permeability classes are:

High permeability - saturated hydraulic conductivity greater than 360 mm/day

Moderate permeability - saturated hydraulic conductivity in the range 12 - 360 mm/day

Low permeability - saturated hydraulic conductivity less than 12 mm/day

Site Drainage: This refers to the soil water regime at a site. It is determined by:

(i) the rate at which water is able to move through the soil (soil permeability), the depth to an impermeable layer, and the soil water holding capacity;

(ii) topographic factors - in particular slope and landscape position which determine whether a site tends to shed or receive surface water and groundwater flows.

The drainage classes and definitions given below are from McDonald *et al.* (1984).

1	*Very poorly drained*	Water is removed from the soil so slowly that the watertable remains at or near the surface for most of the year. Surface flow, groundwater and subsurface flow are major sources of water, although precipitation may be important where there is a perched watertable and precipitation exceeds evapotranspiration. Soils have a wide range in texture and depth, and often occur in depressed sites. Strong gleying and accumulation of surface organic matter are usually features of most soils.
2	*poorly drained*	Water is removed very slowly in relation to supply. Subsurface and/or groundwater flow, as well as precipitation, may be a significant water source. Seasonal ponding resulting from run-on and insufficient outfall also occurs. A perched watertable may be present. Soils have a wide range in texture and depth; many have horizons that are gleyed, mottled, or possess orange or rusty linings along root channels. All horizons remain wet for periods of several months.
3	*Imperfectly drained*	Water is removed only slowly in relation to supply. Precipitation is the main source if available water storage capacity is high, but subsurface flow and/or groundwater contribute as available water storage capacity decreases. Soils have a wide range in texture and depth. Some horizons may be mottled and/or have orange or rusty linings along root channels, and are wet for periods of several weeks.
4	*Moderately well drained*	Water is removed from the soil somewhat slowly in relation to supply, due to low permeability, shallow watertable, lack of gradient, or some combination of these. Soils are usually medium to fine in texture. Significant additions of water by subsurface flow are necessary in coarse-textured soils. Some horizons may remain wet for as long as one week after water addition.
5	*Well drained*	Water is removed from the soil readily but not rapidly. Excess water flows downward readily into underlying moderately permeable material or laterally as subsurface flow. The soils are often medium in texture. Some horizons may remain wet for several days after water addition.
6	*Rapidly drained*	Water is removed from the soil rapidly in relation to supply. Excess water flows downward rapidly if underlying material is highly permeable. There may be rapid subsurface lateral flow during heavy rainfall provided there is a steep gradient. Soils are usually coarse-textured, or shallow, or both. No horizon is normally wet for more than several hours after water addition.

Native Vegetation

Data on the native vegetation were obtained from field descriptions, from Land Conservation Council reports (1977 and 1984), Rowe (1967) and Adams (1997).

Site Numbering

Sites described during the major phase of field work for this project were numbered sequentially. No soil samples were taken for laboratory analyses during this phase of field work. In March 1998 a field trip was undertaken specifically to obtain soil samples for laboratory analyses from selected land types. The sites from which these soils were obtained have also been numbered sequentially but have the letter 'T' in front of the site number (sites T1 to T15). The laboratory data for these soils are given in Appendix 3. Sites described by Imhof *et al.* (1996) in the Tallangatta Creek Valley have the prefix NE before the number (sites NE19 to NE32).

Where site descriptions are available from similar land types and components, the relevant site numbers have been given in brackets.

APPENDIX II

Notes on Assessment of Susceptibility of Land Types to Deterioration

Introduction

The need to maintain and improve the productivity of soil is being increasingly recognised. For soil conservation to be achieved, however, land uses and management practices must be within the capability of the land to support them, and past degradation must, if possible, be repaired. An assessment of land capability (including susceptibility of the land to degradation) and determination of management practices which will at least maintain, and ideally improve, productivity require a knowledge of the natural resources of an area and an understanding of the processes operating.

It is also necessary to understand how land management practices affect landscape characteristics and hence processes. Ideally land characteristic and land process relationships need to be quantified. Among other things, this allows the effects of different managements and land uses on a land type, or of the same management and land use on different land types, to be compared. Considerable research is devoted to developing hydrology and erosion models which allow quantitative prediction of processes from measured values of critical parameters. Unfortunately, current models are too data intensive to be used to provide assessments useful for this report and other methods have had to be employed.

This appendix outlines the methodology used and provides some of the background information on which the method is based. Firstly, however, descriptions of the basic processes and land characteristics involved in land deterioration are given.

Processes of Soil Deterioration and Land Characteristics Involved

There are many forms of land deterioration. These differ in the mechanisms involved and soil properties affected. They include:

Mechanism	Form of degradation and on-site effect
Water erosion *Sheet and rill* *Gully* *Tunnel* *Scour* *Streambank* *Wind erosion* *Mass movement*	Loss of soil and associated nutrients
Chemical deterioration	Loss of nutrients Acidification
Physical deterioration	Decline in structure
Biological deterioration	Loss of humus, and soil fauna flora

Considered here are mass movement and the different forms of water erosion. These processes involve sediment transport and affect water quality in Dartmouth Dam and Lake Hume, a primary reason for this survey.

Definitions of these forms of deterioration are given below. The definitions, with the exception of that for scour erosion, are followed by tables which set out the processes involved, the associated land characteristics, and the management practices that modify the land characteristics. The aim of these tables is to help those unfamiliar with processes of deterioration to understand them and the way they are linked to the land and hence are affected by land management. The definitions and tables are from Aldrick *et al.* (1988).

Sheet (inter-rill) and rill erosion

Sheet erosion is the removal of relatively even layers of soil from the land surface, resulting primarily from the effects of raindrop impact and the transport of detached soil particles by splash and thin-film runoff.

It occurs after the protective cover of plants and litter has been reduced, exposing the soil surface. Rill erosion is the removal of soil within small channels where runoff water concentrates and develops sufficient velocity and turbulence to detach soil by hydraulic shear. Rills are channels which can be obliterated by tillage. These forms are summarised by Fairbridge and Finkl (1979).

Sheet and rill erosion are considered together because runoff usually does not take place as thin-film flow for great distances, but tends to channelise due to irregularities in the shape and nature of the soil surface. Thus sheet and rill erosion tend to be inextricably interwoven.

