4 Land Type Descriptions

4.1 Plateaux on granite and granodiorite, gneiss, rhyolite, schist and sedimentary rock (PG, PGs, PR, PS and PSy)

Flat to undulating terrain occurs in the highest landscape positions in isolated areas throughout the study area. These plateaux are formed on a range of rock types including granite and granodiorite, rhyolite, and metamorphic and sedimentary rocks. These land types are described together as the occurrence of each is relatively small and land characteristics, including vegetation and soils, are similar for each.

Soils are generally moderately deep to deep, red gradational soils with moderate to strong subangular to angular blocky structure. Organic soils and deep uniform loams to clay loams with high accumulations of organic matter occurring in the subalpine zone. They are mostly Alpine Humus Soils, with Acid Peats in more poorly drained sites.

Vegetation is predominantly open forest II, III and IV with *E. delegatensis* or with *E. dives, E. radiata, E. dalrympleana* and *E. rubida*. Open woodland with *E. pauciflora* and grassy or, in more frequently burnt areas, shrubby understoreys occurs in the subalpine zone.

Plate 1

Plateaux on granite and granodiorite: Subalpine *Eucalyptus pauciflora* woodland, Mt. Wills.

Table 4.1 Biophysical Characteristics: Flat to undulating plateaux Map Symbols: PG, PGs, PR, PS and PSy

CLIMATE Rainfall (mm p.a.)	750 - >1400	
GEOLOGY Age, Lithology	Ordovician sandstone, shale and siltstone; Silurian granite and granodiorite; Silurian and Devonian rhyodacite, rhyolite and Silurian quartz porphyry and volcanic breccia	
PHYSIOGRAPHY Elevation range (m) Relative relief (m) Landforms	500 – 1800 60 – 100 Plains and rises, a few low hills	
LAND COMPONENT Diagnostic features Slope range (%)	1 Flat terrain and gentle slopes in the subalpine zone 0 - 10	2 Flat terrain and slopes below the subalpine zone; soils and vegetation variable depending on locality, not subdivided further Mostly 0 - 10, occasionally to 20
SOIL Description Classification - Northcote - Stace Condition of surface soil (dry) Consistence - topsoil - subsoil Exposed rock and surface stone (%), size Slaking tendency, subsoil Depth to rock (m) Soil permeability Site drainage	 Predominantly black loam to clay loam topsoil, up to 0.5 m deep and with moderate to strong crumb or subangular blocky (5-10 mm) structure, overlying dark brown to very dark brown sandy clay loam to clay loam subsoil with moderate to strong subangular blocky structure. Inclusions quartz and/or parent material common, generally 2-10% in topsoil, up to 50% in subsoil. Soils acidic O, Um 6.11, Um 6.12 Alpine Humus; some Acid Peats - Very to moderately weak (moderately moist) Moderately weak (moderately moist) Rock: to 10%, 4 m; stone: to 20%, 45 cm Nil 0.70 - >1.0 Moderate Poorly to moderately well drained	 Very dark to dark brown loam to clay loam topsoil generally with moderate to strong crumb or subangular blocky structure. Mostly a gradual boundary to red clay loam to light clay with moderate to strong subangular or angular blocky structure, often breaking to aggregates <5 mm. A lighter brown to yellowish brown apedal A_2 horizon is sometimes present, and occasionally the subsoil is mottled. Often no inclusions but quartz and/or parent material to 60 mm and 10% may be present. Soils acidic Gn3.11, Gn3.14, Gn3.21, Gn4.11, Gn3.94(?); some Um Krasnozems, Red Podzolic Soils, Brown Earths - Moderately weak to moderately firm (moist) Moderately firm (moist) Rock 0 - <2; stones to 40 cm Slight – rapid Mostly >1.0 with depths greater than 2.0 noted in some localities High; may be moderate where there is an apedal A_2 horizon Mostly moderately well to well drained; occasionally poorly drained areas, mostly in lower landscape positions.
NATIVE VEGETATION Structure Species of upper stratum Sites	 Woodland I *E. pauciflora* predominant; *E. rubida* may be associated. Closed to open heath, sedgeland or *Sphagnum* mossland in poorly drained areas 46, 54	 Open forest II, III, IV Mostly *E. dives, E. radiata, E. dalrympleana* predominant; *E. delegatensis* (open forest IV) predominant at highest elevations. *E. mannifera* and *E. macrorhyncha* often associated 5, 63, 70, 82, 90, 91, 108, T2, T7

Table 4.2 Susceptibility of Land to Erosion: Map symbols: PG, PGs, PR, PS and PSy

PROCESS	SUSCEPTIBILITY Land Component	Rating	CRITICAL LAND FACTORS	COMMENTS
Sheet and rill erosion	1 and 2	Low: slopes <10% Moderate: slopes 10-20%	Factors promoting process: • light, friable nature of topsoil when dry Factors retarding process: • moderate to high permeability	Generally high rainfall and soil characteristics suitable for plant growth mean that revegetation following clearing is likely to be relatively rapid except over the winter months when cold temperatures inhibit plant growth.
Gully erosion	1 and 2	Low	Factors promoting and retarding gully erosion are the same as those listed for sheet and rill erosion.	

4.2 Mountains on granite (MG)

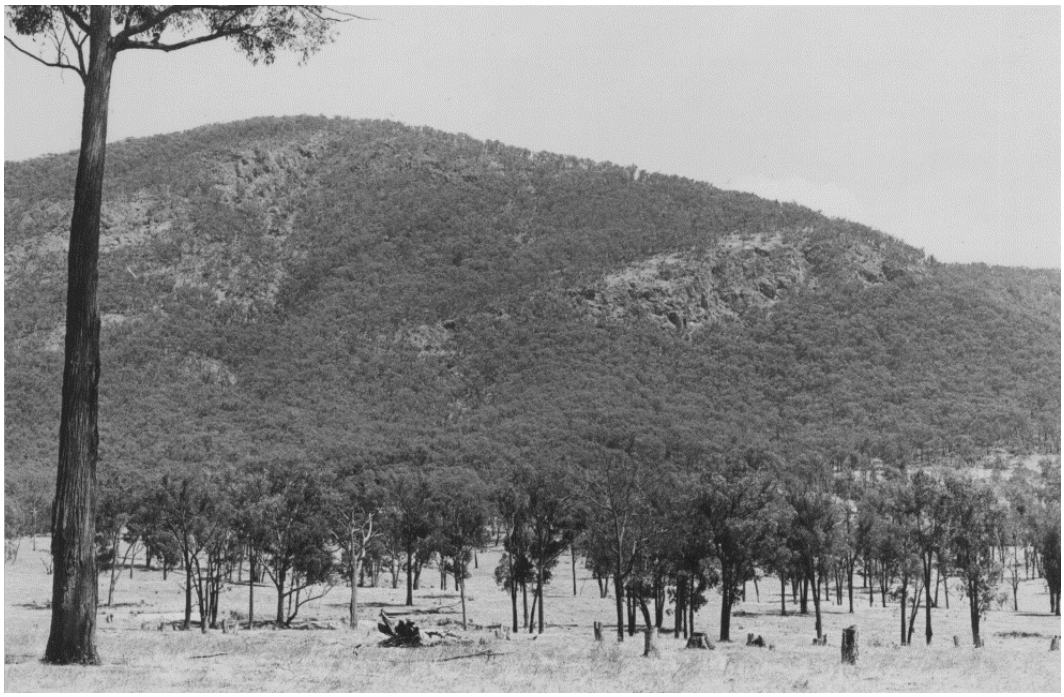
This land type is comprised of mountains and long steep slopes flanking plateaux. Mountains on granite are mostly found in the north and centre of the study area, although they also occur in the Granite Peak and Sugar Loaf Hill regions in the south. Slopes flanking plateaux are scattered, the main occurrences being the flanks of the Koetong Plateau and areas near Mt. Firebrace and west of Fernvale. In this land type, slope gradients are usually uneven and mountain crests are rounded. Surface stone and rock outcrops are common in the drier areas.

In humid areas, moderately deep to deep gradational soils predominate. Dark structured sandy clay loam topsoils are typical and mostly overlie red, well structured clay loam to light clay subsoils. Native vegetation is mostly open forest III with common species including *E. radiata, E. dalrympleana* and *E. globulus.* Open forest IV with *E. delegatensis* occurs in the south.

Uniform soils predominate in drier areas. They are mostly brown to yellowish brown clayey sands to clay loams, with little differentiation into horizons. Topsoils have some accumulation of organic matter, are mostly structured and are often hydrophobic. Deeper, duplex soils occur on lower slopes and on mid to upper slopes where gradients are not so steep. Landslips are often associated with the duplex soils.

Open forest I and II with very sparse understoreys and abundant leaf litter and with *E. macrorhyncha, E. dives, E. goniocalyx* and/or *E. polyanthemos* predominant, would have occurred on most slopes. Many of the open forests however, have been cleared for pastures.

Plate 2



Mountains on granite: Undulating terrain and granitic mountains rise from the Fairyknowe Creek valley to the north of Bullhead Creek.

Table 4.3 Biophysical Characteristics: Mountains on granite Map Symbol: MG

CLIMATE Rainfall (mm p.a.)	650 – 1800					
GEOLOGY Age, Lithology	Ordovician and Silurian granite, granodiorite and diorite					
PHYSIOGRAPHY Elevation range (m) Relative relief (m) Landforms	200 – 1400 Mostly 200 - 400, up to 800 Mountains					
LAND COMPONENT Diagnostic features Slope range (%)	1 Crests and slopes in the subalpine zone 3 - >32	2 Slopes with shallow uniform or gradational soils and dry forest 3 - >32	3 Exposed slopes with duplex soils and dry forest 3 – 32	4 Protected slopes with deep, well-structured red gradational soils 3 - 20 (crests), 20 - >32 (slopes)	5 Protected slopes with red duplex soils 10 - 20	6 Seepage areas 3 - 20
SOIL Description	Predominantly black loam to clay loam topsoil, up to 0.5m deep and with moderate to strong crumb or subangular blocky (5-10 mm) structure, overlying dark brown to very dark brown sandy clay loam to clay loam subsoil with moderate to strong subangular blocky structure. Inclusions quartz and/or parent material common, generally 2-10% in topsoil, up to 50% in subsoil. Soils acidic.	Shallow, very dark to dark greyish brown to brown clayey coarse sand to fine sandy loam topsoil; weak to moderate subangular blocky structure, occasionally crumb. Topsoil mostly grading to yellowish brown clayey sand to coarse sandy loam; occasionally directly overlying rock or grading to a moderately structured sandy clay. Occasionally shallow soils with sandy clay loam texture. Soils acidic. Inclusions of quartz and parent rock variable, up to 50% and 10 cm.	Typically a dark brown sandy loam to sandy clay loam topsoil with strong crumb or moderate medium subangular blocky structure overlying a yellowish brown similarly textured A_2 horizon, apedal or with weak subangular blocky structure. Subsoil mostly structured sandy clay, reddish brown to yellowish brown, mottled or whole coloured. Soils acidic. Quartz up to 10 mm throughout profile.	Deep, very dark brown sandy clay loam A horizon, with moderate to strong fine angular blocky structure, generally grading to red sandy clay subsoil. Subsoil with subangular blocky peds breaking to fine angular blocky. Soils acidic	Deep, very dark brown sandy clay loam topsoil overlying an apedal A_2 horizon with similar texture and sometimes bleached. Subsoil a sandy to medium clay, red, mottled at depth and with strong angular blocky peds (5-10 mm) with secondary peds 2-5 mm. Often quartz to 20% in profile. Soil acidic	No observations
Classification - Northcote - Stace	O, Um 6.11, Um 6.12 Alpine Humus; some Acid Peats	Uc1.43, Uc6.11, Um, Gn3.24 Lithosols, Brown Earths; some soils without Stace equivalen.t	Dy3.41, Db Yellow Podzolic Soils; some soils without Stace equivalent.	Gn3, Gn4 Krasnozems	Dr2.31 Red Podzolic Soils	
Condition of surface soil (dry)	-	Hard	Hard	Soft	Hard	
Consistence - topsoil	Very to moderately weak (moderately moist)	Moderately weak to moderately firm (moist)	Moderately firm (moist)	Moderately firm (moist)	Moderately firm (dry)	
- subsoil	Moderately weak to moderately firm (moderately moist)	Moderately weak to moderately firm (moist)	Moderately firm (moist) Very firm to moderately strong (dry)	Moderately weak to moderately firm (moderately moist)	Very firm to moderately strong (dry)	

Table 4.3 continued on next page

Table 4.3 continued

Map Symbol: MG

Exposed rock and surface stone (%), size	To 50; rock to 4 m, stones to 0.45 m	2 - >50; rock to 2 m, stones to 0.4 m	10 - 50; rock to 2 m, stones to 0.9 m	Rock: nil; stone: >2, to 0.15 m	Rock: nil; stone: >2, to 0.25 m	
Slaking tendency, subsoil	Nil	Variable; mostly nil, some moderate	Variability unknown; at least some soils rapid	Nil to moderate	Rapid	
Depth to rock (m)	0.7 - >1.0	0.10 - 1.30	0.90 - 2.0	1.5 - >2.0	1.5 - >2.0	
Soil permeability	Moderate	Moderate to high	Low to moderate	Mostly high; occasionally moderate	Moderate; sometimes low in subsoil	
Site drainage	Poorly to well drained depending on slope.	Well drained to rapidly drained.	Imperfectly to moderately well drained; poorly drained in depressions.	Mostly well drained; creek flanks and the base of concave slopes poorly drained.	Imperfectly to moderately well drained.	Very poorly to poorly drained.
NATIVE VEGETATION Structure	Woodland I	Open forest I, II		Open forest II, III		No observations
Species of upper stratum	*E. pauciflora* predominant Closed to open heath, sedgeland or *Sphagnum* mossland	*E. goniocalyx, E. macrorhyncha, E. polyanthemos* generally predominant; *E. dives* sometimes associated		*E. dives, E. radiata* and *E. dalrympleana*; *E. obliqua* in more southern localities. *E. macrorhyncha* commonly associated in the north Open forest IV with *E. delegatensis*		
Sites	T9	71, 85, 94, 103, 109, 111	41, 84, 112	95	37	

