Land Unit Descriptions

Land Units associated with plateaux

Units:
P/Hu 2 (Plateau/undulating hills, soil type 2)
P/Ru 2 (Plateau/undulating rises, soil type 2)

Location:
i) Mount Disappointment area, immediately east and south-east (Kinglake State Forest).
ii) Part of Black Range (Northern section).

Description:
Hilly and rise units (undulating) with gentle smooth slopes typically in the range of 8%-10%. With the exception of Ru units, areas are generally surrounded by steep escarpments. Usually elevations are in the range of 500 m to 600 m with some areas on the Black Range exceeding 760 m above sea level (ASL). Units are typically forested. Units occur in close proximity to granite geology.

Stream Description:
Drainage courses are typically broad and shallow, with their banks well protected by trees and shrubs. Most areas are dry in the summer months. Generally channels tend to show a centrifugal and tributary pattern with moderate to wide stream spacing in the range of 200-400 m.

Present Land Use:
Most areas are alienated from agriculture and are incorporated into State Forests and reserved Crown land. Long term forestry use is possible. The units are transected by numerous tracks which allow for recreation use by tourists.

Land Degradation:
Land degradation is minimal due partly to the public land status and the extensive vegetative cover. The vegetative cover tends to limit and restrict erosion beside and along drainage courses. Long vehicular tracks and roadside batters exhibit minor gullying and batter slip.

Surface runoff	Slow to very slow
Flood Risk	Nil
Waterlogging Class	Nil
Erosion Type	Nil (Minor road associated erosion)
Salinity	Nil

Soil Description:
The soils are a complex of uniform fine textured clays and gradational soils which may incorporate broken rock and gravel in their subsoil. Areas around Mount Disappointment, Kinglake, Tallarook and the Black Range tend to be reddish-yellow. Other areas tend to be yellow to yellowish brown. Upperslopes may show the presence of a bleached massive dry hard A_2 horizon. (See Soil Association 2)

Unit:
P/Hr 3 (Plateau/rolling hills, soil type 3)

Location:
The units are located in the south-east of the survey area in the vicinity of the Blue Range and are part of the Rhyodacite Plateau complex.

Description:
Rolling hilly terrain which has moderately inclined side slopes with gradients ranging from 15%-30%. The areas incorporate minor spurs with rhyodacite rock outcrop. Areas are typically well to densely forested with access limited to 4WD type vehicles. Unit boundaries are often diffused with complex geological interaction with granitic areas.

Stream Description:
The units have a number of small streams running from them onto the adjacent plateau land form. These stream channels are often broad and somewhat rocky in cross section. Typically wet, although not necessarily running throughout the summer, they are generally impassible in winter months. Channels have well vegetated and stable side banks and often rocky floors.

Present Land Use:
Areas have been set aside for conservation and recreation use. Access requires 4WD use which is limited to formed tracks. The area holds large reserves of hardwood timber some of which has been logged in the past decade.

Land Degradation:
Generally the area is stable in its native state where it is protected by the vegetative cover. Disturbance of the forest would lead to surface wash and stream sediment build-up. Few roadside cuttings exist, with pathways having been cut along slopes.

Surface runoff	Slow
Flood Risk	Nil
Waterlogging Class	Nil
Erosion Type	Nil
Salinity	Nil

Soil Description:
Deep friable brown to dark red whole coloured gradational well structured rough ped earths. (See Soil Association 3)

Units:
P/Hr 4 (Plateau/rolling hills, soil type 4)
P/Hu 4 (Plateau/undulating hills, soil type 4)
P/Lhu 4 (Plateau/undulating low hills, soil type 4)
P/LHr-u 4 (Plateau/undulating to rolling low hills, soil type 4)
P/DSm 4 (Plateau/moderate drainage slopes, soil type 4)
P/DSg 4 (Plateau/gentle drainage slopes, soil type 4)
P/Ru 4 (Plateau/undulating rises, soil type 4)

Location:
i) Mount Disappointment
ii) Tallarook
iii) Areas about Dropmore and Wattle Hill
iv) The Black Range

The units occur within very broad plateau complexes, which show various degrees of dissection. For the purpose of description, they have been listed under specific sub-units.

Description:
Rolling and undulating hills which are sloping and essentially cleared. Gradients are variable with moderate slopes generally <25% and gentle areas in the range 8%-12%. Rock outcrop with large surface boulders is common and in areas which lack vegetation gives rise to a distinctive landscape. On the non-forested areas (principally in location iii) large level rock pavements have had soil stripped from them. The areas in the vicinity of locations i), ii), and iv) are well forested.

These units are the general broad drainage slopes from the granite areas. Slopes are somewhat variable and depend upon upland terrain components. Moderate (DSm) and gentle (DSg) areas exist with gradients up to 20% and 8% respectively. Many areas have boulders and rock pavement.

Stream Description:
The drainage networks are usually well defined and somewhat integrated, with the drainage slopes showing a clear convergent pattern. Often the forest vegetation restricts access by stock and maintains some stability to the channels and slows runoff. Downslope areas are often incised and have rocky and sandy floors.

Present Land Use:
The areas in the vicinity of Tallarook, Mount Disappointment and the Black Range are under crown land management, and are presently well forested. Areas north of the Switzerland Ranges are generally grazed by sheep and to a lesser extent cattle. These areas have been cleared and sown to native and improved pastures. Cropping and rural residential development is very limited.

Land Degradation:
Well forested areas are generally protected against wind and water erosion. On the cleared areas the lack of vegetation together with agricultural overuse has led to some loss of top soil. Roadside batters are often unstable. Some roads are particularly unstable when wet when the dry hardsetting bleached A_2 horizon loses all consistency and becomes boggy and spewy. Where large boulders are common the effect of grazing and turbulent winds has stripped the soil surface.

Surface runoff	Slow – moderately rapid
Flood Risk	Nil
Waterlogging Class	Nil to temporarily ponded
Erosion Type	Wind erosion occurs on bare defrosted terrain, particularly at the base of the boulders accentuated by sheep and cattle.
Salinity	Nil

Soil Description:
A complex of:

i) deep red well structured very friable uniformly fine textured to slightly gradational profiles. These profiles occur in the vicinity of Mount Disappointment Range.
ii) deep stony, gravelly and sandy apedal pale brown, sometimes mottled, gradational profiles in the areas of Tallarook State Forest.
iii) Moderately deep to shallow pale brown to yellow, very gravelly duplex soils and gradational earths. (See Soil Association 4)

Land units associated with escarpments

Units:
Es 2 (Steep escarpment, soil type 2)
Em 2 (Modern escarpment, soil type 2)

Location:
i) Mount Disappointment
ii) Tallarook
iii) Dropmore

Description:
Steep to very steep dissected and moderately inclined escarpment landform patterns with essentially rocky sideslopes. The units typically abut the plateau terrain units and are always in close association with granitic intrusions. Areas primarily consist of metamorphic sandstone.

Stream Description:
Streams show a typically non-tributary and unidirectional channel pattern with often deeply incised rocky drainage courses.