Land characteristics and management factors involved in sheet and rill erosion

Processes	Land characteristics affecting processes	Factors affected by land characteristics	Management factors that modify land characteristics
Sheet and rill erosion occur when the forces due to rainfall, flowing water and gravity overcome the cohesion and weight of the soil particles/aggregates	Vegetation - structure, percent surface cover (including litter) - leaf area, rooting depth and perenniality	• Exposure of surface soil • Intensity of rain drop impact • Infiltration/runoff ratio • Velocity of surface flow • Transpiration and hence infiltration rate and volume of surface flow	All aspects of the vegetation are affected by selection of species and control of biomass by practices such as: cultivating clearing trafficking fertilising grazing trampling harvesting burning
Processes involved are: detachment of exposed soil by: - raindrop impact - surface flow	Climate - rainfall intensity/duration - seasonal rainfall/ evapotranspiration regime	• Intensity of raindrop impact • Volume of water exceeding infiltration rate and hence volume of surface flow • Soil water content and hence infiltration rate and volume of surface flow	
Transport by - rain splash - surface flow	Geology - permeability of rock or unconsolidated sediments	• Soil water content and hence infiltration rate and volume of surface flow	
Deposition Surface flow occurs on any sloping surface when the rainfall rate exceeds the infiltration rate	Topography - microrelief - slope degree and length - slope and landform shape - position in landscape	• Infiltration/runoff ratio • Velocity of surface flow • Volume and velocity of surface flow • Tendency to concentrate surface flow • Volume of run-on	Contour cultivating, contour banking and strip cropping reduce slope length and affect microrelief
Off-site effects include increased sedimentation in streams and on lower lands	Soil - profile permeability - depth and water-holding capacity - size/weight of surface particles/aggregates - cohesion of surface particles/aggregates, including tendency to slake and disperse - tendency to surface seal and hydrophobicity - percent stone cover	• Infiltration rate and hence volume of surface flow • Infiltration/runoff ratio • Detachment and transport • Detachment • Infiltration rate and hence volume of surface flow • Infiltration/runoff ratio and velocity of surface flow	The above management practices controlling biomass affect soil organic matter content, which in turn affects all listed soil characteristics except surface rock Direct soil compaction and disruption by trampling, trafficking and cultivating affect soil permeability, water holding capacity and size/weight and cohesion of aggregates

Gully and tunnel erosion

Gully erosion results in channels too large to be readily obliterated by tillage. In practical terms, channels with a depth of 0.5 m or more are considered gullies.

In Victoria, Milton (1971) classified gullies on the basis of formative mechanisms e.g. scouring, sapping, spalling, slumping.

Tunnel erosion is the removal of soil from subsurface seepage flow paths. The formation of tunnels has been described by Downes (1946) and Crouch (1980). It occurs when runoff is generated on a soil surface with a low infiltration rate and with interconnected cracks and other holes, such as old root channels and burrows. The water moves preferentially along these cracks and other voids in the subsoil, removing soil. As the tunnels enlarge the ceilings may collapse to form gullies.

Comments:

(i) lack of cohesion between particles is characteristic of soils with high sand and silt content and not cemented by agents such as carbonates, iron oxides or organic matter and of loose gravelly detrital materials with a fine earth matrix;

(ii) cracks and channels develop in soils with a high shrink-swell capacity;

Land characteristics and management factors involved in gully and tunnel erosion

Processes	Land characteristics affecting process	Factors affected by land characteristics	Management factors that modify land characteristics
Gully and tunnel erosion occur when the forces due to rainfall, flowing water and gravity overcome the cohesion and weight of the soil particles/aggregates	Vegetation - structure, percent surface cover (including litter) - leaf area, rooting depth and perenniality	• Exposure of surface soil to detachment • Intensity of raindrop impact • Velocity of channelised flow and hence particle detachment and transport • Transpiration and hence infiltration rate and volume of surface and subsurface flow	All aspects of the vegetation are affected by selection of species and control of biomass by practices such as: cultivating clearing trafficking fertilising grazing trampling harvesting burning
Processes involved are: detachment of exposed surface soil by: - raindrop impact - channellised overland flow - cracking	Climate - rainfall intensity/duration - seasonal rainfall/ evapotranspiration regime	• Intensity of raindrop impact • Volume of surface and subsurface flow • Volume of surface and subsurface flows via regulation of soil water content	
detachment of subsoil by - subsurface flow in permeable strata and along cracks and tunnels - cracking	Geology - perviousness of rock or unconsolidated sediments	• Soil water content and hence infiltration rate and volume of surface and subsurface flow • Lateral or vertical movement of water	
Transport of particles/ aggregates by - channellised overland flow - subsurface flow - gravity collapse Deposition	Topography - microrelief (both of channel and catchment to a site) - valley slope degree and length - position in landscape and catchment area - catchment slope degree and length - slope and landform shape	• Infiltration/runoff ratio • Velocity of surface flow • Volume of surface and sub-surface flows reaching site • Tendency to concentrate surface flow	Contour and diversion banking, strip cropping and contour cultivation reduce catchment slope length and catchment area; they also affect microrelief
Gully erosion is regarded as having occurred when the channel is too deep to be crossed or cannot be obliterated by tillage Off-site effects include increased sedimentation and run-on in streams and on lower lands	Soil - profile permeability - depth and water-holding capacity - size/weight of soil particles/aggregates - cohesion of particles/ aggregates, including tendency to crack, slake and disperse - differential permeability within a horizon due to the presence of cracks and channels - percent stone cover	• Infiltration rate and hence volume of surface and sub-surface flow • Lateral or vertical movement of soil water • Volume of surface and subsurface flow • Detachment and transport • Detachment • Movement of water along preferred channels • Infiltration/runoff ratio and velocity of surface flow	Type and amount of biomass production will affect soil organic matter content, which will in turn affect most listed soil characteristics Soil disruption and compaction by trampling, burrowing, cultivation and trafficking will affect profile permeability, water-holding capacity and size / weight and cohesion of soil particles/aggregates

Scour erosion

Scour erosion refers here to detachment and removal of soil by floodwaters from land beside rivers and creeks.