Table 4.4 Susceptibility of Land to Erosion and Land Slips: Map Symbol: MG

PROCESS	SUSCEPTIBILITY Land Component	Rating	CRITICAL LAND FACTORS	COMMENTS
Sheet and rill erosion	1	Low: slopes <10% Moderate: slopes 10-20% High: slopes >20%	Factors promoting process: • light, friable nature of topsoil when dry Factors retarding process: • moderate to high permeability	
	2 and 3	Moderate: slopes <20% High: slopes >20%	Factors promoting process: • weakly structured topsoil with tendency to surface seal; surface particles with little cohesion • shallow soils • large area of surface rock and stone • long slopes • tendency of soils to be 'droughty' so that there may be reduced surface cover Factors retarding process: • moderate to high permeability of uniform soils	Trafficking and raindrop impact are likely to cause surface sealing. This will greatly reduce infiltration rate and lead to runoff during storms with high rainfall intensity.
	4	Low: slopes <20 % Moderate: slopes 20-50 % High: slopes > 50%	Factors promoting process: • long slopes Factors retarding process: • well structured, stable topsoils • moderate to high permeability	High rainfall and soil characteristics suitable for plant growth mean that revegetation following clearing is likely to be relatively rapid.
	5	Low: slopes <10 % Moderate: slopes 10-20 % High: slopes >20 %	Factors promoting process: • long slopes • reduced permeability of subsurface soil Factors retarding process: • moderate organic matter content of topsoil resulting in relative stability of topsoil	
Gully erosion	2 and 3 1 and 5	Moderate to high Low to moderate	Factors promoting and retarding gully erosion are the same as those listed for sheet and rill erosion for each component.	
Land slipping	3 and 6	Moderate to high	Factors promoting process: • relatively massive bedrock • subsoils with high clay content • very poor to imperfect drainage Factors retarding process: • in natural condition, forests with relatively high evapotranspiration rates which tend to reduce subsoil saturation	Conversion of forest to pasture often results in land slipping. This would primarily be due to reduced water use by pasture and hence greater tendency for subsoil to be saturated.

4.3 Mountains on leucocratic granite. (MLG)

Leucocratic granite outcrops occur in the Mt. Lawson and Pine Mountain regions in the north of the survey area. These mountains have rounded crests and uneven slopes similar to those on other granites. The soils, however, are generally sandier and the vegetation tends to include different species, particularly in the understorey.

Soils and vegetation vary depending on local climate. Wetter areas (found mostly around Mt. Lawson at higher elevations), typically have moderately deep to deep gradational or duplex soils. Mostly they have yellowish red to red clay loam to light clay subsoils which are strongly structured and very friable, breaking readily into smaller aggregates. Native vegetation is open forest II or III with moderately dense understoreys and with *E. dives, E. radiata, E. globulus* and/or *E. dalrympleana* predominant.

On drier slopes, rock outcrops and shallow sandy uniform soils are common. The vegetation is predominantly open forest I or II with sparse understoreys and bare earth and litter common. Tree species include *Callitris endlicheri, E. goniocalyx, E. blakelyi* and/or *E. macrorhyncha*.

Plate 3

Mountains on leucocratic granite: Looking towards Pine Mountain, a mountain developed on leucocratic granite.

Table 4.5 Biophysical Characteristics: Mountains on leucocratic granite Map Symbol: MLG

CLIMATE Rainfall (mm p.a.)	650 – 1000			
GEOLOGY Age, Lithology	Devonian leucocratic granite			
PHYSIOGRAPHY Elevation range (m) Relative relief (m) Landforms	200 – 1000 300 – 800 Mountains			
LAND COMPONENT Diagnostic features Slope range (%)	1 Exposed slopes with dry forest 0 - >32 (slopes of 70% observed)	2 Protected gentle slopes and flat terrain 0 - 10	3 Protected moderate to very steep slopes 10 - >32	4 Poorly drained areas 0 - 10
SOIL Description	Shallow dark brown loamy coarse sand topsoil, with weak crumb structure, overlying an apedal light brown subsoil with similar texture. Quartz and small stones of parent material very common throughout profile. Soils acidic	Very dark brown to black sandy clay loam topsoil, with moderate to strong subangular blocky structure, sometimes overlying a similarly textured strong brown subsurface soil. Subsoil red to yellowish red light clay, sometimes mottled at depth and with fine strong subangular blocky structure. Less than 2% quartz to 8 mm throughout profile. Soil acidic	Dark to very dark brown loam to sandy clay loam topsoil with moderate to strong subangular blocky structure (peds 5-15 mm). Gradual change to reddish brown clay loam to light clay subsoil with subangular blocky peds to 20 mm, often breaking into smaller aggregates with ultimate size <2 mm. Up to 10% quartz and small inclusions of parent material in profile. Soils acidic	Very dark brown sandy clay loam with strong subangular blocky structure, grading to yellowish brown clay loam to sandy clay subsoil with strong angular blocky structure. Reddish brown to yellowish brown mottles common in subsoil. Quartz and small stones of parent material up to 10% in profile. Soils acidic
Classification - Northcote - Stace	Uc5.22 Lithosols	Dr2.11, Dr2.21 No Stace equivalent	Um6, Gn3, Gn4 Krasnozems; other soils without Stace equivalent	Gn3 Brown Earths
Condition of surface soil (dry) Consistence - topsoil - subsoil	- Moderately weak (moist) -	- - -	- Moderately weak (moderately moist) Moderately weak to moderately firm (moist)	- Moderately firm (wet) Moderately firm (wet)
Exposed rock and surface stone (%), size Slaking tendency, subsoil Depth to rock (m) Soil permeability	>50 (rock and stone) - 0.10 - 0.60 High	<2 Unknown 1.20 + High; occasionally moderate	<10; rocks to 5.0 m, stones to 30 cm Variable; slightly to rapid 1.25 - >2.0 High; moderate where soil more coarsely structured	<2; rocks to 5.0 m, stones to 30 cm Variable; slight to rapid >0.9 Moderate
Site drainage	Mostly well to rapidly drained; some areas of poor drainage due to local seepage.	Moderately well to well drained; some areas adjacent to creeks imperfectly drained.	Moderately well to well drained; some areas adjacent to creeks imperfectly drained.	Poorly drained
NATIVE VEGETATION Structure Species of upper stratum	Open woodland and forest I, II *Callitris endlicheri, E. blakelyi, E. goniocalyx* and *E. macrorhyncha* predominant. *Brachychiton populneus* commonly associated.	Open forest II and III *E. dives, E. globulus, E. radiata. E. mannifera, E. dalrympleana* and *E. macrorhyncha* sometimes associated		Closed to open heath
Sites	79	117, 118, 119	66, 76, T4	77

Table 4.6 Susceptibility of Land to Erosion: Map Symbol: MLG

PROCESS	SUSCEPTIBILITY Land Component	Rating	CRITICAL LAND FACTORS	COMMENTS
Sheet and rill erosion	1	Moderate: slopes <20% High: slopes >20%	Factors promoting process: • weakly structured topsoil with tendency to surface seal • surface particles with little cohesion • shallow soils (promotes tendency to saturation) • relatively massive bedrock • long slopes • large area surface rock and stone Factors retarding process: • high permeability of soil	Trafficking and raindrop impact are likely to cause surface sealing. This will greatly reduce infiltration rate and lead to runoff during rainstorms with high intensity.
	2, 3 and 4	Low: slopes <20% Moderate: slopes 20-30% High: slopes >30%	Factors promoting process: • high rainfall • relatively massive bedrock • long slopes Factors retarding process: • well structured and stable topsoil • moderate to high permeability of soil	High rainfall and soil characteristics suitable for plant growth mean that revegetation following clearing is likely to be relatively rapid. This will result in reduced exposure of soil compared with sites with less rapid regrowth.

4.4 Mountains on gneiss (MGs)

Mountains on gneiss are restricted to the north of the region, occurring mostly around Mt. Granya and immediately south of the Mitta Mitta arm of Lake Hume. There is also a small occurrence south of Lockhart Gap. Terrain in this land type is very similar to that of mountains on granite; rock outcrops, however, seem to be less common.

Topography, soils and vegetation vary considerably depending on climate. Higher rainfall areas tend to have relatively even steep slopes with mostly deep, red, well structured gradational soils. Vegetation type is usually open forest II or III with dense ground cover and with *E. radiata, E. albens* and *E. macrorhyncha.*

In areas of low rainfall, slopes are uneven and seeps and small landslips are characteristic. Soils tend to be uniform or duplex, and shallow. Native vegetation is usually an open forest I or II with a sparse understorey and typically with *E. dives, E. macrorhyncha, E. goniocalyx and E. polyanthemos.*

Plate 4

Mountains on gneiss: Road cutting showing shallow soil on weathered rock that is typical of steep slopes with dry forest in this land type.

Table 4.7 Biophysical Characteristics: Mountains on Gneiss Map Symbol: MGs

CLIMATE Rainfall (mm p.a.)	650 – 1000			
GEOLOGY Age, Lithology	Ordovician gneiss and gneissic pegmatite; some inclusions of schist			
PHYSIOGRAPHY Elevation range (m) Relative relief (m) Landforms	200 – 900 250 – 450 Mountains; some very high hills included			
LAND COMPONENT Diagnostic features Slope range (%)	1 Slopes with dry forest and uniform soils 3 - >32	2 Slopes with dry forest and duplex soils 3 - 32	3 Slopes with humid forests 3 - >32 (slopes of 65% observed)	4 Seepage areas 0-10
SOIL Description	Topsoil typically dark brown clayey coarse sand to sandy clay loam with moderate crumb structure, occasionally overlying a brown weak to moderately structured A_2 horizon. Subsoil usually yellowish brown with similar texture and apedal to moderate subangular blocky structure. Inclusions of quartz and parent material variable, 2-50% mostly to about 50 mm. Soils acidic	No observation; soils expected to be similar to HGs, component 2. Very dark to dark brown sandy loam to sandy clay topsoil with weak to moderate crumb or subangular blocky structure, usually overlying an apedal brown to yellowish brown clayey sand to sandy loam A_2 horizon. Subsoil yellowish brown to yellowish red, sometimes mottled, clay loam to light medium clay with moderate to strong subangular to angular blocky structure, peds often 2-5 mm. Inclusions of quartz and parent material very variable (0-50%). Soils acidic	Limited observations; dark brown to dark yellowish brown loam to clay loam, with moderate to strong crumb or subangular blocky structure, sometimes over an apedal brown sandy clay loam A_2 horizon. Subsoil whole coloured yellowish red to red fine sandy clay loam to light clay with strong, fine subangular to angular blocky structure. Inclusions of fine parent material and quartz common. Soils acidic	No observations
Classification - Northcote - Stace	Uc1.4, Uc1.43, Um4 Lithosols	Dr, Dy Red Podzolic Soils; some soils without Stace equivalent	Gn3.11, Gn3.14 Red Podzolic Soils; Krasnozems	
Condition of surface soil (dry) Consistence - topsoil - subsoil	Hard Moderately weak (moist) Moderately weak to moderately firm (moist)	Hard Moderately weak to moderately fine (dry) Very firm to moderately strong (dry)	- Moderately firm (moist) Moderately firm (moist)	
Exposed rock and surface stone (%), size	Mostly <2, some areas 20-50 with rock to 1 m	0 - 50; rock and stone to 60 cm	<2 - 20; rocks to 2 m, stones to 50 cm	
Slaking tendency, subsoil Depth to rock (m) Soil permeability	Nil to slight 0.20 - 0.90 High; moderate in weakly structured soil without high percent gravel inclusions	Nil to rapid 0.50 - 1.0 Low to moderate	Nil to rapid >1.0 High; moderate where an apedal A_2 horizon or topsoil coarsely structured	
Site drainage	Well to rapidly drained	Imperfectly to moderately well drained	Moderately well to well drained	Very poorly to poorly drained
NATIVE VEGETATION Structure Species of upper stratum	Open forest I, II *E. dives, E. macrorhyncha;* some *E. goniocalyx* and *E. polyanthemos*	Open forest I, II *E. albens, E. macrorhyncha* commonly predominant; *E. goniocalyx* and *Xanthorrhoea australis* often associated	Open forest II, III *E. albens, E. macrorhyncha, E. radiata* commonly predominant; *E. mannifera* often associated	No observations
Sites	25, 100, 102	(24, 106, 107)*	(17)*, 93	

* Brackets denote sites are located in another land type in a component which is expected to have similar characterisitics.