Present Land Use:
Areas are used for conservation and recreation.

Land Degradation:
Area have high slopes and little surface soil, consequently runoff has the potential for severe water erosion.

Surface runoff	Rapid to very rapid
Flood Risk	Nil
Waterlogging Class	Nil

Erosion Type	High (Due to high runoff characteristics)
Salinity	Nil

Soil Description:
Generally little or no soil is present. If present, soils are shallow to very shallow, skeletal in form with medium sandy textures. (See Soil Association 2)

The following units occur in the escarpment, mountainous and hilly terrain patterns throughout the survey area. They have not been separately highlighted because they are essentially components of the terrain pattern under which they appear. They have been delineated for mapping purposes because they are sufficiently large to be separately described.

Unit:
Sm 2 (Moderate slopes, soil type 2)

Location:
The units are scattered through the area and occur in conjunction with hilly, mountainous and escarpment landform patterns.

Description:
The unit is a moderately inclined slope on sedimentary and metamorphosed geologies with gradients of 10%-20%. They occur immediately adjacent to the steep sloping terrain patterns Es 2, Ms 2 and Hs 2 and abut the gentle Sg and very gentle DC units. They have been separately delineated because of their distinctiveness from the steeper patterns and have been grouped with the respective landform patterns.

Units on public land are protected by tree cover and incorporate varying amounts of scree. This is particularly so in units associated with escarpment and mountainous areas. The drainage slopes by virtue of their greater dissection have a very rocky surface. The areas north of Alexandra, south of Broadford and near Mt Prospect have been cleared and have light grass cover with a gravelly to smooth surface.

Stream Description:
Drainage courses tend to show a unidirectional to convergent channel network with close channel spacing in the range of 200 m to 300 m. Most channels are dry in summer months. Drainage channels are often incised with rocky scree or bedrock floors. In forested areas they are well treed and have considerable amounts of forest litter.

Present Land Use:
The areas abutting the escarpment and mountainous country south of Alexandra are primarily used solely for conservation and recreation. Cleared areas are used for agriculture including the grazing by sheep and to a lesser extent cattle. Due to their location and accessibility, these areas are favoured for rural retreat development.

Land Degradation:
Areas adjacent to the escarpment have greater runoff and subsequently greater potential for sheet erosion than the hilly terrain. Where forest cover occurs it limits the effect of rainfall and inhibits runoff. In cleared areas the channels are predominantly dry throughout the summer and have been affected by grazing. Runoff has caused to some gullying at the base of the units.

Surface runoff	Slow in the forested areas moderately to rapid runoff in grazed areas
Flood Risk	Nil
Waterlogging Class	Nil
Erosion Type	Sheet erosion on the shoulders of drainage lines in the cleared areas, some gullying in lower situations
Salinity	Nil

Soil Description:
Soils are variable. Off the escarpment and steeper mountains they are shallow to moderately deep rocky dark brown gradational light clays. In hilly and cleared situations soils show some horizonation with bleached A_2 horizon sometimes at the surface due to surface soil loss. (See Soil Association 2).

Units:
Hs 2 (Steep hills, soil type 2)
Hr 2 (Rolling hills, soil type 2)
Hs-r 2 (Steep to rolling hills, soil type 2)

These units are grouped within the escarpment terrain pattern. They are similar to the hilly pattern units Hs 2, Hr 2 and Hs-r 2 generally described below.

Location:
Located only in the vicinity of the Blue Range east of the Cathedral Range.

Description:
Somewhat sinuous steep to very steep dissected escarpment. The unit includes the only Rhyodacite Plateau in the study area, and it abuts the Silurian-Devonian sedimentary hilly terrain to the west and grades into the ridge-mountainous Rhyodacite terrain in the east. Areas are usually well treed but surfaces are typically bare and rocky.

Stream Description:
Streams show a typically non-tributary and unidirectional channel pattern with often deeply incised rocky drainage courses.

Present Land Use:
Used for conservation and recreation.

Land Degradation:
Areas have very steep slopes and little surface soil and consequently runoff may cause severe water erosion.

Surface runoff	Rapid to very rapid
Flood Risk	Nil
Waterlogging Class	Nil
Erosion Type	High (Due to very rapid runoff)
Salinity	Nil

Soil Description:
Generally little or no soil is present. If present, soils are shallow to very shallow, skeletal in form with medium sandy textures. (See Soil Association 2)

Unit:
Es 3 (Steep escarpment, soil type 3)

Location:
Located only in the vicinity of the Blue Range east of the Cathedral Range.

Description:
Somewhat sinuous steep to very steep dissected escarpment. The unit includes the only Rhyodacite Plateau in the study area, and it abuts the Silurian-Devonian sedimentary hilly terrain to the west and grades into the ridge-mountainous Rhyodacite terrain in the east. Areas are usually well treed but surfaces are typically bare and rocky.

Stream Description:
Streams show a typically non-tributary and unidirectional channel pattern with often deeply incised rocky drainage courses.

Present Land Use:
Used for conservation and recreation.

Land Degradation:
Areas have very steep slopes and little surface soil and consequently runoff may cause severe water erosion.

Surface runoff	Rapid to very rapid
Flood Risk	Nil
Waterlogging Class	Nil
Erosion Type	High (Due to very rapid runoff)
Salinity	Nil

Soil Description:
Generally little or no soil is present. If present, soils are shallow to very shallow, skeletal in form with medium sandy textures. (See Soil Association 3)

Unit:
Es 4 (Steep escarpment, soil type 4)

Location:
i) Tallarook
ii) Surrounding the plateau near Dropmore, north of the Goulburn River system near Yea.

Description:
Sinuous to linear, steep to very steep (sometimes precipitous), dissected escarpment. The unit includes a number of plateaux and is usually in close association with sandstone terrain. Areas have stunted vegetation with an open weak understorey. Surfaces are usually rocky and fragmented. Some areas to the east of the Dropmore Plateau may exhibit minor secondary crests.

Steam Description:
Streams show a typically non-tributary and unidirectional channel pattern with often deeply incised rocky drainage courses.

Present Land Use:
Used for conservation and recreation.

Land Degradation:
Areas have very steep slopes and little surface soil and consequently runoff may cause severe water erosion.

Surface runoff	Rapid to very rapid
Flood Risk	Nil
Waterlogging Class	Nil
Erosion Type	High (Due to very rapid runoff)
Salinity	Nil

Soil Description:
Generally little or no soil is present. If present, soils are shallow to very shallow, skeletal in form with medium sandy textures. (See Soil Association 4)

Unit:
Hr 4 (Rolling hills, soil type 4) (found within escarpment terrain)

This unit has been described collectively with Hs, Hr and Hu 4 units in the hill terrain pattern.

The Hr 4 unit does occur within the larger escarpment terrain pattern. Its features are similar to those of the hilly terrain and a general description has been included below.

Location:
Mount William (in the west of the survey region) 8 km north-east of Lancefield.