Land Characteristics involved in scour erosion

Erosion due to floodwaters depends on the volume and velocity of their flow. This is determined by:

(i) rainfall intensity and duration in the catchment

(ii) catchment area and topography

(iii) infiltration and water-holding capacities of soils in the catchment

(iv) stream channel size

(v) the gradient and microrelief of the flooded land

The soil characteristics influencing susceptibility are the same as those involved in the other forms of water erosion.

Streambank erosion

Streambank erosion is the collapse of streambanks and is usually caused by under-cutting of the banks by the stream. It is often exacerbated by trafficking by stock, people or vehicles, and tree clearing along streams.

Bank erosion occurs along river channels cut into colluvium and alluvium, particularly in meandering river systems. It is accelerated when the flow regime of a river is altered due to changes in the catchment, such as clearing, which increase the frequency and volume of peak flows. Straightening of stream channels also leads to more violent flooding and bank erosion due to increased stream velocities and decreased channel storage.

Land characteristics and management factors involved in stream-bank erosion

Processes	land characteristics affecting processes	Factors affected by land characteristics	Management factors that modify land characteristics
Streambank erosion occurs when forces due to water movement along a stream channel are sufficient to detach and remove soil material from the stream-bank	Vegetation - structure, percent surface cover (including litter) - leaf area, rooting depth and perenniality - structure, percent surface cover, leaf area, rooting depth and perenniality within the catchment	• Streambank stability • Transpiration and hence soil water content of banks • Volume and velocity of stream flow	Stabilise stream banks with trees, shrubs and grasses; restrict stock and vehicular access All aspects of catchment vegetation are affected by the selection of species and control of biomass by practices such as: cultivating clearing trafficking fertilising grazing trampling harvesting burning
Processes involved are: detachment of soil from streambank by: - slaking - undercutting - collapse of bank - transport by channel flow - deposition	Climate - rainfall intensity/duration in catchment - seasonal rainfall/ evapotranspiration regime within catchment	• Volume of water exceeding infiltration rate and hence volume of stream flow • Soil water content and hence infiltration rate, runoff and volume of stream flow	
	Geology - permeability of rock or unconsolidated sediments in the catchment	• Soil water content and hence infiltration rate, runoff and volume of stream flow	
	Topography - catchment slopes, degree and length	• Runoff and volume of stream flow	Contour cultivating, contour banking and strip cropping to reduce slope length
	Soil - permeability of soils within the catchment - depth and waterholding capacity of catchment soils - cohesion of soil particles /aggregates on stream bank, including tendency to slake and disperse - size/weight of stream bank particles/aggregates	• Infiltration rate and hence runoff and volume of river flow • Detachment • Detachment and transport	Restrict stock and vehicular access to streams

Mass movement - soil creep and landslide

Soil creep is the imperceptibly slow but significant downslope movement of a mass of soil; it does not require saturated conditions.

Landslides are sudden movements of soil or rock masses down a slope. Landslides (earth and mudflows) leave characteristic concave hollows with crescentric upper edges, whilst at their base the displaced material often has an irregular surface.

Land characteristics and management factors involved in landslides

Processes	Land characteristics affecting processes	Factors affected by land characteristics	Management factors that modify land characteristics
Landsliding occurs when the shear forces exceed soil/regolith strength; this generally occurs when soil/regolith strength is reduced by an increase in water	Vegetation - leaf area, rooting depth and perenniality - total leaf area and canopy type - root depth and mass	• Transpiration and hence soil water content • Volume of water held by canopy and hence volume available for infiltration • Anchorage of soil by roots	All aspects of the vegetation are affected by selection of species and control of biomass by practices such as: cultivating clearing trafficking fertilising grazing trampling clearing burning
Processes involved are: - Infilatration of water - wetting of basal plane - saturation of soil (mudflow) - Shearing and movement of soil mass by gravity	Climate - seasonal rainfall / evapotranspiration regime	• Soil water content	
	Geology - perviousness of rock or unconsolidated sediments - wet strength of rock/ regolith - angle of dip	• Soil water content • Shearing tendency	
	Topography - slope degree - microrelief and position in landscape	• Gravitational force • Run-on, site drainage and hence soil water content	
Other processes that may be involved include: - loading of soil mass resulting in an increase in shear strength - removal of material from slope toe resulting in reduced slope support Types of landslides covered by this table are: - rock and earth slides - earth flow (downslope movement of unsaturated soil and weathered rock on a lubricated basal shear plane) - mudflow (movement of saturated soil and rock) - combination slide/flows	Soil - topsoil permeability - presence of slowly permeable layer - cohesion of particles/ aggregates including tendency to slake and disperse - depth - clay mineralogy	• Infiltration/runoff ratio and hence soil water content • Water content of soil immediately above layer • Soil strength • Soil water content	Compaction and soil disruption by stock, vehicles and cultivation will affect profile permeability

THE SUSCEPTIBILITY OF LAND TO DETERIORATION

The concept of susceptibility

In order to consider the likely impact of land use/management on different land types, the concept of susceptibility of land to deterioration was developed. This concept was described in Aldrick *et al.* (1988); the discussion is repeated here for easy reference.

> The susceptibility of an area of land to a particular form of deterioration is related to the ease with which the associated processes can occur; it is related to the inherent properties of the land in question and is considered independently of land uses and severity of disturbance. For example, soil loss by sheet erosion involves particle detachment and transport by rain splash and surface flow. The susceptibility of the land to soil loss is therefore related to the land properties which influence resistance of the soil particles to detachment and transport, such as the size and weight of soil particles and their cohesion, and the volume and velocity of surface flows. Generation of surface flows is influenced by such factors as infiltration capacity of the topsoil, profile permeability and water holding capacity, slope of the land and rainfall intensity.
>
> It is important that the concept of susceptibility to deterioration be distinguished from the concepts of magnitude of deterioration, tolerance to deterioration, and hazard of deterioration. The magnitude of a form of deterioration involves amount and aerial extent; for example, the amount of soil lost or the area of land waterlogged. It is determined by the severity and type of land disturbance as well as by the inherent susceptibility of the land.
>
> The tolerance of the land to deterioration relates to the effects of deterioration on productivity. The hazard of deterioration involves the probability of deterioration occurring; this depends on land use and management, the magnitude and a real extent of disturbance, and inherent susceptibility.