Table 4.8 Susceptibility of Land to Erosion and Land Slips: Map Symbol: MGs

PROCESS	SUSCEPTIBILITY Land Component	Rating	CRITICAL LAND FACTORS	COMMENTS
Sheet and rill erosion	1	Moderate: slopes <20% High: slopes >20%	Factors promoting process: • weakly structured topsoil with tendency to surface seal • shallow soils (increases likelihood of saturation) • relatively massive bedrock • long slopes • surface particles with little cohesion • in some areas, high percent surface rock and stone Factors retarding process: • moderate to high permeability	Trafficking and raindrop impact are likely to cause surface sealing. This will greatly reduce infiltration rate and lead to runoff during storms with high rainfall intensity.
	2 and 4	Moderate to high depending on combination of landscape characteristics	Factors promoting process: • relatively massive bedrock • long slopes • in some areas, high percent surface rock and stone • in seepage areas, tendency of soil to be saturated • topsoil usually well structured and with greater cohesion between particles than in component 1 but still not promoting very high infiltration rates and still with tendency to seal.	
	3	Low: slopes <20% Moderate: slopes 20-50% High: slopes >50%	Factors promoting process: • high rainfall • long slopes Factors retarding process: • well structured stable topsoil • high permeability • deep soils (reduces tendency of soils to be saturated)	High rainfall and soil characteristics suitable for plant growth mean that revegetation following clearing is likely to be relatively rapid. This reduces the length of time soils are likely to be exposed.
Gully erosion	1, 2 and 4	Low to moderate	Factors promoting and retarding gully erosion are the same as those listed for sheet and rill erosion for these components	
Land slipping	2, 4	Moderate to high	Factors promoting process: • relatively massive bedrock • subsoil with high clay content • very poor to imperfect drainage Factors retarding process: • in natural condition, forests with relatively high evapotranspiration rates which tend to reduce subsoil saturation.	Conversion of forest to pasture often results in land slips. This would be primarily be due to reduced water use by pasture and hence greater tendency for subsoil to be saturated.

4.5 Mountains on rhyolite and rhyodacite (MR)

Rhyolite and rhyodacite are limited in extent, there being two occurrences within the survey area. The smaller area in the north consists of a dissected high mountain with steep slopes (Mt. Burrowa). The larger occurrence, north and south-east of Lake Dartmouth, has mostly been dissected to form mountains with steep slopes, incised valleys and narrow crests. In this region, Mt. Cravensville and Mt. Benambra rise above the surrounding terrain.

Deep to moderately deep gradational soils with loam to clay loam topsoil and yellowish red strongly structured clay loam to light clay subsoil, are common.

Open forest IV with *E. delegatensis* occurs in areas at high elevation with high rainfall and where soils are well drained and have high water holding capacity. At lower elevations and/or on less protected slopes, open forest II or III is characteristic and *E. dives, E. radiata* and *E. dalrympleana* are generally predominant.

Plate 5

Mountains on rhyolite and rhyodacite : Looking towards Mt. Burrowa. Note the steep slopes with abundant rock outcrop of Mt. Burrowa.

Table 4.9 Biophysical Characteristics: Mountains on rhyolite and rhyodacite Map Symbol: MR

CLIMATE Rainfall (mm p.a.)	800 - >1200		
GEOLOGY Age, Lithology	Silurian and Devonian rhyolite and rhyodacite; Silurian quartz porphyry, volcanic breccia, tuff, ignimbrite		
PHYSIOGRAPHY Elevation range (m) Relative relief (m) Landforms	 500 – 1300 300 – 600 Mountains		
LAND COMPONENT Diagnostic features Slope range (%)	1 Crests and slopes in the subalpine zone 3 - >32	2 Crests and slopes with ash forest 3 - 20 (crests), 20 - >32 (side slopes)	3 Crests and slopes without ash forest 3 - 20 (crests), 20 - >32 (side slopes)
SOIL Description	Predominantly black loam to clay loam topsoil, up to 0.5 m deep and with moderate to strong crumb or subangular blocky (5-10 mm) structure, overlying dark brown to very dark brown sandy clay loam to clay loam subsoil with moderate to strong subangular blocky structure. Inclusions quartz and/or parent material common, generally 2-10% in topsoil, up to 50% in subsoil. Soils acidic	Very limited observations; soils deep gradational with dark brown loam to clay loam topsoil over yellowish brown to yellowish red, fine and strongly structured clay loam to light clay subsoil. Some yellowish red uniform soils with loam to silty loam textures and weak to moderately structured topsoil.	Limited observations; some soils on Mt. Burrowa similar to, but shallower than, those of component 2. Weak to moderately well structured sandy loam to sandy clay loam topsoil overlying a sandy to light clay subsoil. Subsoil with moderate to strong structure, sometimes silty. Inclusions of parent material up to 40%, mostly 20-60 mm. Soil acidic
Classification - Northcote - Stace	O, Um 6.11, Um 6.12 Alpine Humus; some Acid Peats	Gn3.21, Gn4.11, Um Krasnozems, some soils without Stace equivalent	Gn
Condition of surface soil (dry) Consistence - topsoil - subsoil	- Very to moderately weak (moderately moist) Moderately weak to moderately firm (moderately moist)	- Moderately weak to moderately firm (moist) Moderately firm (moist)	- - -
Exposed rock and surface stone (%), size Slaking tendency, subsoil Depth to rock (m) Soil permeability	To 50; rock to 4 m, stones to 0.45 m Nil 0.7 - >1.0 Moderate	Stones <2, to 20 cm Moderate to high >1.3 Mostly high; may be moderate where soil not strongly structured	- - <1.2 Mostly high
Site drainage	Poorly to well drained depending on slope.	Well drained; creek flanks and base of concave slopes sometimes less well drained.	Moderately well drained; creek flanks and base of concave slopes sometimes poorly drained.
NATIVE VEGETATION Structure Species of upper stratum	Woodland I *E. pauciflora* predominant Closed to open heath, sedgeland or *Sphagnum* mossland in areas of poor drainage	Open forest IV *E. delegatensis*	*Drier slopes*: Predominantly open forest II, III with *E. dives, E. dalrympleana, E. goniocalyx and E. macrorhyncha* *Wetter slopes*: Mostly open forest II, III with *E. radiata, E. obliqua* and *E. globulus*
Sites		(63, 90, 91)*, T12	T5, T6

*Backets denote sites are located in another land type in a component which is expected to have similar characteristics.

Table 4.10 Susceptibility of Land to Erosion: Map Symbol: MR

PROCESS	SUSCEPTIBILITY Land Component	Rating	CRITICAL LAND FACTORS	COMMENTS
Sheet and rill erosion	1	Low: slopes <10% Moderate: slopes 10-20% High: slopes >20%	Factors promoting process: • light, friable nature of topsoil when dry Factors retarding process: • moderate to high permeability	
	2 and 3	Low: slopes <20% Moderate: slopes 20-50% High: slopes >50%	Factors promoting process: • high rainfall • long slopes Factors retarding process: • well structured stable topsoil • soils with high permeability	High rainfall and soil characteristics suitable for plant growth mean that revegetation following clearing is likely to be relatively rapid. This will reduce exposure of soils compared with land types where regrowth is not as rapid.
Gully erosion	1 and 3	Low to moderate	Factors promoting and retarding gully erosion are the same as those listed for sheet and rill erosion for each component.	

4.6 Mountains on schist (MS)

Mountainous terrain with steep slopes, incised valleys and narrow crests, is typical of the areas of schist. This land type is extensive in the south-west of the study area although there are scattered occurrences throughout.

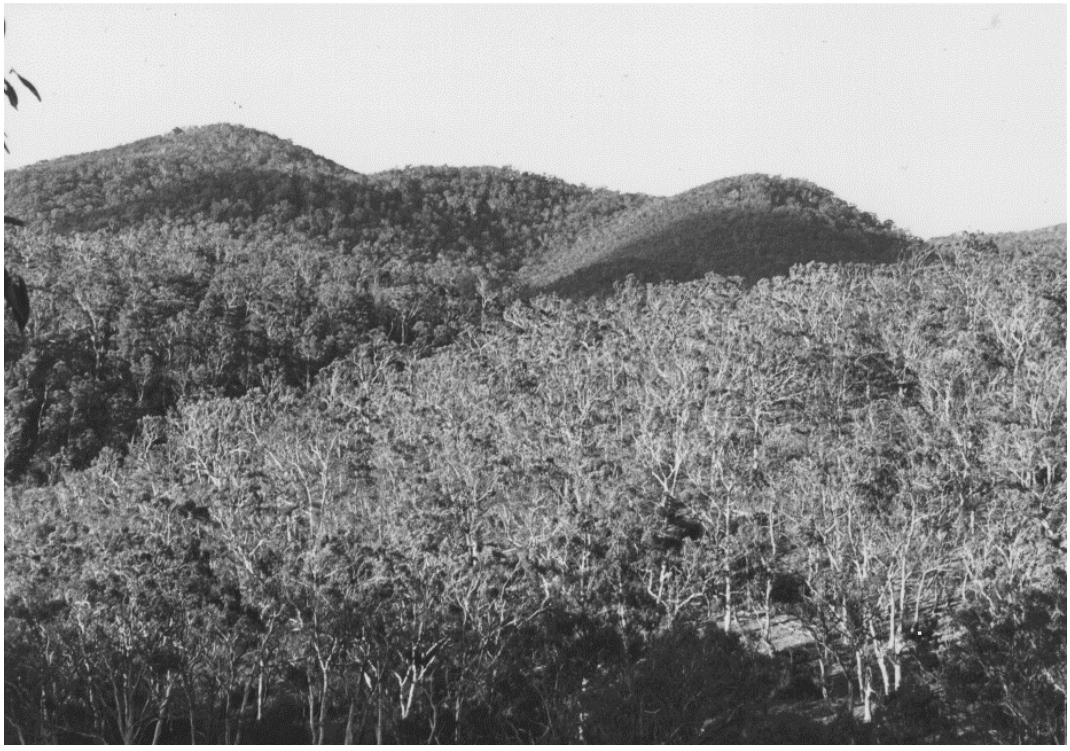
Humid areas. Deep gradational profiles with structured loam to clay loam topsoil grading to yellowish red to dark red, mostly strongly structured light clay subsoil, are characteristic of wetter slopes. Deep soils are common even on steep upper slopes. Profiles are acidic and small stones of parent material often occur throughout.

Open forest IV of *E. delegatensis* occurs in areas with high rainfall and where soils have high water holding capacities but are well drained. Open forest III with *E. radiata, E. globulus* and *E. dalrympleana* tends to occur on protected slopes at lower elevations

Drier areas. Dry slopes commonly have shallow to very shallow stony uniform or gradational soils with an accumulation of organic matter, often thin, at the surface. Subsoils are mostly brown to yellowish red structured loams to clay loams.

Native vegetation is open forest I and II, usually with *E. macrorhyncha, E. goniocalyx* and *E. dives* predominant. *Xanthorrhoea australis* is associated in some localities. Sparse ground cover vegetation and abundant leaf litter, stone and bare earth are common.

Plate 6



Mountains on schist: High sedimentary and metamorphic mountains (forested).

Table 4.11 Biophysical Characteristics: Mountains on schist Map Symbol: MS

CLIMATE Rainfall (mm p.a.)	650 – 2000			
GEOLOGY Age, Lithology	Ordovician schist and spotted phyllite			
PHYSIOGRAPHY Elevation range (m) Relative relief (m) Landforms	300 – 1100 300 – 600 Mountains, some very high hills			
LAND COMPONENT Diagnostic features Slope range (%)	1 Crests and slopes in the subalpine zone 3 - >32	2 Exposed slopes with dry forest 3 - 20 (crests and ridges), 20 - >32 (side slopes)	3 Protected crests and slopes without ash forest 3 - 20 (crests), 20 - >32 (side slopes) (slopes of 72% observed)	4 Protected crests and side slopes with ash forest 3 - 20 (crests), 20 - >32 (side slopes) (slopes of 65% observed)
SOIL Description	Predominantly black loam to clay loam topsoil, up to 0.5 m deep and with moderate to strong crumb or subangular blocky (5-10 mm) structure, overlying dark brown to very dark brown sandy clay loam to clay loam subsoil with moderate to strong subangular blocky structure. Inclusions quartz and/or parent material common, generally 2-10% in topsoil, up to 50% in subsoil. Soils acidic	Very dark grey to brown, predominantly shallow loam to sandy clay loam topsoil with moderate subangular blocky or strong crumb structure. Topsoil generally overlying brown to yellowish brown or yellowish red subsoil of similar texture. Subsoil structure variable, ranging from apedal, particularly where high percentage of parent material inclusions, to moderate or strong subangular or angular blocky. Occasionally a paler A_2 horizon is present, with similar or slightly heavier texture than the A_1. Inclusions of parent material from 5% to >50% and to 30 cm. Soils acidic	Typically a dark brown loam to sandy clay or clay loam topsoil with moderate subangular blocky (10-20 mm) or strong crumb structure. Topsoil generally grading to a slightly heavier textured brown to yellowish or reddish brown subsurface soil also with moderate subangular blocky structure; topsoil sometimes directly overlying the B horizon. Subsoil (B horizon) red to dark red clay loam to light medium clay, mostly with strong angular or subangular blocky peds (10-20 mm) often breaking into fine aggregates (2-5 mm). Possibly also micro-aggregates present. Inclusions of parent material (10-30 mm) usually <10% but may be higher at base of profile. Soils mostly acidic, occasionally neutral at depth.	Very dark brown loam topsoil, with moderate to strong crumb structure, 2-5 mm, sometimes with larger moderate subangular blocky peds (5-10 mm). Topsoil grades to dark brown loam to clay loam with moderate to strong subangular blocky structure 5 - 15mm. Subsoil brown to reddish brown clay loam to light clay with moderate to strong subangular blocky structure to 20mm. Larger peds, sometimes breaking into finer aggregates; may be micro-aggregates as well. Small (5-60 mm) inclusions of parent material, up to 20%. Soils acidic
Classification - Northcote - Stace	O, Um 6.11, Um 6.12 Alpine Humus; some Acid Peats	Um6.33, Um6.14(?) Lithosols, some soils without Stace equivalent	Gn3.11, Gn3.15, Gn4.1, Gn4.31 Krasnozems	Gn4.14, Gn4.34 Krasnozems
Condition of surface soil (dry) Consistence - topsoil - subsoil	- Very to moderately weak (moderately moist) Moderately weak to moderately firm (moist)	- Moderately weak (moist) Moderately weak to moderately firm (moist)	- Moderately firm (moist) Moderately firm (moist)	- Very weak to moderately firm (moderately moist) Moderately firm (dry)
Exposed rock and surface stone (%), size	To 50; rock to 4 m, stones to 0.45 m	Rock: mostly nil; stones:<2 - 50, to 40 cm	Rock: nil; stone: <1-50, to 40 cm	Rock: nil; stone: 2-10, to 30 cm observed
Slaking tendency, subsoil	Nil	Mostly nil, some moderate to rapid	Mostly nil; occasionally moderate to very high. (Soils without tendency to slake were from road cuttings - they may have been stabilised by fungi.)	Nil to very rapid