Description:
Moderately inclined rounded to conical mountain with general slopes of 15%-20% (some areas reach 30%). Rising to an elevation of 807 m ASL, the unit includes the components of a lightly forested, well grassed, sometimes rocky crest, moderately inclined (sometimes steep) sideslopes, drainage courses, foothills and minor benches.

Stream Description:
Channel networks show a radial pattern with stream spacing of 200 m to 300 m at the base of the mountain. Streams are seasonal with only very light flows in the winter months. Stream drainage heads are well grassed, smooth, broad and concave. At the base of the slopes some gullying may occur, however they are usually shallow with stable well grassed banks and rocky floors.

Present Land Use:
The area is extensively used for grazing of cattle with some pine plantations on the steeper areas. Minor clumps of trees have been set aside for protection of stock in the harsher winter.

Land Degradation:
The unit shows little evidence of land degradation. Where rocky, the area has isolated clumps of trees established. Access is by well formed tracks with most land fenced into paddocks. General road access is restricted.

Surface runoff	Moderate
Flood Risk	Nil
Waterlogging Class	Nil
Erosion Type	Sheeting (moderate) Landslip (minor)
Salinity	Nil

Soil Description:
Shallow to moderately deep well structured red friable duplex soils. Some areas may exhibit a yellowish red to yellowish brown colouring and an A_2 horizon. (See Soil Association 4)

Land Units associated with mountainous terrain

Unit:
Mr 1 (Rolling mountains, soil type 1)

Location:
Mount William (in the west of the survey region) 8 km north-east of Lancefield.

Description:
Moderately inclined rounded to conical mountain with general slopes of 15%-20% (some areas reach 30%). Rising to an elevation of 807 m ASL, the unit includes the components of a lightly forested, well grassed, sometimes rocky crest, moderately inclined (sometimes steep) sideslopes, drainage courses, foothills and minor benches.

Stream Description:
Channel networks show a radial pattern with stream spacing of 200 m to 300 m at the base of the mountain. Streams are seasonal with only very light flows in the winter months. Stream drainage heads are well grassed, smooth, broad and concave. At the base of the slopes some gullying may occur, however they are usually shallow with stable well grassed banks and rocky floors.

Present Land Use:
The area is extensively used for grazing of cattle with some pine plantations on the steeper areas. Minor clumps of trees have been set aside for protection of stock in the harsher winter.

Land Degradation:
The unit shows little evidence of land degradation. Where rocky, the area has isolated clumps of trees established. Access is by well formed tracks with most land fenced into paddocks. General road access is restricted.

Surface runoff	Moderate
Flood Risk	Nil
Waterlogging Class	Nil
Erosion Type	Sheeting (moderate) Landslip (minor)
Salinity	Nil

Soil Description:
Shallow to moderately deep well structured red friable duplex soils. Some areas may exhibit a yellowish red to yellowish brown colouring and an A_2 horizon. (See Soil Association 1)

Units:
Sm 2 (Moderate slopes, soil type 2)
DSm 2 (Moderate drainage slopes, soil type 2)

Location:
The units are scattered across the area and occur in conjunction with the hilly, mountainous and escarpment landform patterns. (DSm 2 is restricted to a small area near Mt. Sugarloaf).

Description:
The units are moderately inclined slopes and drainage slopes on sedimentary and metamorphosed geologies with gradients of 10-20% (generally 15%). They occur immediately adjacent to the steep sloping terrain patterns Es 2, Ms 2 and Hs 2 and abut the gentle Sg and very gentle DC units. They have been separately delineated because of their distinctiveness from the steeper patterns and have been grouped with the respective landform patterns.

On public land, units are protected by tree cover and incorporate varying amounts of scree – this is particularly so close to escarpment and mountainous areas. The drainage slopes have very rocky surfaces. The areas north of Alexandra, south of Broadford and near Mt. Prospect have been cleared and have light grass cover with gravelly to smooth surfaces.

Stream Description:
Drainage courses tend to show a unidirectional to convergent channel network with close channel spacing in the range of 200 m to 300 m. Most channels are dry in summer months. Drainage channels are often incised with rocky scree or bedrock floors. In forested areas they are well treed with considerable amounts of forest litter.

Present Land Use:
Areas abutting the escarpment and mountainous country south of Alexandra are used predominantly for conservation and recreation. Cleared areas are used for agriculture particularly grazing by sheep and to a lesser extent cattle. Due to their accessibility these areas are favoured for rural retreat development.

Land Degradation:
Areas adjacent to the escarpment have greater runoff and subsequently greater potential for sheet erosion that the hilly terrain. Where forest cover occurs limits the effect of rainfall and inhibits runoff. In cleared areas the channels are predominantly dry throughout the summer period and have been affected by grazing. Runoff has caused to some gullying at the base of the units.

Surface runoff	Slow in forested areas. Moderately to rapid runoff in grazed areas.
Flood Risk	Nil
Waterlogging Class	Nil
Erosion Type	Sheet erosion on the shoulders of drainage lines in the cleaned areas, some gullying in lower situations. Forested areas are typically stable

Salinity	Nil

Soil Description:
Soils are variable. Off the escarpment and steeper mountains they are shallow to moderately deep rocky dark brown gradational light clays. In hilly and cleared situations soils show horizontal with bleached A_2 horizons sometimes at the surface due to surface soil loss. (See Soil Association 2)

Units:
Mvs 2 (Very steep mountains, soil type 2)
Ms 2 (Steep mountains, soil type 2)
Mr-s 2 (Rolling to steep mountains, soil type 2)
Mr 2 (Rolling mountains, soil type 2)

Location:
The areas are situated to the east of the study area, north of the Alexandra township and south beyond the Blue and Black Range plateaux to the Great Dividing Range.

Description:
Very steep, steep and rolling mountainous terrain on sedimentary and metamorphosed sedimentary geologies. The area are often dissected and exhibit slopes in the range of 50-60% in steep areas (Cathedral Range >100%), to 25% in the moderate rolling situations. Generally the units range from 450 m to 600 m ASL. Some peaks near the Eildon Reservoir in the Big River State Forest are in excess of 800 m ASL with Rocky Peak (985 m ASL) the highest. Some area north of Alexandra have been cleared but the units are predominantly forested public land. The very steep Cathedral Range (Mvs 2) has limited tree cover and has a very rocky to bare surface. The units include dissected rough and linear ridges, rounded and conical crests; steep and moderately inclined rocky and smooth sideslopes; foot hills, lower benches and drainage courses which are smooth and rounded in upper situations, to concave to vertically sided in lower areas.

Stream Description:
Courses are unidirectional, essentially perpendicular to the ridgelines; channel frequency is typically 1 per km with a tributary pattern. Most channels are dry in summer months. Upper channels are non-incised smooth, broad and concave. Lower slope situations become incised and deep but essentially stable gullies are common. These gullies are generally <3 m deep with vertical sides bottoming onto sandstone.