Rating susceptibility

In order to compare the susceptibilities of different land types to particular processes of deterioration, susceptibility needs to be rated. This is difficult as:

(i) ideally it requires a quantified relationship between the different factors involved, for example, the slope gradient for different rainfall intensities that is necessary for overland flow to transport the surface particles of different soils.

(ii) some of the land characteristics important to particular degradational processes are known to be very variable within a land type or even land component. For example, Talsma and Hallam (1980) found that the saturated hydraulic conductivity of soils varied by up to two orders of magnitude over very short distances.

Methodology for rating susceptibility used in this report

A detailed rating of the susceptibility of the different land types to deterioration was not regarded as feasible due to the problems of rating susceptibility outlined and to the paucity of data available. Any such rating is likely to be misleading. Instead, the likely hydrology and its implications for erosion are discussed qualitatively for the different physiographic regions in Chapter 3. The aim is to provide an understanding of processes at a landscape as distinct from site level.

As there is a need, however, for some indication of the relative susceptibilities of the land types to sediment movement, land components have been given a broad rating, (low, moderate or high), to sheet, rill and gully erosion, and land slipping. These ratings are given in tabular form in Chapter 4, along with critical land characteristics.

To arrive at the ratings for sheet and rill erosion, and for gully erosion, weight has been given to probable soil infiltration rates, soil permeability, soil water storage capacity and rainfall. As no measurements were made for these characteristics for soils in the survey area, they have been assessed using the sources given in Appendix 1. Consideration has also been given to the method for rating the erodibility of soils in Charman (1984).

APPENDIX III

LABORATORY DATA FOR SELECTED SOIL PROFILES

Site Descriptions

Site: T1 **Land Type:** RHGs

General Landscape Description:
Road cutting on midslope position on rolling hills (gneiss). Remnant native vegetation includes *Eucalyptus melliodora* (Yellow Box), *E. bridgesiana* (Apple Box) and *E. polyanthemos* (Red Box).

Soil Profile Morphology:

A_1 0-10 cm	Very dark greyish brown (10YR 3/2) organic sandy loam; moderate fine polyhedral structure; dry firm consistence; gradual change to:
A_2 10-30 cm	Yellowish brown (10YR 5/4) gritty light sandy clay loam, bleached (10YR 7/4, dry); weak coarse prismatic structure; dry firm to very firm consistence; slightly gravelly (quartz); clear change to:
B_2 30-55 cm	Dark yellowish brown (10YR 4/6) gritty light medium clay, mottled (30%, medium, 5YR 4/6); strong medium to fine prismatic structure; dry strong consistence; gravelly (quartz); gradual change to:
B_3/C 55-70 cm	Dark yellowish brown (10YR 4/6) gritty light medium clay, weak medium prismatic structure; firm consistence; gravelly (quartz); gradual change to:
C/R 70^+ cm	

Factual Key: Db2.41
ASC: Bleached-Mottled, Eutrophic, Brown CHROMOSOL

Site: T2 **Land Type**: PSy

General Landscape Description:
Road cutting on midslope position on gentle plateau (sedimentary). Overstorey native vegetation includes: *E. radiata* (Narrow Leaf Peppermint), *E. obliqua* (Messmate) and *E. mannifera* (Brittle Gum).

Soil Profile Morphology:

A_{11} 0-15 cm	Dark brown (7.5YR 3/2) organic loam fine sandy; moderate medium to fine polyhedral structure; dry weak to firm consistence; gravelly (15%; 6-60 mm diameter); clear change to:
A_{12} 15-35 cm	Brown (7.5YR 5/4) light fine sandy clay loam, not bleached (7.5YR 6/4, dry), mottled (15%, medium, 2.5YR 4/6); moderate medium polyhedral structure; dry very firm consistence; gravelly (20%; 6-60 mm diameter); clear change to:
B_2 35-70 cm	Red (2.5YR 4/6) light clay, strong medium to fine prismatic structure; dry very firm to strong consistence; gravelly (40%; 20-200 mm diameter, sandstone); gradual change to:
C/R 70^+ cm	

Factual Key: Gn4.14
ASC: Acidic, Mesotrophic, Red DERMOSOL

Site: T3 **Land Type**: LHUH

General Landscape Description:
Road cutting on midslope position on higher elevation undulating hills (granite). Overstorey native vegetation includes *E. radiata* (Narrow Leaf Peppermint), *E. globulus* (Blue Gum) and *E. obliqua* (Messmate).

Soil Profile Morphology:

A_1 0-15 cm	Very dark greyish brown (10YR 3/2) organic light sandy clay loam; moderate fine polyhedral/granular structure; dry weak consistence; gravelly (15%, 2-6 mm diameter, quartz); gradual change to:
A_2 15-35 cm	Brown (7.5YR 4/4) gritty sandy clay loam, bleached (7.5YR 7/4, dry) mottled (15%, medium, 5YR 4/6); weak coarse polyhedral structure; dry firm consistence; gravelly (15%, 2-6 mm diameter, quartz); clear change to:
B_2 35-100 cm	Red (2.5YR 4/5) gritty light medium clay; strong medium to fine prismatic structure; dry very firm to strong consistence; gravelly (10%, 2-6 mm diameter, quartz); diffuse change to:
B_3 100-120 cm	Red (2.5YR 4/6) gritty light clay, moderate medium prismatic structure; firm consistence; gravelly (20%, 2-6 mm diameter, quartz); gradual change to:
C/R 120^+ cm	

Factual Key: Dr2.41
ASC: Bleached, Mesotrophic, Red KUROSOL

Site: T4 **Land Type**: MLG

General Landscape Description:
Road cutting on midslope position on rolling to steep mountains (leucocratic granite). Overstorey native vegetation includes *E. radiata* (Narrow-Leaf Peppermint), *E. globulus* (Blue Gum) and *E. obliqua* (Messmate).