Table 4.11 continued on next page

Table 4.11 Continued Map Symbol: MS

Depth to rock (m) Soil permeability Site drainage	0.7 - >1.0 Moderate Poorly to well drained depending on slope	0.15 - 1.0 Mostly moderate; high where profile strongly structured or topsoil overlies subsoil with high percent of inclusions. Well drained; creek flanks imperfectly to moderately well drained.	0.5 - >2.2 High: may be moderate where subsurface soil structure weak. Well drained; creek flanks and base of concave slopes poorly to moderately well drained.	0.90 - >2.0 High Well drained; creek flanks and base of concave slopes poorly to moderately well drained
NATIVE VEGETATION Structure Species of upper stratum Sites	Woodland I *E. pauciflora* predominant Closed to open heath, sedgeland or *Sphagnum* mossland in poorly drained areas	Open forest I, II *E.dives, E. macrorhyncha* generally predominant; *E. goniocalyx* *E. mannifera, E. dalrympleana* sometimes associated. 3, 7, 34, 88, 96, 98, T8	Open forest II, III *E. dives, E, radiata* usualy predominant; *E. globulus, E. goniocalyx, E. macrorhyncha, E. dalrympleana* sometimes associated. 52, 89, 92, 97, 101, T11	Open forest IV *E. delegatensis, E. dalrympleana* sometimes associated. 49, 50, 51, 53

Table 4.12 Susceptibility of Land to Erosion: Map Symbol: MS

PROCESS	**SUSCEPTIBILITY** **Land Component**	**Rating**	**CRITICAL LAND FACTORS**	**COMMENTS**
Sheet and rill erosion	1	Low: slopes <10% Moderate: slopes 10-20% High: slopes >20%	Factors promoting process: • light, friable nature of topsoil when dry Factors retarding process: • moderate to high permeability	
	2	Low: slopes <10% Moderate: slopes 10-30% High: slopes >30%	Factors promoting process: • shallow soils (promoting tendency of soil to be saturated) • long slopes • in some places, high percent surface stones Factors retarding process: • moderate to strong topsoil structure and relatively stable aggregates • moderate permeability • bedrock highly fractured	
	3 and 4	Low: slopes <20% Moderate: slopes 20-50% High: slopes >50%	Factors promoting process: • high rainfall • long slopes Factors retarding process: • moderate to strong topsoil structure and stable aggregates • moderate to high soil permeability • bedrock highly fractured	High rainfall and soil characteristics suitable for plant growth mean that revegetation following clearing is likely to be relatively rapid.
Gully erosion	1, 2	Low to moderate	The factors promoting and retarding sheet erosion promote and retard gully erosion for each component. In addition, tendency of subsoil to slake may also promote gully erosion in some areas.	

4.7 Mountains on sedimentary rock (MSy)

Fine grained sedimentary rocks, locally metamorphosed to slate and hornfels, occur predominantly in the south. There is also a minor occurrence of these rocks along the Tallangatta Creek valley. Mountains with moderate to steep slopes, narrow crests and incised valleys are typical.

Subalpine areas. Organic soils and deep uniform loams to clay loams are common while vegetation is an open woodland with *E. pauciflora* and grassy or shrubby understoreys.

Humid areas. Shallow to moderately deep, stony, acidic gradational soils predominate. Sometimes a shallow accumulation of organic matter on the surface gives texture contrast. The topsoil is usually a moderately well structured loam to sandy clay loam that grades into a structured brown to reddish brown clay loam subsurface soil. The subsoil is commonly a light clay. Finely textured uniform soils also occur.

Open forest IV with *E. delegatensis* occurs in very wet areas. Native vegetation is mostly open forest II or III with *E. radiata* and *E. dalrympleana.*

Drier areas. No observations of the soils were made but they are probably very similar to the soils on drier slopes of mountains and hills on schist. That is, they are probably shallow uniform soils, brown to yellowish brown or red and with loam to sandy clay loam texture.

Native vegetation is expected to be mostly open forest I or II with *E. dives* and/or *E. macrorhyncha* predominant. Ground cover and understoreys are often sparse and leaf litter abundant.

Plate 7

Mountains on sedimentary rock to the West of Omeo Highway showing the typical ridge/ravine topography.

Table 4.13 Biophysical Characteristics: Mountains on sedimentary rock Map Symbol: MSy

CLIMATE Rainfall (mm p.a.)	900 - 1600			
GEOLOGY Age, Lithology	Interbedded Ordovician sandstone, shale and siltstone; locally metamorphosed to slate, low grade phyllite			
PHYSIOGRAPHY Elevation range (m) Relative relief (m) Landforms	400 - 1000 250 - 400 Mountains			
LAND COMPONENT Diagnostic features Slope range (%)	1 Crests and slopes in the subalpine zone 3 - >32	2 Exposed slopes with dry forests 3 - 20 (crests), 20 - >32 (side slopes)	3 Protected crests and side slopes without ash forests 3 - 20 (crests), 20 - >32 (side slopes)	4 Protected crests and side slopes with ash forests 3 - 20 (crests), 20 - >32 (side slopes)
SOIL Description	Predominantly black loam to clay loam topsoil, up to 0.5 m deep and with moderate to strong crumb or subangular blocky (5-10 mm) structure, overlying dark brown to very dark brown sandy clay loam to clay loam subsoil with moderate to strong subangular blocky structure. Inclusions quartz and/or parent material common, generally 2-10% in topsoil, up to 50% in subsoil. Soils acidic	No observations; soils similar to those in land type MS, component 1. Dark brown shallow loam to sandy clay loam topsoil with moderate to strong subangular blocky or crumb structure. Subsoil apedal where high percent inclusions of parent material; otherwise moderate or strong subangular or angular blocky structure. Soil acidic.	Limited observations: topsoil black to dark brown to dark reddish brown loam to sandy clay loam or silty clay loam with moderate sub-angular blocky structure (5-15 mm) occasionally breaking to smaller peds (2-5 mm). Topsoil overlying brown to reddish brown clay loam to light clay subsurface soil, with weak to moderate subangular blocky structure. Subsoil brown to red light clay to clay with moderate to strong subangular blocky structure. Inclusions of parent material (to 60 mm) common in profiles. Soils acidic	No observations; soils likely to be similar to those in component 2 but generally deeper and with more strongly structured subsoils.
Classification - Northcote - Stace	O, Um 6.11, Um 6.12 Alpine Humus; some Acid Peats	Um Lithosols	Uf, Gn3.1 -	
Condition of surface soil (dry) Consistence - topsoil - subsoil	- Very to moderately weak (moderately moist) Moderately weak to moderately firm (moderately moist)	- Moderately weak (moist) Moderately weak to moderately firm (moist)	- Moderately weak to moderately firm (moist) Moderately weak to moderately firm (moist)	
Exposed rock and surface stone (%), size Slaking tendency, subsoil Depth to rock (m) Soil permeability	To 50; rock to 4 m, stones to 0.45 m Nil 0.7 - >1.0 Moderate	Mostly moderate; high where profile strongly structured or where subsoil with high percent gravel inclusions.	Rock: nil; stones: 20-50; 1-50 cm observed No slaking observed 0.5 - 1.0 Moderate; may be high where numerous biopores or high percent inclusions in topsoil.	
Site drainage	Poorly to well drained depending on slope.	Well drained; creek flanks imperfectly to moderately well drained.	Well drained; creek flanks and base of concave slopes poorly to moderately well drained.	
NATIVE VEGETATION Structure Species of upper stratum Sites	Woodland I *E. pauciflora* predominant Closed to open heath, sedgeland or *Sphagnum* mossland	Open forest I, II *E. dives, E. macrorhyncha* usually predominant	Open forest II, III *E. dives, E. radiata* generally predominant; *E. globulus, E. macrorhyncha, E. mannifera, E. dalrympleana* associated species 56, 58, 99, T13	Open forest IV *E. delegatensis*

Table 4.14 Susceptibility of Land to Erosion: Map Symbol: MSy

PROCESS	SUSCEPTIBILITY Land Component	Rating	CRITICAL LAND FACTORS	COMMENTS
Sheet and rill erosion	1	Low: slopes <10% Moderate: slopes 1-20% High: slopes >20%	Factors promoting process: • light, friable nature of topsoil when dry Factors retarding process: • moderate to high permeability	
	2	Low: slopes <10% Moderate: slopes 10-20% High: slopes >20%	Factors promoting process: • shallow soils (promotes tendency of soils to saturate) • long slopes • in some places, high percent surface stones Factors retarding process: • moderate to strong topsoil structure and relatively stable aggregates • fractured bedrock • moderate to high permeability	
	3 and 4	Low: slopes <10% Moderate: slopes 10-30% High: slopes >30%	Factors promoting process: • long slopes • high rainfall • in some places, high percent surface stones Factors retarding process: • moderate to strong topsoil structure and relatively stable aggregates • moderate to high permeability • fractured bedrock	High rainfall and soil characteristics suitable for plant growth mean that revegetation following clearing is likely to be relatively rapid.
Gully erosion	2 1, 3 and 4	Moderate Low	The same factors promoting and retarding sheet and rill erosion for each component promote and retard gully erosion.	

4.8 Hills on granite (HG, HG-DP)

Hills on granite occur in scattered areas throughout the region. Hills are often very high and in drier areas slopes are typically uneven with rock outcrop, seeps and landslips common. Hills on granite and granodiorite with humid forest form part of the dissected top and eastern margins of the Koetong Plateau. Here crests are generally rounded, slopes moderately steep and valleys generally broad.

Soils vary considerably in their depth, colour and texture differentiation, probably due to differences in climate and mineral composition of the parent material. Deep, well structured reddish brown to yellowish red uniform and gradational soils, with sandy clay loam to light clay texture, are common in higher rainfall areas. On drier slopes, sandy, shallow uniform soils are characteristic. Shallow duplex soils with sandy loam over a clay loam to clay subsoil, occur on more gentle slopes. They are usually associated with the landslips.

On humid slopes vegetation is commonly an open forest II or III. *E. radiata, E. globulus* and *E. dalrympleana* are the usual species. Open forest I and II with *E. dives, E. macrorhyncha, E. goniocalyx* and *E. polyanthemos* occurs on drier slopes. On the drier slopes understoreys are sparse with a high percentage of leaf litter and bare ground.

Plate 8

Hills on granite: Undulating terrain and hills on granite along Callaghans Creek track (mid study area). Granitic and metamorphic area.