Present Land Use:
i) Forested areas: Little timber harvesting is now being undertaken however these areas are being set aside for future needs. Principle use is for recreation and conservation such as sightseeing, bush walking, and boating on Lake Eildon. The land units form the catchment to the Eildon Reservoir.
ii) Cleared areas: Typically this land is grazed by sheep on the upland areas and cattle on the lower situations.

Land Degradation:
Forested areas: These areas are generally public land. Vegetative cover offers some protection against wind and water erosion; some access areas show minor batter slip and extrusive sapping. Inconsiderate usage of bush tracks has led to deep wheel ruts.

Cleared areas: Generally private land and used for agriculture. Fencing has restricted access and has limited intruder caused problems. Some mismanagement by extreme overgrazing has resulted in wind erosion and also A horizon sapping on lower situations. The wind erosion effects are accentuated on the north facing slopes which dry out quicker and become more droughty in summer months.

Surface runoff	Slow (on forested areas) Moderate to rapid (cleared areas)
Flood Risk	Nil
Waterlogging Class	Nil
Erosion Type	Sapping on roadside cuttings Wind sheeting (moderate on cleared areas)

Salinity	Nil

Soil Description:
A complex of uniform fine textured clays and gradational soils, which incorporate large percentages of broken rock and gravel in their subsoil. They are often typified by a bleached dry hard erosion resistant A_2 horizon. (See Soil Association 2)

Units:
Ms 3 (Steep mountains, soil type 3)
Mr 3 (Rolling mountains, soil type 3)

Location:
The units occur in the east of the study area, incorporating the Torbreck and Royston Ranges. They are a southern extension of the escarpment around the Blue Range where the mountainous terrain forms the southern fringe of the catchment.

Description:
These units are typically rocky densely forested mountainous and mountain slope terrain with steep to moderately inclined gradients. Slopes are generally <45%, ranging from 12-60%. The areas have numerous ridge lines typically aligned NNW; sideslopes and crests are often rocky, well treed and access is generally limited to unconsolidated earthen roads and fire tracks. The units are generally found between 800 m and 1000 m ASL, however Mount Torbreck is the highest point at 1514 m on the steep mountainous terrain to the west.

Stream Description:
Stream channels are typically rocky, moderately incised with many broken and fallen trees along their length. Generally they show a non directional integrated pattern with the major streams including Snobs Creek, the Rubicon and Royston Rivers tending strongly in a north-west orientation. A number of picturesque areas occur along these major channels. In the winter months many streams cannot be forded by vehicles.

Present Land Use:
Presently the principal land use is for recreation and conservation, particularly for bushwalking and tourist needs. In the past all areas were heavily logged. Small areas have been set aside for a hydro-electric power station on the Rubicon River to supply power locally.

Land Degradation:
The units show minimal to no land deterioration problems. All situations are well forested and protected, soil permeabilities allow for good infiltration with minimal overland flow. However if this protective cover is removed or areas disturbed it is to be expected that the soils would be eroded. Roadside and track cuttings are often unstable, due mainly to rocks in the profiles and the large volumes of water that may percolate through the soil. Tracks are often very slippery and boggy with deep wheel ruts common on some smaller roads.

Surface runoff	Moderately rapid to slow
Flood Risk	Nil
Waterlogging Class	Nil
Erosion Type	Nil
Salinity	Nil

Soil Description:
Deep friable brown to dark red whole coloured gradational well structured rough ped earths. (See Soil Association 3)

Unit:
DSm 3 (Moderate drainage slopes, soil type 3)

Location:
The unit occurs within the mountainous terrain pattern and incorporates the Storm Creek and parts of the Tweed Spur road approximately 10 km south east of Taggerty township. The unit abuts the western escarpment of the Blue Range and the Mt Sugarloaf mountains. For the purposes of mapping the unit is topographically an integral part of the MS 2 unit near Mt Sugarloaf.

Description:
The unit is a moderately inclined drainage slope off the Devonian igneous deposits. The area is densely forested and typically rocky with rock scree. The area is generally inaccessible. Elevation ranges between 400 m to 600 m ASL with slopes in the range of 20%-30%.

Stream Description:
Drainage patterns are typically unidirectional and convergent. The stream channels are rocky, moderately incised with fallen forest vegetation common. The areas are not drought prone in most years but streamflows usually cease in the November/December period.

Present Land Use:
The area is public land and is presently only used for recreation and conservation.

Land Degradation:
The area is particularly stable and shows only minimal natural streambank fall. The pressure of a well formed road and restricted vehicle access allows the native forest to confine any surface disturbance.

Surface runoff	Slow – very slow
Flood Risk	Upslope nil – minor in lower situation
Waterlogging Class	Nil – flat minor depressions seasonally waterlogged
Erosion Type	Minor streambank block fall
Salinity Nil	

Soil Description:
Deep friable brown to dark red whole coloured gradational well structured rough ped earths. Surface litter common in upslope area. (See Soil Association 3)

Units:
Ms 4 (Steep mountains, soil type 4)
Mr 4 (Rolling mountains, soil type 4)

Location:
The SP units occur in the south east of the study area, immediately north of the Great Dividing Range. They typically abut the mountainous hilly terrain of sedimentary and Rhyodacite geology.

Description:
These units include steeply sloping and rolling moderately inclined terrain, with numerous exposed boulders. Slopes are typically 40-50% (Ms) and 25% (Mr), with elevations reaching 800 m ASL (generally ranging from 500 m to 600 m). The areas are well forested with a number of large granitic tors often hidden from roadside view. Components include small flat but sometimes rocky crests, smooth steep and moderately sloping sideslopes, and rocky and sandy drainage courses.

Steam Description:
Drainage patterns are usually unidirectional to convergent and well defined. Often the forest vegetation has maintained some stability to channels and has reduced runoff. Downslope areas are often incised and often have rocky floors.

Present Land Use:
Generally the areas are under forest and are Public Land and have been set aside for general recreation and conservation use.

Land Degradation:
Well forested areas are generally protected against water and wind erosion. On some of the sparsely treed and cleared areas the lack of vegetation cover has led to some sheeting and stripping of topsoils. Some crest areas show exposed boulders which are at risk to wind erosion.

Surface runoff	Slow to very slow
Flood Risk	Nil
Waterlogging Class	Nil
Erosion Type	Wind erosion on exposed areas
Salinity	Nil

Soil Description:
i) Shallow to moderately deep pale brown to yellow very gravelly duplex soils and gradational earths (found on the upper slopes and crest areas).
ii) Deep well structured very friable uniformly textured to slightly gradational profiles. Some areas may show sandy inclusions (general areas). (See Soil Association 4)

Land units associated with hilly terrain

Units:
Hs 2 (Steep hills, soil type 2)
Hr 2 (Rolling hills, soil type 2)
Hu 2 (Undulating hills, soil type 2)
Hs-r 2 (Steep to rolling hills, soil type 2)
Hr-s 2 (Rolling to steep hills, soil type 2)

Location:
The steeper hills (Hs) occur near the centre of the catchment, in the vicinity of Mount Disappointment Plateau and areas further east along the Yea Spur and Minto hills. The rolling terrain type (Hr) occurs generally off the higher mountainous areas. Undulating terrain (Hu) is restricted to a small area west of the old Hume Highway north of Broadford.