Soil Profile Morphology:

A_1 0-10 cm	Very dark greyish brown (10YR 3/2) gritty, organic sandy clay loam; weak to moderate fine polyhedral/ blocky structure; dry firm to very firm consistence; slightly gravelly (3%, 2-6 mm diameter, quartz); clear change to:
A_2 10-20 cm	Dark reddish brown (5YR 3/4) gritty fine sandy loam, bleached (7.5YR 7/4, dry) mottled (10%, fine, 5YR 4/6); moderate fine prismatic structure; dry firm consistence; gravelly (8%, 2-6 mm diameter, quartz); clear change to:
B_{21} 20-40 cm	Yellowish red (5YR 4/5) gritty, silty light clay; strong coarse to medium to fine prismatic structure; dry very firm to strong consistence; gravelly (15%, 2-6 mm diameter, quartz); gradual/diffuse change to:
B_{22} 40-110 cm	Yellowish red (5YR 4/6) gritty, silty light clay, moderate coarse to medium prismatic to fine blocky structure; very firm consistence; gravelly (20%, 2-6 mm diameter, quartz); gradual change to:
C/R 110^+ cm	

Factual Key: Gn4.11/Gn3.11
ASC: Bleached-Acidic, Mesotrophic, Red DERMOSOL

Site: T5 **Land Type**: MR

General Landscape Description:
Road cutting on midslope position on steep mountains (rhyolite/rhyodacite), easterly aspect. Overstorey native vegetation includes *E. radiata* (Narrow-Leaf Peppermint), *E. mannifera* (Brittle Gum) and *E. globulus* (Blue Gum).

Soil Profile Morphology:

A_1 0-20 cm	Yellowish red (5YR 4/6) organic sandy clay loam; moderate medium to fine polyhedral/blocky structure; dry firm to very firm consistence; gravelly (20%, 6-60 mm diameter, quartz); clear change to:
B_2 20-70 cm	Red (2.5YR 4/8), silty light clay; moderate to strong coarse to medium to fine prismatic structure; dry very firm consistence; gravelly (35%, 6-60 mm diameter, quartz); clear change to:
B_3 70-110 cm	Reddish yellow (7.5YR 6/8) gritty, silty light clay, moderate coarse to medium to fine prismatic structure; very firm consistence; gravelly (20%, 2-6 mm diameter, quartz); gradual change to:
C/R 110^+ cm	

Factual Key: Gn4.11
ASC: Acidic, Mesotrophic, Red DERMOSOL

Site: T6 **Land Type**: MR

General Landscape Description:
Road cutting on midslope position on steep mountains (rhyolite/rhyodacite), westerly aspect. Overstorey native vegetation includes *E. dives* (Broad-Leaf Peppermint), *E. mannifera* (Brittle Gum), *E. globulus* (Blue Gum) and *E. goniocalyx* (Long-Leaf Box).

Soil Profile Morphology:

A_1/A_2 0-20 cm	Yellowish red (5YR 4/6, 5YR 6/4, dry) organic heavy sandy loam; weak to moderate medium to fine polyhedral/blocky structure; dry firm to very firm consistence; moderately gravelly (30%, 20-60 mm diameter, parent material); clear change to:
B_2 20-60 cm	Red (2.5YR 4/6), sandy clay; weak to moderate medium to fine prismatic structure; dry very firm to consistence; gravelly (40%, 20-60 mm diameter, quartz); clear change to:
C/R 60^+ cm	

Factual Key: Gn4.11/Gn3.11
ASC: Acidic, Mesotrophic, Red DERMOSOL

Site: T7 **Land Type**: PG

General Landscape Description:

Road cutting on midslope position on undulating plateau (granite), north westerly aspect. Overstorey native vegetation includes *E. dives* (Broad-Leaf Peppermint) and *E. mannifera* (Brittle Gum).

Soil Profile Morphology:

A_1 0-10 cm	Very dark greyish brown (10YR 3/2) organic light fine sandy clay loam; moderate medium to fine polyhedral/ blocky structure; dry weak to very firm consistence; slightly gravelly (20%, 6-60 mm diameter, quartz); clear change to:
B_1 10-40 cm	Dark reddish brown (5YR 3/4), silty light clay; moderate to strong medium to fine prismatic structure; dry firm consistence; gravelly (35%, 6-60 mm diameter, quartz); clear change to:
B_2 40-110 cm	Reddish yellow (7.5YR 6/8) gritty, silty light clay, moderate coarse to medium to fine prismatic structure; very firm consistence; gravelly (20%, 2-6 mm diameter, quartz); gradual change to:
C/R 110^+ cm	

Factual Key: Gn4.11
ASC: Haplic, Mesotrophic, Red DERMOSOL

Site: T8 **Land Type**: MS

General Landscape Description:
Road cutting on upperslope/crest position on steep mountains (schistose metamorphics), westerly aspect. Overstorey native vegetation includes *E. radiata* (Narrow-Leaf Peppermint) and *E. mannifera* (Brittle Gum).

Soil Profile Morphology:

A_1 0-20 cm	Dark reddish brown (5YR 3/3) organic loam fine sandy; weak to moderate medium to fine polyhedral/ blocky structure; dry firm consistence; moderately gravelly (30%, 20-60 mm diameter, parent material); clear change to:
B_2 20-55 cm	Red (2.5YR 4/6), sandy clay; moderate medium to fine prismatic structure; dry very firm to consistence; gravelly (55%, 6-200 mm diameter, parent material); clear change to:
C/R 55^+ cm	

Factual Key: Um6.12
ASC: Acidic, Mesotrophic, Red DERMOSOL

Site: T9 **Land Type**: MG (PG)

General Landscape Description:
Road cutting on upperslope position on undulating subalpine mountain/plateau (granite), north easterly aspect. Overstorey native vegetation includes *E. pauciflora* (Snow Gum) and possibly *E. rubida* (Candlebark) and *E. stellulata* (Black Sallee).

Soil Profile Morphology:

A_{11} 0-15 cm	Black (10YR 2/1) organic loam; moderate fine subangular blocky structure; dry weak consistence; gravelly (12%, 2-20 mm diameter, quartz); clear to gradual change to:
A_{12} 15-30 cm	Black (10YR 2/1) organic loam; moderate to strong fine subangular blocky structure; dry weak consistence; gravelly (15%, 2-200 mm diameter, quartz and mica); clear change to:
B_2 30-60 cm	Dark brown organic sandy clay loam, weak to moderate fine subangular blocky structure; moist firm consistence; moderately gravelly (25%, 2-200 mm diameter, quartz and mica); gradual/clear change to:
C/R 60^+ cm	

Factual Key: Um6.14
ASC: Melacic, Dystrophic, Black DERMOSOL

Site: T10 **Land Type**: LHUG

General Landscape Description:
Road cutting on lower slope position on a gentle terrace component of low undulating hills (granite), westerly aspect. Overstorey native vegetation includes *E. radiata* (Narrow-Leaf Peppermint) and *E. teretcornis* (Forest Red Gum).