Table 4.15 Biophysical Characteristics: Hills on granite

Map Symbols: HG, HG - DP

CLIMATE Rainfall (mm p.a.)	650 - 1600				
GEOLOGY Age, Lithology	Silurian granite and granodiorite				
PHYSIOGRAPHY Elevation range (m) Relative relief (m) Landforms	 200 - 1000 80 - 250 Hills				
LAND COMPONENT Diagnostic features Slope range (%)	1 Exposed slopes with shallow uniform soils and dry forest 3 - >32	2 Exposed slopes with duplex soils 3 - 32	3 Protected slopes with deep, well-structured red soils 3 - >32	4 Protected slopes with non-red soils 3 - >32	5 Seepage areas 3 - 10
SOIL Description	Few observations; mostly the same as shallow soils in MG land type. Shallow, very dark sandy loam topsoil with weak subangular blocky structure overlying pale brown clayey sand subsoil. Inclusions of fine quartz and parent material to 50%. Soils acidic	Few observations; mostly similar to soils in MG land type, component 2. Very dark grey sandy loam to sandy clay loam topsoil with moderate subangular blocky structure overlying a yellowish brown similarly textured A_2 horizon. Subsoil yellowish brown sandy clay loam to sandy clay. Soils acidic	Very dark greyish brown to dark brown sandy loam to sandy clay loam or clay loam topsoil with moderate to strong subangular blocky peds (10-20 mm) typically breaking into smaller units. Topsoil grading to AB or B_1 horizon of brown sandy clay loam to clay loam with similar structure to topsoil. Subsoil yellowish red to dark reddish brown sandy clay loam to clay loam to light clay, with moderate to strong angular blocky structure (10-15 mm) breaking into smaller angular or subangular blocky peds (2-8 mm). Quartz up to 10 mm and mostly 2-10%. Occasional stone floaters	Black to dark grey to dark greyish brown sandy loam to sandy clay loam topsoil with weak to moderate subangular blocky or crumb structure. Topsoil overlying yellowish brown to brown, sometimes mottled, sandy loam to sandy clay or light clay subsoil with weak subangular to strong angular blocky structure. Quartz gravel variable, mostly <20% and <10 mm. Soils acidic	No observations
Classification - Northcote - Stace	Uc1.43 Lithosols	Dy Yellow Podzolic Soils	Gn3.1, Um6.33(?) Krasnozems; some soils without suitable Stace classification	Um, Gn3.9 -	
Condition of surface soil (dry)	Hard	-	-	-	
Consistence - topsoil	Moderately weak (dry)	Moderately firm (moist)	Moderately firm (moist)	Moderately weak to moderately firm (moist)	
- subsoil	Moderately weak to moderately firm (moist)	Moderately firm (moist)	Moderately firm (moist)	Moderately weak to moderately firm (moist)	
Exposed rock and surface stone (%), size	Rock: <2; stone: <2, to 20 cm	Stones: 2-10; <35 cm	Rock: nil; stone mostly <2 and <25 cm, occasionally 20 - 50 and to 50 cm	Rock: <2, to 2 m; stones: <2, <20 cm	
Slaking tendency, subsoil	Mostly nil	Variability unknown; some soils rapid	Mostly nil; occasionally rapid	Nil to moderate	
Depth to rock (m)	0.20 - 0.75	0.75 - 1.50	0-75 - >2.0	0.75 - 1.5	
Soil permeability	Moderate to high	Low to moderate	High	Moderate	
Site drainage	Well to rapidly drained	Imperfectly to moderately well drained	Well drained; creek flanks and base of concave slopes less well drained.	Imperfectly to well drained	Very poorly to poorly drained

Table 4.15 continued on next page

Table 4.15 continued Map Symbols: HG, HG - DP

NATIVE VEGETATION Structure	Open forest I, II		Open forest II, III		No observations
Species of upper stratum	*E. dives, E. goniocalyx, E. macrorhyncha*; *Xanthorrhoea australis* sometimes associated		*E. dives, E. radiata, E. globulus, E. macrorhyncha, E. mannifera* and *E. dalrympleana* common		
Sites	85, 103, 109, 110, 111	41, 84, 87, 112	75, 80, 115, 116	83, 113	

Table 4.16 Susceptibility of Land to Erosion and Land Slips: Map Symbols: HG, HG - DP

PROCESS	SUSCEPTIBILITY Component	Rating	CRITICAL LAND FACTORS	COMMENTS
Sheet and rill erosion	1 and 2	Moderate: slopes <20% High: slopes >20 %	Factors promoting process: • weakly structured topsoil • shallow soils • relatively massive bedrock • surface particles with little cohesion • surface stone and rock cover >20 % (occurs on some slopes only) Factors retarding process: • moderate to high permeability	Trafficking and raindrop impact are likely to cause surface sealing. This will greatly reduce infiltration rate and lead to runoff during storms with high rainfall intensity. Shallow soils and relatively massive bedrock can result in rapid saturation of soils during high rainfalls; this will promote runoff.
	3 and 4	Low: slopes <20 % Moderate: slopes 20-50% High: slopes >50%	Factors promoting process: • relatively massive bedrock • long slopes • surface stone cover >20 % (occurs on some slopes only) Factors retarding process: • well structured, stable topsoils; • moderate to high permeability	Structure of topsoils in component 4 not quite as effective in retarding sheet and rill erosion as topsoils in component 3. Where a high stone cover is present, this results in slopes >10 % having a moderate susceptibility to erosion and slopes >20 % having a high susceptibility. High rainfall and soil characteristics suitable for plant growth mean that revegetation following clearing is likely to be relatively rapid. This will result in reduced exposure of soils compared with components and land types where regrowth is less rapid.
Gully erosion	1 and 2	Low to moderate	Factors promoting and retarding gully erosion are the same as those listed for sheet and rill erosion for these components.	
Land slipping	2 and 5	Moderate to high	Factors promoting process: • relatively massive bedrock • subsoil with high clay content Factors retarding process: • in natural conditions, forests with relatively high evapotranspiration rates which tend to prevent subsoil becoming saturated.	Conversion of forest to pasture often seems to result in land slips. This would primarily be due to reduced water use by pasture and hence tendency for subsoil to be saturated.

4.9 Hills on gneiss (HGs)

Hills on gneiss are restricted to the north-west where they occur mostly between the Mitta Mitta and Murray arms of Lake Hume, and immediately south of the Mitta Mitta arm. The hills are often very high with broad rounded crests. Slopes are typically uneven and landslips and seepage areas are common.

Soils are mostly shallow, and uniform or duplex. Topsoils range from clayey coarse sand to sandy clay loam; subsoils are similarly textured in uniform soils but vary from clay loam to light clay in duplex soils. Soils are acidic.

Most of the native vegetation of these slopes has now been cleared for pastures. Remnants consist mostly of open forest I and II with *E. dives* and/or *E. macrorhyncha* predominant.

Plate 9

Hills on gneiss occur north of the Mitta Mitta arm of Lake Hume while a relatively large area of low hills and undulating terrain on gneiss occurs to the south. Mountains on gneiss are seen in the distance.

Table 4.17 Biophysical Characteristics: Hills on gneiss Map Symbol: HGs

CLIMATE Rainfall (mm p.a.)	650 - 1000			
GEOLOGY Age, Lithology	Ordovician gneiss and gneissic pegmatite; some inclusions of schist			
PHYSIOGRAPHY Elevation range (m) Relative relief (m) Landforms	300 - 600 80 - 200 (occasionally 300) Hills			
LAND COMPONENT Diagnostic features Slope range (%)	1 Slopes with dry forest and uniform soils 3 - 10 (crests), 10 - >32 (side slopes)	2 Slopes with duplex soils 3 - 32	3 Slopes with humid forest 3 - 20 (crests), 20 - >32 (side slopes)	4 Seepage areas 3 - 10
SOIL Description	Limited observations; probably very similar to uniform soils of MGs. Very dark grey to greyish brown loam topsoil with moderate crumb structure overlying a yellowish brown similarly textured subsoil. Subsoil apedal or with moderate subangular blocky peds (15-20 mm). Soils acidic	Very dark to dark brown sandy loam to sandy clay topsoil with weak to moderate crumb or subangular blocky structure, usually overlying an apedal brown to yellowish brown clayey sand to sandy loam A_2 horizon. Subsoil yellowish brown to yellowish red, sometimes mottled, clay loam to light medium clay with moderate to strong subangular to angular blocky structure, peds often 2-5 mm. Inclusions quartz and parent material very variable (0 - 50%). Soils acidic	Limited observations; soils similar to those of MGs, component 3. Topsoil a dark greyish brown loam with moderate to strong crumb or subangular blocky structure. An apedal brown sandy clay loam A_2 horizon sometimes present. Subsoil a reddish brown clay loam to light clay with strong subangular blocky structure (2-5 mm). Inclusions of fine parent material and quartz common. Soils acidic	No observations
Classification - Northcote - Stace	Uc1.41 Lithosols	Dr, Dy3.11(?) Red Podzolic Soils; some soils without suitable Stace classification	Gn3.14 Red Podzolic Soils	
Condition of surface soil (dry) Consistence - topsoil - subsoil	Hard Moderately firm (dry) Moderately firm (dry)	Hard Moderately weak to moderately firm (dry) Very firm to moderately strong (dry)	- Moderately firm (dry) Moderately firm (dry)	
Exposed rock and surface stone (%), size Slaking tendency, subsoil Depth to rock (m) Soil permeability	Rock: 0; stone: mostly <2% to 10 cm - 0.2 - 0.80 High; moderate in weakly structured loam without high percent gravel inclusions.	0.50; rock and stone to 60 cm Nil to rapid 0.5 - 1.0 Low to moderate	Isolated rock outcrops Nil to rapid >1.0 High	
Site drainage	Well to rapidly drained	Imperfectly to moderately well drained	Moderately well to well drained	Very poorly to poorly drained
NATIVE VEGETATION Structure Species of upper stratum	Open forest I, II *E. dives, E. macrorhyncha;* some *E. goniocalyx* and *E. polyanthemos*	Open forest I, II *E. goniocalyx, E. albens* commonly predominant; *E. goniocalyx* and *Xanthorrhoea australis* often associated	Open forest II, III *E. dives, E, macrorhyncha, E. radiata* usually predominant with *E. mannifera* often associated	
Sites	18, (100)*	24, 106, 107	17	

*Brackets denote sites are located in another land type in a component which is expected to have similar characteristics.

Table 4.18 Susceptibility of Land to Erosion and Land Slips: Map Symbol: HGs

PROCESS	SUSCEPTIBILITY Land Component	Rating	CRITICAL LAND FACTORS	COMMENTS
Sheet and rill erosion	1 and 2	Low: slopes <10% Moderate: slopes 10-20% High: slopes >20%	Factors promoting process: • weakly structured topsoil with tendency to surface seal • shallow soils (promote saturation) • relatively massive bedrock • long slopes • surface particles with little cohesion Factors retarding process: • moderate to high permeability	Trafficking and raindrop impact are likely to cause surface sealing. This will greatly reduce infiltration rate and lead to runoff during storms with high rainfall intensity.
	3	Low: slopes <20% Moderate: slopes 20-50% High: slopes >50%	Factors promoting process: • long slopes • high watertables near creeks Factors retarding process: • well structured stable topsoil • high permeability	High rainfall and soil characteristics favourable for plant growth mean that revegetation following clearing is likely to be relatively rapid. This will result in reduced exposure of soils compared with components and land types where regrowth is less rapid.
Gully erosion	2	Low to moderate	Factors promoting and retarding gully erosion are the same as those listed for sheet and rill erosion for these components.	
Land slipping	2 and 4	Moderate to high	Factors promoting process: • relatively massive bedrock • subsoil with high clay content Factors retarding process: • in natural conditions, forests with relatively high evapotranspiration rates which tend to prevent subsoil becoming saturated.	Conversion of forest to pasture often seems to result in land slips. This would primarily be due to reduced water use by pasture and hence tendency for subsoil to be saturated.

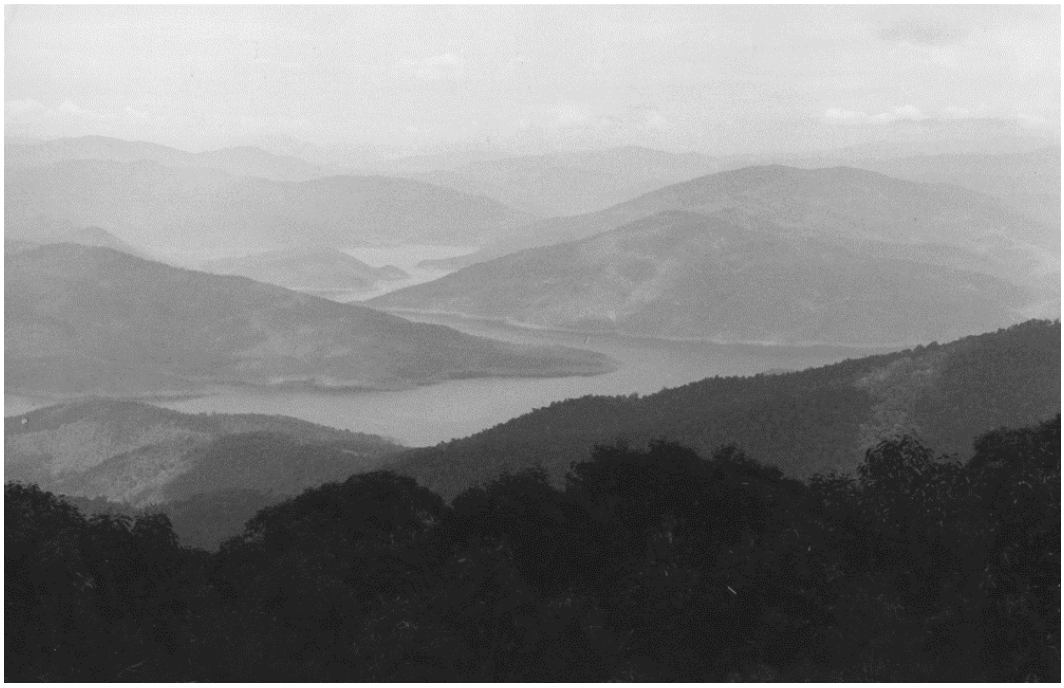
4.10 Hills on rhyolite and rhyodacite (HR, HR-DP)

The occurrences of rhyolite and rhyodacite are mostly associated with high mountains. In the area north-east of Mt. Cravensville, however, hills on rhyolite and rhyodacite occur adjacent to flat to undulating terrain. It appears that in this area, initiation of dissection by the modern drainage network is relatively recent. There are also scattered hills on rhyolite and rhyodacite around Lake Dartmouth.