Description:
Hilly units with steep (typically <55%) moderate (typically <25%) and gentle (typically 8-10%) slopes. The units (Hs and Hr) include large expanses of dissected terrain which tend to be rocky. Generally hills are cleared, smooth and rounded in cross section, with timbered areas predominantly public land. The undulating areas tend to rise to 300 m ASL and up to 400 m near the plateau and dissected escarpment. The units include components consisting of rounded and conical crests, bare sometimes rocky side slopes, footslopes, minor benches, swales flats and drainage courses.

On private land, particularly on the crests of the steep hills near Strath Creek, areas have little or no surface vegetation. Grass cover has been stripped by over-grazing.

Stream Description:
Drainage courses tend to show centrifugal and non-directional channel networks; moderate to wide stream channel spacing in the range of 300 m to 600 m is typical; most channels are dry in the summer months. Upper drainage areas are very broad and rounded with the lower situations showing some incision. Where incision is apparent, erosional gullies have been formed with 1 m to 2 m vertical sides.

Present Land Use:
Within public land, the forested areas are used for recreation and conservation. Some areas have been planted to softwoods but no logging is presently underway.

Generally the cleared areas are used for grazing.

Due to location accessibility, rural residential development has had an impact over the past 5 to 10 years close to the larger townships of Seymour, Yea, Alexandra and Mansfield.

Land Degradation:
These units suffer similar problems to those experienced on mountainous terrain. On a number of north facing slopes early draughting coupled with overgrazing by sheep has led to denuding of surface cover. Some local landholders have sought to contain this problem by tree planting with both fenced and open management programs. Gullying is essentially restricted to lower situations and is similar to that found on the lower mountainous slopes. Tunnelling is a problem on some areas particularly in the west where isolated Silurian sediments occur. Roadside cuttings often show slumping and sapping of surface and subsurface materials due to sub-soil dispersion and slaking. Cuttings may also be unstable due to weak fractured bedrock. A number of the lower gullies and flatter components exhibit various degrees of salting typified by spiny rush and dwarf barley grass. In some areas fencing to exclude stock appears to have lessened the effects of salting.

Some modern housing development has been placed so that track access and house footings could become unstable due to channelling of runoff.

Surface runoff	Moderately rapid to rapid
Flood Risk	Nil
Waterlogging Class	Nil to temporarily ponded
Erosion Type	Wind erosion on crests
	Gullying in lower situations
	Tunnelling in some western areas
	Batter slumping and slipping
Salinity	Lower drainage situations

Soil Description:
Shallow to moderately deep uniformly fine textured to gradational profile which often incorporates varying quantities of gravel.

Profiles often exhibit a bleached hardsetting A_2 horizon with a yellowish brown to strong brown, weak to moderate subangular blocky subsoil. (See Soil Association 2).

Units:
Sm 2 (Moderate slopes, soil type 2)

Location:
The units are scattered across the area and occur in conjunction with the hilly, mountainous and escarpment landform patterns. (DSm 2 is restricted to a small area near Mt. Sugarloaf).

Description:
The unit is a moderately inclined slope sedimentary and metamorphosed geologies with gradients of 10-20% (generally 15%). They occur immediately adjacent to the steep sloping terrain patterns Es 2, Ms 2 and Hs 2 and abut the gentle Sg and very gentle DC units. They have been separately delineated because of their distinctiveness from the steeper patterns and have been grouped with the respective landform patterns.

On public land, units are protected by tree cover and incorporate varying amounts of scree – this is particularly so close to escarpment and mountainous areas. The drainage slopes have very rocky surfaces. The areas north of Alexandra, south of Broadford and near Mt. Prospect have been cleared and have light grass cover with gravelly to smooth surfaces.

Stream Description:
Drainage courses tend to show a unidirectional to convergent channel network with close channel spacing in the range of 200 m to 300 m. Most channels are dry in summer months. Drainage channels are often incised with rocky scree or bedrock floors. In forested areas they are well treed with considerable amounts of forest litter.

Present Land Use:
Areas abutting the escarpment and mountainous country south of Alexandra are used predominantly for conservation and recreation. Cleared areas are used for agriculture particularly grazing by sheep and to a lesser extent cattle. Due to their accessibility these areas are favoured for rural retreat development.

Land Degradation:
Areas adjacent to the escarpment have greater runoff and subsequently greater potential for sheet erosion than the hilly terrain. Where forest cover occurs limits the effect of rainfall and inhibits runoff. In cleared areas the channels are predominantly dry throughout the summer period and have been affected by grazing. Runoff has caused to some gullying at the base of the units.

Surface runoff	Slow in forested areas,. Moderately to rapid runoff in grazed Areas.
Flood Risk	Nil
Waterlogging Class	Nil
Erosion Type	Sheet erosion on the shoulders of drainage lines in the cleaned areas, some gullying in lower situations.
Salinity	Nil

Soil Description:
Soils are variable. Off the escarpment and steeper mountains they are shallow to moderately deep rocky dark brown gradational light clays. In hilly and cleared situations soils show some horizontal with bleached A2 horizons sometimes at the surface due to surface soil loss. (See Soil Association 2)

Units:
Hr 4 (Steep hills, soil type 4)
Hr 4 (Rolling hills, soil type 4)
Hu 4 (Undulating hills, soil type 4)

Location:
The units occur throughout the catchment but are principally in the northern sections within the Strathbogie Ranges; about Mount Helen north of Yea, and north of Lancefield in the west. Small areas also occur immediately adjacent to the Great Dividing Range in the south.

Description:
These units are steep and moderately rolling sideslopes together with undulating hilly areas which exhibit a recurring pattern of hills with gentle sideslopes. Slopes are variable ranging from 40-50% for steep areas, 25% in the case of moderate areas and 10% for undulating situations. In a number of instances the rolling and steep hills incorporate small areas of undulating components which abut the higher sedimentary terrain. Most areas have rock outcrop with large surface boulders common. The general lack of treed vegetation gives rise to the distinctive landscape. Large level rock pavements have arisen where soils have been stripped away and often exhibit thin sheets of water seeping over them in the autumn and spring.

Stream Description:
The drainage areas usually show a unidirectional to convergent well-defined stream pattern. Often some vegetation has maintained some stability by slowing runoff. Within the rolling hills west of Pyalong, higher runoff is experienced and drainage areas tend to a non-directional, broad, vegetation free, sandy open shallow channels. Down slope drainage areas are often incised and often have rocky floors.

Present Land Use:
Generally the areas are used for grazing by sheep and to a lesser extent cattle. Following clearing some years ago, areas have been sown to native and improved pastures. Minor cropping is limited to the broad, very gently inclined, lower components and is often restricted to fodder crop usage. Rural residential development is limited and restricted to the immediate vicinity of the townships.