Soil Profile Morphology:

A_1 0-15 cm	Dark reddish brown (5YR 3/3) organic light fine sandy clay loam; weak coarse/massive polyhedral structure; dry firm consistence; slightly gravelly (2%, 2-6 mm diameter, washed quartz, sediments); clear change to:
B_{21} 15-30 cm	Dark red (2.5YR 3/6) fine sandy light clay; moderate medium prismatic to blocky structure; dry very firm to strong consistence; gravelly (5%, 2-6 mm diameter, quartz and sediments); gradual change to:
B_{22} 30-100 cm	Dark red (2.5YR 3/6) silty light clay, strong medium to fine prismatic to blocky structure; moist strong consistence; gravelly (10%, 2-200 mm diameter, quartz and mica); gradual/clear change to:
D 100^+ cm	Gravels

Factual Key: Dr2.11
ASC: Haplic, Mesotrophic, Red CHROMOSOL

Site: T11 **Land Type**: MS

General Landscape Description:
Road cutting on upper slope (spur) position on rolling to steep mountain (metamorphic rocks), northerly aspect. Overstorey native vegetation includes *E. globulus* (Blue Gum), *E. radiata* (Narrow-Leaf Peppermint) and *E. dives* (Broad-Leaf Peppermint).

Soil Profile Morphology:

A_1 0-10 cm	Dark reddish brown (5YR 3/4) organic sandy loam, mottled (5%, fine, 5YR 4/6); moderate medium to fine polyhedral/ blocky structure; dry firm consistence; slightly gravelly (5%, 2-6 mm diameter, quartz/ metamorphics); clear change to:
B_1 10-25 cm	Yellowish red (5YR 4/6), heavy sandy clay loam, mottled (10%, medium, 5YR 5/8); moderate coarse to medium prismatic structure; dry firm consistence; gravelly (12%, 2-60 mm diameter, quartz/ metamorphics); pH 6.2; clear change to:
B_2 25-55 cm	Yellowish red (5YR 5/8), heavy sandy clay loam, mottled (5%, fine, 5YR 4/6); light fine sandy clay, moderate coarse to medium to fine prismatic structure; very form to strong consistence; gravelly (20%, 2-6 mm diameter, quartz); pH 6.0; gradual change to:
C/R 55^+ cm	

Factual Key: Gn4.11
ASC: Acidic, Mesotrophic, Red DERMOSOL

Site: T12 **Land Type**: MR

General Landscape Description:
Road cutting on crest slope (spur) on rolling to steep mountain (acid volcanics). Overstorey native vegetation includes *E. pauciflora* (Snow Gum) and *E. dalrympleana* (Mountain Gum).

Soil Profile Morphology:

A_1 0-15 cm	Dark reddish brown (5YR 3/2) organic loam fine sandy; moderate medium to fine polyhedral/blocky structure; dry firm consistence; slightly gravelly (10%, 6-20 mm diameter, parent material); gradual change to:
B_2 15-40 cm	Yellowish red (5YR 4/6), heavy fine sandy clay loam; weak to moderate medium to fine prismatic to granular structure; gravelly (15%, 2-60 mm diameter, parent material); gradual change to:
B_3/C 40-65 cm	Yellowish red (5YR 5/8), heavy sandy clay loam, mottled (5%, fine, 5YR 4/6); light fine sandy clay, moderate coarse to medium to fine prismatic structure; very firm to strong consistence; moderately gravelly (60%, 6-60 mm diameter, parent material); gradual change to:
C/R 65^+ cm	

Factual Key: Gn4.11
ASC: Acidic, Dystrophic, Red DERMOSOL

Site: T13 **Land Type**: MSy

General Landscape Description:
Road cutting on crest slope (spur) on rolling to steep mountains (sedimentary). Overstorey native vegetation includes *E. dives* (Broad-Leaf Peppermint), *E. radiata* (Narrow-Leaf Peppermint) and *E. mannifera* (Brittle Gum).

Soil Profile Morphology:

A_1 0-10 cm	Dark reddish brown (5YR 3/4) organic fine sandy clay loam; moderate medium prismatic structure; dry firm to strong consistence; slightly gravelly (15%, 2-200 mm diameter, parent material); clear change to:
B_{21} 10-25 cm	Yellowish red (5YR 4/6), fine sandy clay; moderate medium to fine prismatic to granular structure; gravelly (30%, 20-60 mm diameter, parent material); clear/gradual change to:
B_{22} 25-50 cm	Yellowish red (5YR 4/6), heavy sandy clay loam; light fine sandy clay, moderate coarse to medium to fine prismatic structure; very firm to strong consistence; moderately gravelly (40%, 20-200 mm diameter, parent material); gradual change to:
C/R 50^+ cm	Rock

Factual Key: Gn4.11/GN3.11
ASC: Haplic, Mesotrophic, Red DERMOSOL

Site: T14 **Land Type**: LHUG

General Landscape Description:
Road cutting on lower slope position on undulating low hills (granite). Overstorey native vegetation includes *E. microcarpa* (Grey Box) and *E. goniocalyx* (Long-leaf Box).

Soil Profile Morphology:

A_1 0-10 cm	Dark greyish brown (10YR 4/2) gritty, organic light sandy clay loam; weak structure; dry very firm consistence; moderately gravelly (20%, 2-6 mm diameter, quartz); clear change to:
A_2 10-40 cm	Dark reddish brown (7.5YR 5/6) gritty light sandy clay loam, bleached (7.5YR 7/4, dry); weak structure; dry very firm consistence; moderately gravelly (35%, 2-6 mm diameter, quartz); gradual change to:
B_2 40-80 cm	Yellowish red (5YR 4/6-8) gritty, silty light clay; strong coarse to medium to fine prismatic structure; dry very firm to strong consistence; moderately gravelly (40%, 2-6 mm diameter, quartz); gradual change to:
C $80\text{-}120^+$ cm	

Factual Key: Gn4.51
ASC: Acidic, Mesotrophic, Red DERMOSOL

Site: T15 **Land Type**: LHUS

General Landscape Description:
Road cutting on lower slope position on undulating low hills (metasedimentary). Overstorey native vegetation includes *E. macrorhyncha* (Stringybark), *E. microcarpa*, (Grey Box), *E. polyanthmus* (Red Box) and *E. blakelyi* (Blakely's Gum).