Soils are mostly deep to moderately deep, strongly structured and gradational with clay loam to light clay textures.

Vegetation is predominantly open forest III with some open forest II. Species include *E. dives, E. radiata* and *E. dalrympleana.* Some *E. pauciflora* woodland may occur on exposed slopes at high elevations.

Plate 10



Hills on rhyolite and rhyodacite: View (south) from Mt. Benambra overlooking Dartmouth Reservour; some hills on rhyolite and rhyodacite occur adjacent to the reservoir.

Table 4.19 Biophysical Characteristics: Hills on rhyolite and rhyodacite Map Symbols: HR, HR - DP

CLIMATE Rainfall (mm p.a.)	 800 - 1400
GEOLOGY Age, Lithology	 Silurian and Devonian rhyolite and rhyodacite; Silurian quartz porphyry, volcanic breccia, tuff, imbrignite
PHYSIOGRAPHY Elevation range (m) Relative relief (m) Landforms	 500 - 1300 100 - 250 Hills
LAND COMPONENT Diagnostic features Slope range (%)	1 Crests and slopes; no subdivision into components made 3 - 20 (crests), 20 - >32 (side slopes)
SOIL Description Classification - Northcote - Stace Condition of surface soil (dry) Consistence - topsoil - subsoil Exposed rock and surface stone (%), size Slaking tendency, subsoil Depth to rock (m) Soil permeability Site drainage	 No observations; soils are regarded as being the same as for MR
NATIVE VEGETATION Structure and Species of upper stratum Sites	 Mostly open forest II, III with *E. dives, E. radiata* and *E. dalrympleana* on drier slopes; some open forest IV with *E. delegatensis* on wetter slopes

Table 4.20 Susceptibility of Land to Erosion: Map Symbols: HR, HR - DP

PROCESS	SUSCEPTIBILITY Land Component	Rating	CRITICAL LAND FACTORS	COMMENTS
Sheet and rill erosion	1	Low: slopes <20 % Moderate: slopes 20-50% High: slopes >50 %	Factors promoting process: • long slopes • high rainfall Factors retarding process: • well structured stable topsoil • soils with high permeability	High rainfall and soil characteristics suitable for plant growth mean that revegetation following clearing is likely to be relatively rapid. This will result in reduced exposure of soils compared with land types with less rapid regrowth.

4.11 Hills on schist (HS, HS-DP)

Hills on schist are not extensive and are scattered throughout the survey area. Slopes vary from moderate to steep, crests are somewhat rounded and valleys are usually incised. Valleys with alluvial and colluvial fill occur. However, in the occurrence west of Walwa, the hills and valleys are at high elevations and are part of a dissected plateau surface.

Humid areas. Slopes have moderately deep to deep, gradational or duplex soils. The topsoil is usually a structured red to reddish brown silty clay to light clay. The native vegetation mostly consists of an open forest III with *E. radiata* predominant. An *E. delegatensis* open forest IV occurs in high rainfall areas in the south.

Drier areas. Shallow, acidic stony uniform soils are common. Typically they are a loam to sandy clay loam, sometimes silty. Native vegetation is usually open forest I or II with *E. macrorhyncha, E. dives* and *E. polyanthemos.* Understoreys are sparse and leaf litter and bare ground are common.

Plate 11

Hills on schist: Treed Metamorphic and Sedimentary hills adjacent to the Tallangatta Valley.

Table 4.21 Biophysical Characteristics: Hills on schist Map Symbol: HS

CLIMATE Rainfall (mm p.a.)	650 – 1800		
GEOLOGY Age, Lithology	Ordovician schist, spotted phyllite		
PHYSIOGRAPHY Elevation range (m) Relative relief (m) Landforms	200 – 600 60 – 250 Hills		
LAND COMPONENT Diagnostic features Slope range (%)	1 Exposed slopes with dry forest and shallow soil 3 - 20 (crests), 20 - >32 (side slopes)	2 Slopes with duplex soils 3 - 20 (crests), 20 - >32 (side slopes)	3 Protected wetter slopes 3 - 20 (crests), 20 - >32 (side slopes)
SOIL Description	Limited observations; soils probably very similar to those of MS, component 1. Very dark brown shallow loam to sandy clay loam topsoil, sometimes silty, with weak to moderate subangular blocky structure. Topsoil overlying a shallow brown gravelly loam, sometimes silty, to sandy clay loam with angular blocky structure. Parent material inclusions (4-180 mm), to 50%. Soils acidic	Very dark grey to brown loam to clay loam topsoil, sometimes silty, with moderate subangular blocky (5-10mm) to crumb structure, grading to silty clay loam subsurface soil, brown to reddish brown with weak subangular blocky to strong angular blocky structure. Subsoil brown to dark reddish brown to dark red light clay or silty clay with strong subangular blocky structure (5-15 mm) breaking to fine peds (2-5 mm) and possibly micro-aggregates. Inclusion of parent material (5-20 mm) mostly 2-10% in topsoil but up to 20-50% in subsoil. Soils acidic	Dark brown to dark reddish brown loam to clay loam topsoil with strong subangular blocky structure (5 mm) sometimes also with larger moderate subangular blocky peds (10-15 mm). Topsoil grading to yellowish red to red clay loam to fine sandy or silty clay to light clay with strong subangular blocky structure. Subsoils may also have micro-aggregates. Inclusions parent material from 2 - 20%. Soils acidic
Classification - Northcote - Stace	Um Lithosols	Dr, Dy2 Some Red and Yellow Podzolic Soils, some soils without Stace equivalent	Gn3.1 Krasnozems
Condition of surface soil (dry) Consistence - topsoil - subsoil	Hard Moderately firm (moist) -	- Moderately weak to moderately firm (moist); moderately firm (dry) Moderately firm (moist); moderately strong (dry)	- Moderately weak to moderately firm (moist) -
Exposed rock and surface stone (%), size	Rock: 2 - 10, 70 cm; stones: 20 - 50, 25 cm	Rock: Nil; stones <2% to 30 cm	Rock: <2; stones: <2-20, 2-20 cm
Slaking tendency, subsoil Depth to rock (m) Soil permeability	Nil 0.20 - 0.75 Moderate; high where profile strongly structured or high percent inclusions.	Rapid <1.0 Moderate	Nil to rapid 1.0 - 2.0 High
Site drainage	Well drained	Well drained	Moderately well to well drained
NATIVE VEGETATION Structure Species of upper stratum	Open forest I, II *E. dives, E. macrorhyncha* and/or *E. polyanthemos* generally predominant; *E. goniocalyx* sometimes associated	Open forest II *E. macrorhyncha, E. dives* generally predominant	Open forest IV with *E. delegatensis* Open forest III with *E. radiata* generally predominant; *E. dalrympleana*, *E. dives, E. macrorhyncha* and *E. mannifera* commonly associated
Sites	3, 86, 96, 98	36, 72, 114	73, 91, 121

Table 4.22 Susceptibility of Land to Erosion: Map Symbol: HS

PROCESS	SUSCEPTIBILITY Land Component	Rating	CRITICAL LAND FACTORS	COMMENTS
Sheet and rill erosion	1	Low: slopes <20 % Moderate: slopes 20-33 % High: slopes >33 %	Factors promoting process: • long slopes • in some places, high percent surface stones Factors retarding process: • moderate to strong topsoil structure and relatively stable aggregates • moderate permeability • bedrock highly fractured.	Moderate permeability and highly fractured bedrock are likely to result in infrequent soil saturation, except near creeks, and this will reduce the incidence of runoff.
	2 and 3	Low: slopes <20 % Moderate: slopes 20-50 % High: slopes >50 %	Factors promoting process: • long slopes Factors retarding process: • moderate to strong topsoil structure and relatively stable aggregates • moderate to high permeability • bedrock highly fractured.	Deep soils and highly fractured bedrock are likely to result in infrequent soil saturation except near creeks and this will reduce the incidence of runoff. High rainfall and soil characteristics favourable for plant growth mean that revegetation following clearing is likely to be relatively rapid. This reduces the time for which soil is exposed and prone to erosion.
Gully erosion	1 and 2	Low to moderate	Factors promoting and retarding gully erosion are the same as those listed for sheet and rill erosion.	

4.12 Hills on sedimentary rock (HSy, HSy-DP)

Hills formed on sedimentary rock occur mostly in the south although they are also found along the Tallangatta Creek valley. Slopes are generally moderate to steep and valleys are mostly incised with little alluvium or colluvium.

Soils vary with rainfall regime. In more humid areas, moderately deep, red well structured gradational soils with light clay subsoil are typical. Shallow uniform soils of brown to yellowish brown or red loam to sandy clay loam are characteristic of the drier slopes and crests.

Native vegetation also varies with rainfall, being mostly an open forest I or II with *E. dives* and *E. macrorhyncha* and a sparse understorey in drier areas. More humid localities have open forest II or III with dense understoreys and *E. radiata* and *E. dives* predominant.

Plate 12

Hills on sedimentary rock: Hills of sedimentary rock forming a boundary to the Tallangatta Creek valley.

Table 4.23 Biophysical Characteristics: Hills on Sedimentary Rock Map Symbols: HSy - DP, HSy

CLIMATE Rainfall (mm p.a.)	750 - 1400	
GEOLOGY Age, Lithology	Interbedded Ordovician sandstone, shale and siltstone; locally metamorphosed to slate, low grade phyllite, hornfels and quartzite	
PHYSIOGRAPHY Elevation range (m) Relative relief (m) Landforms	 300 - 700 100 - 200 Hills	
LAND COMPONENT Diagnostic features Slope range (%)	1 Slopes with dry forests 3 - 10 (crests), 10 - >32 (side slopes)	2 Slopes with humid forests 3 - 10 (crests), 10 - >32 (side slopes)
SOIL Description	No observations but similar to soils of HS, component 1. Very dark brown shallow loam, sometimes silty, to sandy clay loam topsoil with weak to moderate subangular blocky structure. Subsoil a shallow brown gravelly loam, sometimes silty, to sandy clay loam; apedal (where high percentage of inclusions) to strong subangular or angular blocky structure. Soils acidic	Limited observations (see also soils of MSy); dark reddish brown sandy clay loam topsoil, with moderate subangular blocky structure (10-15 mm), overlying a red light clay, sometimes silty, with moderate to strong subangular blocky structure.
Classification - Northcote - Stace	Um -	Gn3.1 -
Condition of surface soil (dry) Consistence - topsoil - subsoil	- Moderately firm (moist) -	Hard Moderately weak to moderately firm (moist) Moderately weak to moderately firm (moist).
Exposed rock and suffice stone (%), size Slaking tendency, subsoil Depth to rock (m) Soil permeability	- - 0.25 - 0.75 Moderate; high where profile strongly structured or high percentage of inclusions.	Rock: 0; stone: to 25 and mostly 1 - 20 cm - 0.5 - 1.0 Moderate; high where topsoil with high percent gravel inclusions and/or many biopores.
Site drainage	Well drained; creek flanks and base of concave slopes poorly to moderately well drained.	Well drained; creek flanks imperfectly to moderately well drained.
NATIVE VEGETATION Structure Species of upper stratum	 Open forest I, II *E. dives* and/or *E. macrorhyncha* typically predominant	 Open forest II, III *E. dives, E. dalrympleana* and/or *E. radiata* usually predominant; *E. globulus, E. macrorhyncha* and *E. mannifera,* may be associated
Sites		(58, 99)*

*Brackets denote sites are located in another land type in a component which is expected to have similar characteristics.

Table 4.24 Susceptibility of Land to Erosion

Map Symbols: HSy - DP, HSy

PROCESS	SUSCEPTIBILITY Land Component	Rating	CRITICAL LAND FACTORS	COMMENTS
Sheet and rill erosion	1	Low: slopes <20 % Moderate: slopes 20-33 % High: slopes >33 %	Factors promoting process: • long slopes • in some places, high percent surface stone • silty topsoil with weak to moderate structure Factors retarding process: • moderate permeability • fractured bedrock	Moderate to high permeability and highly fractured bedrock are likely to result in infrequent soil saturation, except near creeks, and this will reduce the incidence of runoff.
	2	Low: slopes <20% Moderate: slopes 20-50% High: slopes >50%	Factors promoting process: • long slopes • in some places, high percentage of stone cover Factors retarding process: • well structured stable topsoil • moderate to high permeability • fractured bedrock	
Gully erosion	1	Low to moderate	Factors promoting and retarding gully erosion are the same as those listed for sheet and rill erosion.	

4.13 Rolling hills on gneiss (RHGs)

Hills with gentle slopes and broad rounded crests and valleys occur on gneiss immediately north of the Mitta Mitta arm of Lake Hume. This is the only occurrence of this terrain. Land slips and seepage areas are common.

Moderately deep yellow duplex soils, with moderately well structured and sometimes mottled clay subsoil, are characteristic. Where slopes are steep, shallow uniform soils are common.

The native vegetation is typically an open forest I or II with *E. macrorhyncha* predominant, or an open woodland or open forest I or II with *E. albens, E. goniocalyx, E. polyanthemos* and *E. blakelyi.*

Plate 13

Rolling hills on gneiss in the Jarvis Creek district.