Land Degradation:
On cleared areas the lack of vegetation creates a risk of wind erosion during prolonged dry periods and overgrazing will cause surface soil loss. Roadside batters often exhibit A_2 sapping in wetter drainage depressions.

Surface runoff	Moderate to rapid
Flood Risk	Nil
Waterlogging Class	Nil

Erosion Type	Wind stripping Batter collapse
Salinity	Nil

Soil Description:
Moderately deep to shallow pale brown to yellow, very gravelly duplex soils and gradational earths, which occur in areas north of Yea or east of Pyalong.

Some situations in the south of the catchment soils are deep red, well structured, very friable uniformly fine textured to slightly gradational profiles.

Boulders occur in most situations. (See Soil Association 4).

Unit:
DSm 4 (Moderate drainage slopes, soil type 4)

Location:
The unit is an integral part of the hilly terrain pattern and occurs approximately 16 km east of the Mongalore township. It abuts the Es 4 Smith range escarpment units. Access is limited to private roads and small seasonal agricultural tracks.

Description:
Moderately inclined drainage slopes with gradients from 12%-20% (generally in the order of 15%), elevation of 400 m ASL. The areas have been predominantly cleared and bare patches around granite tors are common. The area is drought prone and has a short growing season. Somewhat undulating the area is typified by granite boulders as in the hilly units.

Stream Description:
The drainage network is unidirectional to convergent in directionality and well defined. Streams flow westerly and take drainage from the escarpment units in the east. The area has been cleared for grazing with the result that runoff is high. The drainage lines are generally sandy and open in appearance. Downslope areas are often incised and have rocky floors.

Present Land Use:
Areas are predominantly privately owned and used for grazing by sheep. Some goats are also stocked in the area. Minimal rural residential subdivision has occurred.

Land Degradation:
The lack of vegetation creates a risk of wind erosion. Stock grazing and effects have denuded the surface around granite tors and wind erosion can be a problem. Roads and tracks tend to channel runoff with the result that small gullies and channels occur. With soil surfaces disturbed the spewy A2 soil horizon can be exposed which erodes quickly.

Surface runoff	Moderate to rapid
Flood Risk	Nil
Waterlogging Class	Nil
Erosion Type	Wind stripping, overland, sheeting, minor road gullying
Salinity	Nil

Soil Description:
Shallow to moderately deep pale brown to yellow, very gravelly duplex soils and gradational earths. Boulders are common on the surface. (See Soil Association 4).

Unit:
Hs 5 (Steep hills, soil type 5)

Location:
Restricted to the north eastern section of the survey area and immediately south of Mansfield.

Description:
An isolated hill with steep slopes inclined 35-45%. The unit forms the eastern side of the Blue Range. On the western side of the range, the terrain includes steep units on rhyodacite. Elevation is typically 400 m to 600 m ASL, with individual crest components being 490 m and 600 m+ respectively. The units incorporates rocky, rounded crests, steep to moderately inclined sideslopes (which have treed and cleared areas), minor foothills and drainage courses.

Stream Description:
The stream channels trend easterly and drainage courses are moderate to closely spaced with a unidirectional erosional channel network. Channels are generally 'V' shaped with rocky or rock exposed stream floors. Typically the sides exhibit a rough to rocky appearance showing blockfall and slumping. Often at the base of the hillslope the channels are broader with vegetation cover on the sediments offering some protection from further degradation.

Present Land Use:
The unit is frequently grazed by cattle with large areas left under forest as a conservation measure. Minor rural residential development occurs to the north near Highton.

Land Degradation:
The area has shallow soils which often have a residual stone cover on the crests. Under natural conditions there is little or no grass cover. If left exposed, the area suffers from sheet erosion. Gullies occur and block fall and slumping are common. Downslope, the channels sometimes widen and may have a good grass protective cover.

Surface runoff	Moderately rapid to very rapid
Flood Risk	Nil
Waterlogging Class	Nil
Erosion Type	Water and wind erosion Gully
Salinity	Nil

Soil Description:
Topsoil absent, skeletal soils on very shallow, often rocky uniformly fine textured reddish brown strongly structured clays. (See Soil Association 5).

Units:
Hr 7 (Rolling hills, soil type 7)
Hu 7 (Undulating hills, soil type 7)

Location:
These units are situated in the west of the catchment near Broadford and north of Kilmore.

Description:
A series of hill units with moderate to gentle sideslopes. The areas are generally cleared with isolated clumps of trees lower slopes. Units exhibit varying amounts of exposed rock which is more prevalent on the narrow components and along the shoulders of the hills. Trafficability in these areas is difficult to impossible. The hill units reflect the presence of eruption points near Pretty Sally, Green Hill and Mount Fraser. Components include small and large flats, crests, narrow rocky ridges and smooth moderate to gently inclined side slopes. Small areas within the moderately inclined rolling granitic terrain to the west show residual basaltic capping features. These residuals have been included in this section because they are similar to the rolling terrain landform.

Stream Description:
Generally drainage courses take on a non-directional tributary pattern with stream spacing varying from 150 m to 300 m. The closer spacings tending to be more confined to the steeper terrain types. Along the shoulders of channels and in the channels numerous rocks occur. Areas are typically well grassed.

Present Land Use:
Typically areas are grazed by sheep and to a lesser extent cattle. Cropping is restricted due to slope and rock. Grazing relies on natural seepage and stream channels for water points, because dam construction is difficult and would require moderate to extensive management techniques.

Land Degradation:
The areas have limited tree protection and grass cover is often eaten out in summer months. Wind and sheet wash occurs, accentuated by the high runoff from the impermeable soil and exposed rock. Overgrazing by stock and lack of protection in the drainage courses can lead to soil loss down slope. However, this could be less than from the associated sedimentary terrain.

Surface runoff	Moderately rapid to slow
Flood Risk	Nil
Waterlogging Class	Nil
Erosion Type	Minor wind erosion in summer months Water sheeting losses on the shoulders of hill units
Salinity	Nil

Soil Description:
Shallow to deep (minor) uniformly heavy textured well structured impermeable clays. Three principal types occur, those with greyish brown, reddish brown and black subsoils. (See Soil Association 7).

Land units associated with low hills

Units:
LH 2 (Low hills, soil type 2)
LHr 2 (Rolling low hills, soil type 2)
Lhu 2 (Undulating low hills, soil type 2)

Location:
These units occur extensively throughout the study area, with approximately 80% of the units located in the western region between Heathcote Junction, Seymour and Pyalong.

Description:
Low hill units with moderate (typically 25%) and gently inclined (8-10%) slopes. Units are generally cleared, smooth and rounded in cross-section with treed areas restricted to public land. Elevations are generally in the order of 200 m to 250 m, but some moderately sloping areas rise to 300 m in the east. Components include rounded and conical crests, minor benches, swales, flats, footslopes and drainage courses.

Stream Description:
Drainage courses tend to show centrifugal and non-directional channel networks; moderate to wide stream channel spacing the range of 300 m to 600 m is typical; most channels are dry in summer months. Upper drainage areas are very broad and rounded with the lower situations showing some incision. In some downslope incised areas, erosional gullies and tunnelling occurs.