Soil Profile Morphology:

A_1 0-10 cm	Dark brown (10YR 3/4) gritty, organic loam fine sandy; moderate fine prismatic to granular structure; dry firm consistence; gravelly (10%, 6-20 mm diameter, parent material); clear change to:
A_2 10-35 cm	Yellowish red (5YR 5/6); light fine sandy clay loam, bleached (7.5YR 7/4, dry); massive/ weak coarse prismatic structure; dry very firm consistence; gravelly (15%, 6-60 mm diameter, parent material); clear change to:
B_2 35-65 cm	Red (2.5YR 4/6) gritty, silty light medium clay; strong medium to fine prismatic to blocky structure; gravelly (15%, 6-60 mm diameter, parent material); gradual change to bedrock.

Factual Key: Dr2.41
ASC: Bleached, Mesotrophic, Red CHROMOSOL

Physiographic Region	Sub Region	Map Symbol	Land Type	Rainfall (mm)	Geology	Soils	Native Vegetation
Flat to undulating plateaux in highest landscape positions		PG	Plateaux on granite and granodiorite, gneiss, rhyolite, schist and sedimentary rock.	750 >1400	Granite and granodiorite.	In the subalpine zone, organic soils and deep uniform loams to clay loams, well structured. At elevations below the subalpine, mostly deep well structured red gradational soils.	Small areas of subalpine woodland with *Eucalyptus pauciflora*. Mostly open forest II, III & IV: *E. dalrympleana*,*E. Dives*,*E. radiata*, and *E. Rubida*; *E. Delegatensis* at higher elevations.
		PGs			Gneiss.		
		PR			Rhyodacite/Rhyolite, quartz porphyry.		
		PS			Schist and spotted phyllite.		
		PSy			Sandstone, shales and siltstones.		
Dissected plateaux	Hills	HGDP	Hills on granite	800 - 1600	Granite and granodiorite.	Mostly red and yellow duplex soils and moderately to strongly structured gradationaln soils.	Mostly cleared for pine plantations; native vegetation probably predominantly as for mountains on granite (see below).
		HRDP	Hills on rhyolite and rhyodacite	800 - 1400	Rhyodacite and rhyolite, quartz porphyry.	Typically yellow brown to red strongly structured gradational soils with clay loam to light clay subsoils. Some less well structured uniform soils with loam to silty loam textures.	Predominantly open woodland and open forest III, with *E. dives* and *E. dalrympleana* on drier more exposed sites and *E. delegatensis* on wetter sites at higher elevations; *E. pauciflora* on cold sites and at highest elevations.
		HSDP	Hills on schist	800 - 1800	Schist and spotted phyllite.	Generally duplex or gradational soils, sometimes deep, with strongly structured subsoils.	Native vegetation now almost entirely cleared probably as for hills on schist with steep relatively even slopes (see below).
		HSyDP	Hills on sedimentary rock	750 - 1400	Sandstone, shale and siltstone.	Generally gradational soils with moderately to strongly structured light clay subsoils; some uniform soils.	As for hills on sedimentary rocks (see below).
	Low hills and undulating terrain	LHUH	Low hills and undulating terrain in high landscape Positions	750 - 1400	Granite (including leucocratic granite), granodiorite; small areas of schist and rhyolite/rhyodacite.	Slopes on colluvium or bedrock typically with red duplex or gradational soils with moderately to strongly structured subsoils. Alluvial areas mostly with one or more depositional layers and poorly developed soils.	Areas on granite predominantly cleared. Probably mostly open forest II, III with *Eucalyptus macrorhyncha* and *E. Goniocalyx* on drier slopes and with *E. dives*, *E. radiata* and *E. dalrympleana* on wetter slopes.
Mountains	Mountains with uneven (benched) slopes common Areas with coarse crystalline rocks	MG	Mountains on Granite	650 - 1800	Granite, granodiorite and diorite.	On drier slopes and ridges, mostly shallow uniform clayey sands to sandy loams. Also some red, brown and yellow duplex soils. In wetter areas, such as on southerly slopes, mostly deep, well structured, red gradational Soils.	Open forest I, II, III mostly with *Eucalyptus dives*, *E. macrorhyncha*, *E. goniocalyx* and *E. Polyanthemos* and heathy or grassy understorey on drier slopes. Wetter slopes with open forest III,IV with *E. Radiata*, *E. dalrympleana* and *E. Globulus*, some *E. Obliqua*.
		MGs	Mountains on gneiss	650 - 1000	Gneiss and gneissic pegmatite; minor Schist.	Mostly shallow, uniform clayey sands to sandy clay loams or red or yellow duplex soils. In more humid areas, moderate to deep, mostly well structured, red gradational soils.	
		MLG	Mountains on leucocratic granite	650 - 1000	Leucocratic granite.	Mostly shallow stony loamy coarse sands. More humid areas with deep, well structured red uniform or gradational soils; some well structured red duplex soils on gentle slopes.	Similar vegetation to mountains on granite and gneiss. Also extensive areas of open woodland I with *Eucalyptus blakelyi*, *E. Goniocalyx*, *E. macrorhyncha* and *Callitris endlicheri*.
	Mountains with steep, relatively even slopes, narrow crests an incised valleys ridge and ravin terrain	MR	Mountains on rhyolite and rhyodacite	800 - 1200	Rhyolite and rhyodacite, quartz porphyry and volcanic breccia.	Deep well structured gradational soils; some uniform loams to silty loams with weak to moderate structure.	Drier slopes: commonly with open forest II of *Eucalyptus dives*, *E. macrorhyncha* and *E. goniocalyx*. At higher elevations woodland or open forest II, III with *E. dives* and *E. dalrympleana; E. pauciflora* at highest elevations. Wetter slopes: with open forest II, III and IV commonly with *E. radiata*, *E. obliqua* and *E. globulus*; *E. delegatensis* and *E. dalrympleana* at higher elevations. Valleys in the south often with open forest III with *E. viminalis* and *E. Radiata.*
		MS	Mountains on schist	650 - 2000	Schist and spotted phyllite.	Humid slopes mostly with deep, strongly structured red gradational soils with clay loam to light clay subsoils. Drier slopes with shallow stony uniform loams to sandy clay loams; some shallow to moderately deep gradational soils of variable structure.	
		MSy	Mountains on sedimentary rock	900 - 1600	Mostly sandstone, shale and siltstone sometimes locally metamorphosed to slate, phyllite, hornfels and quartzite.	Stony uniform or gradational soils, mostly red with moderately to strongly structured clay subsoils. Drier slopes with shallow uniform stony loams to sandy clay loams. Shallow gradational soils often with structured clay loam or clay subsoils.	