Table 4.25 Biophysical Characteristic: Rolling hills on gneiss Map Symbol: RHGs

CLIMATE Rainfall (mm p.a.)	650 - 1000	
GEOLOGY Age, Lithology	Ordovician gneiss	
PHYSIOGRAPHY Elevation range (m) Relative relief (m) Landforms	 250 - 650 Commonly 100 - 150 Hills, sometimes low hills	
LAND COMPONENT Diagnostic features Slope range (%)	1 Crests, slopes and valleys with duplex soils and predominantly gentle to moderate slopes 3 - <32	2 Steep and very steep slopes with uniform soils >20
SOIL Description Classification - Northcote - Stace Condition of surface soil (dry) Consistence - topsoil - subsoil Exposed rock and surface stone (%), size Slaking tendency, subsoil Depth to rock (m) Soil permeability Site drainage	 Very dark grey to dark brown sandy loam to sandy clay loam topsoil, with moderate crumb or subangular blocky structure, typically overlying a bleached apedal A_2 horizon with sand, sandy loam or sandy clay loam texture. Subsoil light clay, sandy clay or light medium clay, mostly very pale brown, yellowish brown or brown, often mottled, with moderate to strong angular to subangular blocky structure. Inclusions of quartz and some parent material to 5 cm and 2-10%. Soils acidic Dy3.21, Dy3.41, some Dr, Db Mostly Yellow Podzolic Soils, some Red Podzolic Soils Hard Moderately weak to moderately firm (moist) Moderately strong (dry) Rock: mostly nil; stone: to 10%, 40 cm Moderate to very rapid 0.5 - 1.5 Low to moderate Imperfectly to moderately well drained	No observations; this component covers the same slope/soil type as HGs, component 1.
NATIVE VEGETATION Structure Species of upper stratum Sites	 Open woodland or open forest I and II *E. dives, E. macrorhyncha, E. albens, E. goniocalyx, E. polyanthemos* and *E. blakelyi* common species 26, 64, 104, 105, T1	

Table 4.26 Susceptibility of Land to Erosion and Land Slips: Map Symbol: RHGs

PROCESS	SUSCEPTIBILITY Land Component	Rating	CRITICAL LAND FACTORS	COMMENTS
Sheet and rill erosion	1	Moderate to high - depends on combination of biophysical characteristics	Factors promoting process: • low to moderate permeability • relatively massive bedrock • long slopes • tendency of topsoil to surface seal Factors retarding process: • moderately deep soils	Trafficking and raindrop impact are likely to cause surface sealing. this will greatly reduce infiltration rate and lead to runoff during periods of high rainfall intensity.
	2	Moderate: slopes <20% High: slopes >20%	Factors promoting process: • weakly structured topsoil with tendency to surface seal • shallow soils • relatively massive bedrock • long slopes • surface particles with little cohesion • large area surface rock and stone Factors retarding process: • moderate to high permeability	
Gully erosion	1	Low to moderate	Factors promoting and retarding gully erosion are the same as those listed for sheet and rill erosion. Also, the reduced permeability of the subsoil compared with the surface soil promotes lateral subsurface flow.	
Land slipping	1	Moderate to high	Factors promoting process: • relatively massive bedrock • subsoils with high clay content Factors retarding process: • in natural condition, forests with relatively high evapotranspiration rates which tend to prevent subsoil becoming saturated.	Conversion of forest to pasture often results in land slips. Primarily this would be due to reduced water use by pasture and hence greater tendency for the subsoil to be saturated.

4.14 Low hills and undulating terrain in high landscape positions (LHUH)

Plains, rises and low hills occur at elevated positions in the landscape, principally in the Koetong and Mt. Alfred regions. These landforms are mostly associated with alluviated valley floors and colluvial footslopes that are part of the dissected plateaux which have developed in areas where stream incision has been limited. Underlying bedrock is mostly granite and granodiorite, with small occurrences of schist, rhyolite and rhyodacite.

Soils are similar to those on similar terrain at lower elevations, except that the complex layering has not been observed. Duplex soils are typical. They usually have brownish yellow to red strongly structured sandy to light medium clay subsoil.

Native vegetation is mostly open forest I or II with *E. dives* and *E. macrorhyncha* predominant. Open forest III with *E. dives* and *E. radiata* occurs in higher rainfall areas. Most native vegetation in the Koetong area has been cleared for pine plantations, and in the north-east for pasture.

Plate 14

Low hills and undulating terrain in high landscape positions: Undulating terrain at high elevation on the Koetong Plateau.

Table 4.27 Biophysical Characteristics: Low hills and undulating terrain in high landscape positions Map Symbol LHUH

CLIMATE Rainfall (mm p.a.)	750 - 1400		
GEOLOGY Age, Lithology	Silurian granite and granodiorite; small areas of Ordovician schist and Silurian rhyolite and rhyodacite; colluvium and alluvium derived from those rocks		
PHYSIOGRAPHY Elevation range (m) Relative relief (m) Landforms	400 - 1000 <90 Plains, rises and low hills		
LAND COMPONENT Diagnostic features Slope range (%)	1 Alluvial deposits, often swampy 0 - 2	2 Gentle slopes on granite or granite derived colluvium Mostly 0 - 10; some short slopes to 30	3 Gentle slopes on schist, rhyolite or derived colluvium 0 - 20
SOIL Description Classification - Northcote - Stace Condition of surface soil (dry) Consistence - topsoil - subsoil Exposed rock and surface stone (%), size Slaking tendency, subsoil Depth to rock (m) Soil permeability Site drainage	 Limited observations; soils with one or more depositional layers common - layers variable depending on locality. Swampy areas with very dark grey clay loam to light clay surface soil with abundant organic matter and moderate crumb structure. Lower horizons usually grey with distinct brown mottles and clay loam to light medium clay texture. Soil acidic Swamps: O Humic Gley - Moderately weak (dry) Very firm (moist) Nil Slight >1.0 Depends on texture and structure Swamps: very poorly drained	 Soils variable. Very dark grey to dark brown loam to sandy clay loam topsoil with moderate subangular blocky (4-10 mm) or crumb (2-5 mm) structure. A_2 horizon often present, bleached, massive and with a sandy loam texture. Subsoil strong brown to yellowish brown, sometimes mottled, sandy clay to light medium clay with moderate to strong angular to subangular blocky structure (2-10 mm). Quartz inclusions mostly to about 5 mm and up to 20%. Some soils as described in MLG. Dr2.11, Dr2.21, Dr2.31, Gn3.84 Red and Yellow Podzolic Soils - Variable - Moderately weak (dry) to moderately firm (moist) Moderately firm to very firm (dry) Rock: nil; stones: <2, to 10 cm Variable; nil to rapid >0.75 Moderate to low Imperfect to well drained	 No observations; in northern occurrences soils probably similar to those in LHUS, component 3, but without deep underlying colluvium. In the south, soils probably similar to those in the more humid components of the HR and HS land types.
NATIVE VEGETATION Structure and Species of upper stratum Sites	 No observations - sites too disturbed by clearing 42	 Open forest I, II *E. dives* and *E. macrorhyncha* Open forest II, III *E. globulus, E. radiata* and *E. rubida* 43, 44, 78, 117, 118, 119, T3	 No observations; in northern areas probably open forest I, II with *E. dives, E. macrorhyncha* and/or *E. polyanthemos* predominant. In wetter southern occurrences, probably open forest II, III with *E. radiata* and *E. dives*

Table 4.28 Susceptibility of Land to Erosion: Map Symbol: LHUH

PROCESS	SUSCEPTIBILITY Land Component	Rating	CRITICAL LAND FACTORS	COMMENTS
Sheet and rill erosion	2 and 3	Low	Factors promoting process: • often saturated soils • tendency to receive run-on • in some localities, a sandy topsoil with poor cohesion Factors retarding process: • predominance of gentle slopes • in many localities, a high organic matter content of topsoil giving a stable structure and high infiltration rate where soils not poorly drained.	
Gully erosion	2	Moderate	Factors promoting process: • tendency to receive run-on • subsoil often with low permeability promoting lateral subsurface flow • in some places, tendency of subsoil to slake Factors retarding process: • predominance of gentle slopes	

4.15 Low hills and undulating terrain on granite, gneiss and derived colluvium and alluvium (LHUG)

This land type is relatively extensive in the north, occurring in all major river valleys. It includes river terraces that are no longer flooded, fans and colluvial footslopes, as well as low hills on bedrock. Geomorphic history appears to have been complex with several cycles of erosion and deposition indicated in some areas. Slopes are predominantly flat to moderate though some steep slopes are associated with low hills. Landslips are often found on slopes below hills and mountains.

Variability in parent material results in a range of soils. Soils on recent alluvium tend to have little development while on older terraces they are moderately deep to deep, well structured gradational or duplex soils. Soils on colluvium and gentle slopes on bedrock are predominantly duplex with bleached A_2 horizons and strongly structured subsoils. Material below the B horizon of soils on older terraces and colluvial slopes is variable, often being stratified with some layers cemented. Shallow uniform or gradational soils are characteristic of low hills with steep to very steep slopes.

A large proportion of the native vegetation has now been cleared. Probably open forest II, with some woodland II on recent alluvium, predominated. Common species would have included *E. camaldulensis* (recent alluvium), *E. albens, E. bridgesiana, E. dives, E. goniocalyx, E. macrorhyncha, E. ovata* and *E. blakelyi.*

Plate 15

Low hills and undulating terrain on granite, gneiss and derived colluvium and alluvium: Undulating terrain typical of this land unit is in the foreground while hills on gneiss occur in the mid-distance and mountains on gneiss in the distance.

Table 4.29 Biophysical Characteristics: Low hills and undulating terrain on granite, gneiss and derived colluvium and alluvium Map Symbol: LHUG

CLIMATE Rainfall (mm p.a.)	650 - 1000					
GEOLOGY Age, Lithology	Ordovician gneiss; Silurian granite and granodiorite; Devonian leucocratic granite; derived silt, sand and gravel colluvium; poorly sorted Pleistocene to Recent alluvial clay, silt, sand and gravel					
PHYSIOGRAPHY Elevation range (m) Relative relief (m) Landforms	200 - 400 <90 Plains, rises and low hills					
LAND COMPONENT Diagnostic features Slope range (%)	1 Recent alluvium 0 - 10	2 Alluvial terraces, no longer flooded, and fans 0 – 10	3 Gentle to moderate slopes on colluvium 3 - 20	4 Drainage areas and seeps on colluvium 3 - 20	5 Gentle to moderate slopes on bedrock 3 - 20	6 Low hills with steep to very steep slopes >20
SOIL Description	Shallow, dark greyish brown sandy loam to loam with weak subangular blocky structure overlying depositional layers which have undergone little soil development.	Soils variable depending on source of alluvium and depositional history. Generally dark brown to brown loam to sandy clay loam to clay loam topsoil with moderate to strong subangular block or crumb structure. A_2 horizon usually present, often bleached and usually apedal or with weak subangular block structure. Subsoil brown to yellowish brown to dark red, often mottled, sandy or light clay to heavy clay with moderate or strong subangular blocky structure (5-15mm) often breaking into peds <5mm. Occasionally shallow soils with one or more overlying depositional layers of variable colour, texture and structure. Inclusions of quartz 2-100mm common; occasional inclusions rounded river gravels. Soils acidic.	Black to very dark greyish brown to brown loam to fine sandy loam or sandy clay loam topsoil, with moderate to strong crumb (2-5 mm) to subangular blocky (2-15 mm) structure. A_2 horizon mostly present and usually an apedal bleached sandy loam to sandy clay. Subsoil brown to yellowish brown, occasionally grey, mostly mottled sandy, light or medium clay with moderate to strong angular or subangular blocky structure (5-10 mm) often breaking into peds 2-5 mm. Inclusions of quartz and parent material ranging from nil to 20-50%, soil acidic. Subsoil sometimes containing or underlain by depositional layers, often cemented.	Limited observations; very dark grey clay loam topsoil with strong subangular blocky structure over a similarly coloured light medium clay, probably apedal. A black apedal medium to heavy clay below. Inclusions of quartz <2% and <2 mm. Soils neutral to alkaline.	Very dark grey, dark brown or brown fine sandy loam to sandy clay loam topsoil with predominantly strong or moderate crumb structure (2-5 mm) but sometimes with angular or subangular blocky peds to 10 mm. Topsoil mostly overlying a dark brown to yellowish brown or sometimes bleached apedal sandy loam to sandy clay loam A_2 horizon. Subsoil sandy or silty clay to light medium clay, brown to yellowish brown to yellowish red to red, sometimes mottled; occasionally a sandy loam or sandy clay loam. Subsoil with moderate to strong angular to subangular blocky structure (2-10 mm) with secondary peds <2 mm. Subsurface soil occasionally directly overlies weathering rock. Inclusions, mostly of quartz or parent material to 20% and 50 mm. Soils acidic	No observations; soils expected to be the same as for HG land type.