Present Land Use:
Generally areas are private land and are used for grazing by sheep and to a lesser extent by cattle. Due to their accessibility, rural retreat housing development has had an impact in the past decade.

Land Degradation:
These units have similar problems to those experienced on mountainous terrain. On an number of north facing slopes, early stock draughting overgrazing by sheep stripped surface protecting cover. Some local landholders have sought to contain this problem by tree planting using both fenced and open management techniques. Gullying is essentially restricted to lower situations and is similar to that found on the lower mountainous slopes. Tunnelling is a problem on some areas particularly in the west where isolated Silurian sediments occur. Roadside cuttings often show slumping and sapping of surface and subsurface materials due to sub-soil dispersion and slaking. Cuttings may also be unstable due to weak fractured bedrock. A number of the lower gullies and flatter components exhibit various degrees

of salting typified by spiny rush and dwarf barley grass. In some areas fencing to exclude stock has apparently reduced the effects of salting.

Some modern housing development has been placed so that track access and house footings could become unstable due to the inappropriate channelling of runoff.

Surface runoff	Moderately rapid to slow Overgrazed areas may show rapid runoff
Flood Risk	Nil
Waterlogging Class	Nil
Erosion Type	Variable gullying in lower situations Tunnelling in some western areas
Salinity	Generally nil Some lower situations moderate - high

Soil Description:
Soils are a complex of uniform fine textured clays and gradational soils which incorporate varying percentages of rock and gravel in their subsoil. They are typified by a bleached dry hard A_2 horizon. Depths are variable and dependent upon topographic position. (See Soil Association 2).

Unit:
Lhu 4 (Undulating low hills, soil type 4)

Location:
The units are located in the west and north west of the project area. They typically abut or are in very close proximity to the higher and steeper granitic hills.

Description:
Undulating low hill units with gentle side slopes exhibiting gradients in the order of 8-10%. Rock outcrop with large surface boulders is common and the units show similar surface features to their hilly counterparts.

Stream Description:
The drainage stream pattern exhibits a non-directional to convergent well defined sandy open shallow channels. Typically these are free of treed vegetation but may have thick grass cover. Downslope drainage areas are often incised with rocky floors.

Present Land Use:
Areas are typically grazed by sheep. Little use has been made for fodder cropping and residential development is restricted due to the distance from populated centres and the stoniness of the soils.

Land Degradation:
Very similar problem to those experienced on the H4 units occur in the LH units. Wind erosion during prolonged dry periods has been accentuated about the base of rocks and generally on north facing sideslopes. Overgrazing by stock has led to denuding at the base of boulders with further problems being caused by wind erosion.

Soil Description:
Soil include:

i) deep stony gravelly and sandy apedal pale brown sometimes mottled gradationals;

ii) moderately deep to shallow pale brown to yellow very gravelly duplex and gradational earths. (See Soil Association 4).

Unit:
Lhu 7 (Undulating low hills, soil type 7)

Location:
The units occur in the west of the catchment between granitic and sedimentary geologies near the townships of Kilmore and Seymour.

Description:
Undulating gentle sloping low hill terrain on basalt. The unit exhibits varying amounts of exposed rock particularly on sideslopes and sideslope-crest shoulders. The recurring undulating pattern is generally though to be a reflection of partial dissection by numerous drainage channels. Areas are predominantly treeless with sparsely scattered eucalypts. Surfaces are well grassed but this is variable depending upon the grazing management.

Stream Description:
Generally drainage courses take on a non-directional to tributary pattern with 300 m stream spacing. Often this pattern may be very diffuse with a tendency to shallow open depressions. Along some shoulders it is not uncommon for numerous rock outcrop to occur. Areas are typically well grassed and are grazed throughout the year.

Present Land Use:
The units are predominantly freehold and used for the grazing by cattle and sheep. There is presently some pressure for rural residential subdivision throughout the unit.

Land Degradation:
Cropping is restricted due to rock. Grazing often relies on natural seepage as dam construction is difficult and would require moderate to extensive management techniques.

Surface runoff	Moderately rapid to slow
Flood Risk	Nil
Waterlogging Class	Nil
	Temporarily ponded in bench depressions
Erosion Type	Wind erosion in summer months
	Water sheeting on shoulder components
Salinity	Nil

Soil Description:
Shallow to deep uniformly heavy textured well structured impermeable clay including those with:
- greyish brown subsoils
- reddish brown subsoils
- black subsoils. (See Soil Association 7).

Land units associated with rises and gentle slopes

Unit:
Sg 1 (Gentle slopes, soil type 1)

Location:
The unit occurs in the far south west of the survey area at the base of Mount William.

Description:
This is a gentle sloping unit resulting from colluvial wash off the mountainous Cambrian materials. Generally the area has rock free smooth and grassed surfaces, which have been cleared for agricultural use. Minor drainage areas dissect the unit.

Stream Description:
Drainage courses are few in number but generally take on a unidirectional to convergent pattern. Channels are often slightly gullied in form with shallow vertical sides. In many cases some rock may be visible in the channel floors.

Present Land Use:
The unit is easier to manage than mountainous counterparts and is used for cattle grazing. Minor areas are being investigated for rural residential development due to their close proximity to Lancefield and due to the attractive backdrop provided by Mount William.

Land Degradation:
The area has minor gully erosion risk. The unit receives runoff from the mountainous Mr 1 unit, and this has resulted with the formation of minor shallow sometimes broad gullies. These areas are typically stable because of present management practice.

Surface runoff	Moderately rapid
Flood Risk	Nil
Waterlogging Class	Nil
Erosion Type	Minor gullying
Salinity	Nil

Soil Description:
Moderately deep to deep well structured friable generally whole coloured duplex soils (Dr 5, Dr 4) some yellowish soils which may be gradational in form. Stones and gravel common at depth. (See Soil Association 1).

Units:
Ru 2 (Undulating rises, soil type 2)
Sg 2 (Gentle slopes, soil type 2)
Svg 2 (Very gentle slopes, soil type 2)
DSg 2 (Gentle drainage slopes, soil type 2)
DSvg 2 (Very gentle drainage slopes, soil type 2)
DSg 2/4 (Gentle drainage slopes, soil type 2/4)

Location:
Units are located throughout the survey area, particularly at the base of mountainous and hilly terrain types.

Description:
The units are low, undulating, gently sloping rises incorporated as Ru units and residual slopes (Sg and Svg units) off the higher terrain types including mountainous and hilly units. The areas exhibit features similar to the low hill units where there are smooth relatively level slopes with some dissection from drainage courses. The drainage slopes (DS units) have numerous channels passing through them and vary from very gentle to moderate sloping terrain.

Stream Description:
Drainage courses tend to show centrifugal and non-directional channel networks; moderate to wide stream channel spacing in the range 300 m to 600 m is typical; most channels are dry in summer months. Upper drainage areas are very broad and rounded with the lower situations showing some incision. In some downslope incised areas, erosional gullies and tunnelling is common.