Physiographic Region	Sub Region	Map Symbol	Land Type	Rainfall (mm)	Geology	Soils	Native Vegetation
Hills	Hills with uneven (benched) slopes common areas with coarse crystalline rocks.	HG	Hills on granite	650 - 1600	Granite and granodiorite.	Shallow stony sands and sandy loams and yellow duplex soils on drier slopes. More humid areas mostly with deep, strongly structured, red, uniform or gradational soils with sandy clay loam to light clay subsoils; some soils nonred and less well structured.	As for mountains on granite and gneiss.
		Hgs	Hills on gneiss	650 - 1000	Gneiss and gneissic pegmatite.	Shallow uniform sands and sandy loams or red or yellow duplex soils in drier areas. Red gradational soils in more humid localities.	Open forest I, II and III with *Eucalyptus dives*, *E. goniocalyx*, *E. macrorhyncha* and *E. radiata*.
	Hills with steep, relatively even slopes, narrow crests and incised valleys	HR	Hills on rhyolite and rhyodacite	800 - 1200	Rhyolite and rhyodacite, quartz porphyry and volcanic breccia.	As for hills on rhyolite that are within the dissected plateaux physiographic region.	Predominantly open woodland and forest II, III with *Eucalyptus dives*, *E. radiata* and *E. dalrympleana* on drier slopes; some *E. macrorhyncha*. Wetter slopes with *E. delegatensis*; *E. pauciflora!lin*; on exposed slopes and at highest elevations.
		HS	Hills on schist	650 - 1800	Schist and spotted phyllite.	Wetter slopes with red gradational soils with strongly structured subsoils; some red and yellow duplex soils. Drier slopes with shallow stony uniform loams to sandy clay loams, sometimes structured in the subsoil.	<u>Wetter slopes:</u> open forest II, III commonly with *Eucalyptus radiata* and *E. dalrympleana*. <u>Drier slopes:</u> open forest I, II commonly with *E. dives*, *E. macrorhyncha* and *E. polyanthemos* and with a shrubby or grassy understorey. Predominant native vegetation in the north of the study area is unclear because of extensive clearing.
		Hsy	Hills on sedimentary rock	750 - 1400	Mostly sandstone, shale and siltstone sometimes locally metamorphosed to slate, phyllite, hornfels and quartzite.	Red gradational soils with well structured clay subsoils in more humid areas. Shallow to moderately deep uniform loams to sandy clay loams, often stony, on drier slopes.	
Rolling Hills		RHGs	Rolling hills on gneiss	700 - 1000	Gneiss.	Mostly yellow duplex soils; some red duplex. Shallow uniform sands and sandy loams on very steep slopes.	Mostly cleared. Observations suggest native vegetation was predominantly an open woodland or forest I, II mostly with *Eucalyptus dives*, *E. goniocalyx* and *E. macrorhyncha*; also with *E. albens*, *E. polyanthemos* and *E. blakelyi*.
Low hills and undulating terrain	Granite, gneiss and derived colluvium; alluvium	LHUG	Low hills and undulating terrain on granite, gneiss and derived colluvium and alluvium.	650 - 1000	Gneiss, granite, granodiorite and derived silt, sand and gravel colluvium. Poorly sorted alluvial clay, silt, sand and gravel.	Uniform undifferentiated sands and loams on recent alluvium; mostly yellow duplex soils on older alluvial terraces and colluvial deposits. Yellow and red duplex soils on gentle to moderate slopes on bedrock. Shallow uniform sands and loams generally on steeper slopes.	Woodland or open forest II with *Eucalyptus camaldulensis* or *E. ovata* on recent alluvium. Open forest I, II with *E. macrorhyncha*, *E. goniocalyx*, *E. polyanthemos* and *E. blakelyi* on slopes.
	Schist, sedimentary rock and derived colluvium; alluvium	LHUS	Low hills and undulating terrain on schist, sedimentary rock and derived colluvium and alluvium	650 >1400	Schist, sandstone, shale, siltstone and derived silt sand and gravel colluvium; poorly sorted alluvial clay, silt, sand and gravel.	Uniform undifferentiated sands and loams on recent alluvium. Strongly structured red gradational soils and red and yellow duplex soils on gentle to moderate slopes on colluvium and bedrock. Steep slopes on bedrock generally with stony, shallow, uniform loams.	Lower rainfall areas: woodland and open forest II with *Eucalyptus camaldulensis* and *E. ovata* on recent alluvium; open forest I and II with *E.dives*, *E. macrorhyncha* and *E. goniocalyx* on older terraces and slopes. <u>Higher rainfall areas:</u> open forest II, III with *E. radiata* and *E. viminalis* on alluvium and *E. dives* and *E. radiata* on slopes.
Active floodplains		A	Active floodplains	650 - 1200	Recent sediments: gravel, sand, silt and clay.	Variable depending on source of alluvium and flood regime. Profiles with depositional layers of variable texture and little soil development common. Soils include uniformly textured silty to medium clays and uniform sandy loams to clay loams. Acidic gradational soils with sandy clay loam topsoils and light clay subsoils occur on lower alluvial terraces.	Few sites. Native vegetation now almost entirely cleared. Probably mostly woodland or open forest II with *E. camaldulensis* and *E. bridgesiana* in the north and with *E. viminalis* and *E. radiata* in the south.