Table 4.29 continued on next page

Table 4.29 continued

Map Symbol: LHUG

Classification - Northcote	Uc1. 4, Um1.4	Dy2.42, Dy3.41, Gn	Dy3.41, Dg2.41	Dd	Dr3.41, Db1, Dy3.41, Gn3.14, Uc	
- Stace	Alluvial Soils	Minimal Prairie and Yellow Podzolic Soils; some soils without Stace equivalent	Yellow and Gleyed Podzolic Soils; some soils without Stace equivalent	Possibly some Prairie Soils	Red and Yellow Podzolic Soils; some soils without Stace equivalent	
Condition of surface soil (dry)	-	Hard	Hard	-	Hard	
Consistence - topsoil	Moderately to very firm (dry)	Moderately to very firm (dry)	Variable; moderately weak to moderately strong (dry)	Very firm (dry)	Moderately weak to very firm (dry)	
- subsoil	Very firm to moderately strong (dry)	Very firm to very strong (dry)	Very firm to moderately strong (dry)	Very firm (dry)	Moderately weak to moderately strong (dry)	
Exposed rock and surface stone (%), size	Nil	Rock: nil; stone <2, <50 cm	Rock and stone mostly nil; stones occasionally to 2%, 50 cm	Nil	Nil	
Slaking tendency, subsoil	Nil	Nil to very rapid	Mostly moderate to very rapid, occasionally nil	Slight	Mostly rapid to very rapid	
Depth to rock (m)	-	0.75 - >2.3	>1.2	>1.0	0.45 - 2.0; mostly >1.0	
Soil permeability	Variable depending on texture and structure of the different layers.	Variable depending on texture and structure of the different layers.	Moderate to low	Low	Moderate to low	
Site drainage			Poor to moderately well drained	Poorly to very poorly drained	Mostly imperfectly to moderately well drained	
NATIVE VEGETATION Structure	Woodland II, open forest II	Open forest II	Open forest II		Open forest II	Open forest I, II
Species of upper stratum	*E. camaldulensis*, or in less well drained areas, *E. ovata.* Some *E. melliodora*	Mostly *E. macroryncha* and *E. goniocalyx* predominant; occasionally *E. blakelyi* predominant	Predominant species include *E. goniocalyx, E. macrorhyncha, E. polyanthemos* and *E. blakelyi. E. albens and E. bridgesiana* may associated	Native vegetation difficult to determine due to extensive clearing; probably open forest II of *E. ovata*	Predominant species include *E. goniocalyx, E. macrorhyncha, E polyanthemos* and *E. blakely, E. albens* and *E. bridgesiana* may be associated.	*E. dives* and/or *E. macrorhyncha* commonly predominant
Sites	30, 31	20, 32, 39, 40, 60, T10, NE22	9, 10, 13, 14, 22, 29, 33, 59, 68, 75, T14, NE23	28	4, 8, 12, 15, 16, 19, 21, 23, 27, 65, 67, NE21	

Table 4.30 Susceptibility of Land to Erosion:Map Symbol: LHUG

PROCESS	SUSCEPTIBILITY Land Component	Rating	CRITICAL LAND FACTORS	COMMENTS
Sheet and rill erosion	2, 3, 4, 5 and 6	Moderate: slopes 3-20 % High: slopes >20 %	Factors promoting process: • in some areas of components 5 and 6, massive bedrock at relatively shallow depth • surface particles often with little cohesion • on some slopes, surface stone and rock cover >20 % (promotes overland flow) Factors retarding process: • in some areas (with higher rainfall regimes), strongly structured topsoil with high infiltration.	Trafficking and raindrop impact are likely to cause surface sealing. This will greatly reduce infiltration rate and lead to runoff during storms with high rainfall intensity.
Gully erosion	2, 3 and 4	High in areas in which channellized flow occurs	Factors promoting process: • moderate to low permeability of soil • moderate to very rapid tendency of the subsoil to slake in some areas, layers at depth with little strength and coherence.	
	5 and 6	Moderate in areas in which channellized flow occurs	Factors promoting process: • moderate to low soil permeability • rapid to very rapid tendency of subsoil to slake	

4.16 Low hills and undulating terrain on schist, sedimentary rock and derived colluvium and alluvium (LHUS)

This land unit is widespread, occurring from areas adjacent to the Murray River floodplains in the north to valleys in the mountains in the south. Included are river terraces, mostly above flood level, colluvial footslopes and low hills on bedrock. Depositional history of some terraces appears complex.

Shallow uniform soils occur on recently deposited and little altered alluvium. Older alluvial terraces and colluvial slopes tend to have gradational or duplex soils, mostly with A_2 horizons and strongly structured subsoils. Soils on steep slopes of low hills vary with climate. In dry areas they are shallow uniform or gradational soils, mostly with loam to clay loam texture. In more humid regions, deep gradational soils with red, strongly structured clay loam to medium clay subsoil predominate.

In the drier northern regions, the native vegetation has mostly been cleared to allow grazing. It was probably mostly open forest II, with some woodland II on recent alluvium, with common species including *E. albens, E. camaldulensis* (recent alluvium), *E. dives, E. goniocalyx, E. macrorhyncha* and *E. ovata.* Open forest II or III occurs where rainfall is higher. *E. dives, E. radiata* and/or *E. viminalis* are common in these areas.

Plate 16

Low hills and undulating terrain on schist, sedimentary rock and derived colluvium and alluvium: Road cutting along Georges Creek road showing an inspection of unconsolidated material of different depositional phases/and soil development.

Table 4.31 Biophysical Characteristics: Low hills and undulating terrain on schist, sedimentary rock and derived colluvium and alluvium Map Symbol: LHUS

CLIMATE Rainfall (mm p.a.)	650 - >1400				
GEOLOGY Age, Lithology	Ordovician schist and spotted phyllite; interbedded sandstone, shale, siltstone; derived silt, sand and gravel colluvium, poorly sorted; Pleistocene to Recent alluvial clay, silt, sand and gravel				
PHYSIOGRAPHY Elevation range (m) Relative relief (m) Landforms	200 – 800 < 90 Plains, rises and low hills				
LAND COMPONENT Diagnostic features Slope range (%)	1 Recent alluvium 0 – 10	2 Alluvial terraces and fans 0 - 10	3 Gentle to moderate slopes on colluvium 3 - 20	4 Gentle to moderate slopes on bedrock 3 – 20	5 Low hills with steep slopes >20
SOIL Description	Limited observations; shallow dark greyish brown sandy loam to clay loam topsoil with weak subangular blocky structure, overlying alluvium which has been little altered pedogenetically.	Limited observations; soils variable depending on depositional and erosional history. Soils with one or more horizons overlying depositional layers not uncommon. Layers variable in colour, texture, structure and inclusions.	Topsoil dark greyish brown to dark brown loam, sometimes silty, with weak to moderate subangular blocky or crumb structure. A_2 horizon mostly present, sometimes bleached, and commonly an apedal to weakly structured loam to clay loam, fine sandy or silty. Subsoil brownish yellow to red light clay or silty clay with strong subangular blocky structure (5-10 mm) and fine secondary subangular blocky peds (2-3 mm). May be burried horizons at depth; colour, texture and structure of these variable. Inclusions of parent material or quartz to 20% and 5-30 mm. Soils acidic	Soils similar to component 3 but without underlying deep colluvium and with higher percent of parent material inclusions in the B horizon. Very dark greyish brown to dark brown fine sandy loam to sandy clay loam topsoil with weak blocky structure sometimes overlying a sandy loam to sandy clay loam A_2 horizon. Subsoil a strong brown to red clay loam to light clay, sometimes mottled, and with weak to medium blocky structure. Inclusions of parent material to 50 mm and 30%. Soil acidic	No observations; soils expected to be similar to those in HS land type.
Classification - Northcote - Stace	Uc1.4, Um1.4 Alluvial soils	- -	Dr2.41, Dr3.22, Dy3.41, Gn3.84 Red and Yellow Podzolic Soils	Dr2.41, Gn3.14 Red Podzolic Soils	
Condition of surface soil (dry) Consistence - topsoil - subsoil	- - -	- - -	- Moderately weak to moderately firm (dry) Moderately firm (dry)	- Moderately firm (dry) Moderately strong (dry)	
Exposed rock and surface stone (%), size	Nil	Nil	Nil	Stone: <2, to 15 cm	
Slaking tendency, subsoil	Nil	Varies in different layers from nil to rapid	Nil to rapid	Variability unknown; at least some soils high	
Depth to rock (m) Soil permeability	- Variable depending on texture and structure of the different layers.	>2.0 Variable depending on texture and structure of the different layers.	1.5 - >4.0 Moderate; high where subsurface soil with many biopores; low where weakly structured clay layer at depth.	0.5 - 1.5 Moderate; high where subsurface soi.	

Table 4.31 continued next page

Table 4.31 continued Map Symbol: LHUS

Site drainage	Variable depending on texture and structure of the different layers.	Variable depending on texture and structure of the different layers.	Poorly to well drained	Poorly to well drained	Well drained
NATIVE VEGETATION Structure and species of upper stratum	*Lower rainfall areas*: Woodland II and open forest II with *E. camaldulensis* or in less well drained areas, *E.ovata.* Some *E. melliodora* *Higher rainfall areas*: Open forest III with *E. radiata* and *E. viminalis*	*Lower rainfall areas*: Mainly open forest II with *E. macrorhyncha* and *E. goniocalyx* predominant; *E. blakelyi* predominant in some localities *Higher rainfall areas*: Open forest III with *E. radiata* and *E. viminalis*	*Lower rainfall areas*: Open forest I, II with predominant species including *E. dives, E. goniocalyx, E. macrorhyncha* and *E. blakelyi. E. albens* and *E. bridgesiana* may be associated *Higher rainfall areas*: Open forest II, III commonly with *E. dives* and/or *E. radiata;* sometimes with *E. viminalis*	*Lower rainfall areas*: Open forest I, II with *E. dives* and/or *E. macrorhyncha* most commonly predominant; *E. polyanthemos* sometimes associated *Higher rainfall areas*: Open forest II with *E. dives* and *E. radiata* usually predominant	
Sites		69	1, 35, 62, 120, NE26	T15, NE24, NE29, NE31	2, 36

Table 4.32 Susceptibility of Land to Erosion: Map Symbol: LHUS

PROCESS	**SUSCEPTIBILITY** **Land Component**	**Rating**	**CRITICAL LAND FACTORS**	**COMMENTS**
Sheet and rill erosion	2, 3, 4 and 5	Low: slopes <20 % Moderate: slopes 20-33 % High: slopes >33 %	Factors promoting process: • in some places, high percent surface stones Factors retarding process: • moderate to strong topsoil structure and relatively stable aggregates • moderate to high permeability • bedrock highly fractured.	Soils have a higher susceptibility to erosion in the drier rainfall areas where they are shallower, and have topsoils that are less well structured and lower in organic matter.
Gully erosion	2, 3, 4 and 5	Low to moderate in areas in which channelized flow occurs.	Factors promoting and retarding sheet and rill erosion also promote and retard gully erosion. In addition, rapid slaking of some subsoils will increase susceptibility to gully erosion.	

4.17 Active floodplains (A)

Floodplains occur along all major river systems in the north of the survey area, the largest being those of the Murray and Mitta Mitta rivers. Large alluvial deposits are infrequent in the southern mountainous terrain.

Soils are variable depending on the principal source of alluvium and flood regime. Profiles with depositional layers, including river gravels, and little pedogenetic development are 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.

Woodland II with *E. camaldulensis* would have been typical of the larger central and northern flood plains which have mostly been cleared. Grasslands, sedgelands or closed scrub were probably associated with poorly drained areas. Open forest III with *E. viminalis* and *E. radiata* would have been common on floodplains in the south.

Plate 17

Active floodplains: Floodplain with prior stream (palaeo) channel, terraces.

Table 4.33 Biophysical Characteristics: Active Floodplains Map Symbol: A

CLIMATE Rainfall (mm p.a.)	 650 – 1200
GEOLOGY Age, Lithology	 Recent alluvium
PHYSIOGRAPHY Elevation range (m) Relative relief (m) Landforms	 200 – 300 <9 Terraces, floodplains, river channels
LAND COMPONENT Diagnostic features Slope range (%)	1 Flats and terraces with an active flood regime 0 – 3
SOIL Description Classification - Northcote - Stace Condition of surface soil (dry) Consistence - topsoil - subsoil Exposed rock and surface stone (%), size Slaking tendency, subsoil Depth to rock (m) Soil permeability Site drainage	 Variable depending on principal source of alluvium and flood regime. Profiles with depositional layers of variable texture and little soil development common. Soils include uniformly textured dark brown silty to medium clays with moderate blocky structure and uniform sandy loams to clay loams, also with moderate structure in the B horizon. Acidic, gradational soils with sandy clay loam topsoils and light clay subsoils, often with moderate to strong structure, occur on lower alluvial terraces. Uf, Um5.52, Gn, Gn3.11, Gn3.14, Gn3.24 Alluvial Soil - Variable: weak to firm (moist); weak to very firm (dry) Weak to firm (moist); firm (dry) Nil Mostly nil Soils overlying cemented layers and river gravels rather than rock; depth of soil mostly >1 m. Very variable depending on soil texture; mostly low to moderate. Variable depending on texture of alluvium, presence of underlying gravel layers and height above river channel; mostly poorly to moderately well drained.
NATIVE VEGETATION Structure and species of upper stratum Sites	 *Centre and north*: Woodland and open forest II with *E. camaldulensis* and *E. bridgesiana* *South*: Open forest II with *E. viminalis* and *E. radiata* NE19, NE20, NE25, NE27, NE30 and NE32

Susceptibility of land type to erosion

In this land type, streambank erosion and flood scour are the predominant processes by which sediment will be removed. It is not possible to rate the susceptibility of land in this land type to streambank erosion and flood scour. The factors that influence the susceptibility of land to these processes, however, are given in Appendix 2.