Present Land Use:
Generally areas are private land and are used for grazing by sheep and to a lesser extent by cattle. Due to their accessibility, rural residential housing development has had an impact in the past decade.

Land Degradation:
These units have similar problems to those experienced on mountainous terrain. On a number of north facing slopes early stock draughting and overgrazing by sheep has led to denuding of surfaces. Some landholders have sought to contain this problem by tree planting. Gullying is essentially restricted to lower situations and is similar to that found on the lower mountainous slopes. Tunnelling is a problem on some areas particularly in the west where isolated Silurian sediments occur. Roadside cuttings often show slumping and sapping of surface and subsurface materials due to dispersion and slaking. These cuttings may also be unstable due to weak fractured bedrock. A number of the lower gullies and flatter components exhibit various degrees of salting typified by spiny rush and dwarf barley grass. In some areas fencing to exclude stock appears to have lessened the effects of salting.

Some housing development has been placed so that track access and house footings could become unstable due to inappropriate channelling of runoff.

Surface runoff	Moderately rapid to slow Overgrazed areas may show rapid runoff
Flood Risk	Nil
Waterlogging Class	Nil
Erosion Type	Variable gullying in lower situations Tunnelling in some western areas
Salinity	Generally nil Some lower situations – moderate to high

Soil Description:
Soils are a complex of uniform fine textured clays and gradational soils which incorporate varying percentages of rock and gravel in their subsoil. They are typified by a bleached dry hard A_2 horizon. Depths are variable and dependent upon topographic position. (See Soil Association 2).

Unit:
DSg 3 (Gentle drainage slopes, soil type 3)

Location:
The unit is restricted to the headwaters of the Acheron River near Somers Park in the south west of the study area.

Description:
The unit is an upper gentle drainage slope aligned approximately north-south with the Acheron River and with the Acheron Way passing through its centre. Side slopes are gently inclined with gradients in the order 4-8% with flat to very gentle slopes along the areas close to the river system. The unit abuts the rolling and steeply inclined mountainous units Ms 3 and Mr 3 and in the north extends to the Silurian and Devonian low hills. Elevation ranges from 600 m ASL down to 450 m ASL. Generally the area is well treed but a good deal of clearing has taken place when the area was opened up for the Acheron way road project.

Stream Description:
The unit contains the headwaters of the Acheron River and exhibits a convergent channel network. The stream channels are typically rocky, moderately incised with broken forest vegetation along the upper reaches. In the main river along the road the stream is free of debris.

The streams are not drought prone and only the uppermost areas can be forded by 4WD vehicle in summer months.

Present Land Use:
The area is Public Land presently used for recreation and conservation (excepting the major access of the Acheron Way). The area has been lightly logged in the past. A picnic site exists for visitors at Somers Park south west of Mt Richie.

Land Degradation:
The area is particularly stable and shows only minimal natural streambank fall. The presence of a formed road and restricted vehicle access allows the native forest to confine any surface disturbance.

Surface runoff	Slow to very slow
Flood Risk	Upslope nil, minor in lower situations
Waterlogging Class	Generally nil, although flat minor depressions seasonally waterlogged
Erosion Type	Minor streambank block fall
Salinity	Nil

Soil Description:
Deep friable brown to dark red whole coloured gradational well structured rough ped earths. Surface litter common in upslope area. (See Soil Association 3)

Unit:

DSg 4 (Gentle drainage slopes, soil type 4)

Location:
The units occur within the rolling granite hills, in the central north of the survey area and abutting the sandstone hills and Goulburn flood plain near Kerrisdale. The gentle sloping area (DSg) forms a discontinuous band stretching from the vicinity of Mount Anne along Country and Stewart Creeks to Terangaville, on the Goulburn River flood plain. A small area of DSg occurs north of Pyalong in the far west of the survey area.

Description:
The drainage slope units have many features in common with those found within the plateau terrain group. Runoff from the majority of the area finds its way into Hughes Creek and areas to the north west. A minor portion near Terangaville moves into the Goulburn River. Within the units, slopes are somewhat variable with gradients ranging from 4-15%. Elevations range from 350 m to 300 m ASL. Areas generally have smooth surfaces which are often cleared of timber; small clumps of trees are common and large granitic rocks occur throughout.

Stream Description:
Stream channels are typically sandy and grassed. They are usually shallow flat bottomed, U shaped, well defined gully like channels, which overall form a convergent and integrated stream pattern. Conversely channel head waters are smooth and rounded in cross section.

Present Land Use:
The unit is used for grazing (typically sheep) with residential development restricted to agricultural homesteads.

Land Degradation:
The areas are generally stable, although lack of vegetative cover and grazing may lead to some stripping of topsoil layers. Roadside batters are potentially unstable with the dislocation and sapping of the spewy A_2 horizons. Destabilisation of the drainage areas, particularly downslope, could occur if stock movements are not adequately managed.

Surface runoff	Slow to moderately rapid
Flood Risk	Nil
Waterlogging Class	Nil
Erosion Type	Minor sheeting Some gully development downslope
Salinity	Nil

Soil Description:
Complexes of:

i) deep sandy apedal pale brown to yellow, sometimes mottled, gradational soils with a bleached A_2 horizon common.
ii) moderately deep to deep, pale brown to yellow, very gravelly duplex soils sometimes mottled at depth.

Units:
Ru 4 (Undulating rises, soil type 4)
Sg 4 (Gentle slopes, soil type 4)
Svg 4 (Very gentle slopes, soil type 4)

Location:
The units occur in the west of the study area. They typically abut or are close to the higher granitic landform units.

Description:
The units are undulating gently sloping rises with relative reliefs of generally 15 m or less. Slopes are a moderate 12-15%. The gentle slope (Sg) and very gently sloping (Svg) units, show 5-12% and approximately 3% gradients respectively but otherwise are similar to the rise units and occur at the base or abut the higher H or M granite terrain types. All areas may have rock, boulder or pavement. Erosion may occur at the base of rocks where grazing has had an effect.

Stream Description:
The drainage patterns are typically varied with directional to convergent stream patterns. The channels are well defined but shallow with vertical to rounded cross sections. They are typically free of treed vegetation although it is not uncommon for clumps of tree vegetation to occur.

Present Land Use:
Areas are typically grazed by sheep with some limited rural residential land use.

Land Degradation:
Very similar problems to those experienced in the HS and LH units. Erosion has been accentuated about the base of rocks and generally on north facing sideslopes. Overgrazing by stock has led to some denuding at the base of boulders and wind erosion accentuates this problem during prolonged dry periods.

Surface runoff	Moderately rapid to slow
Flood Risk	Nil
Waterlogging Class	Nil
Erosion Type	Some minor gullying, wind erosion at the base of boulders
Salinity	Nil

Soil Description:
i) deep stony gravelly and sandy apedal pale brown, sometimes mottled gradationals;
ii) moderately deep to shallow pale brown to yellow very gravelly duplex and gradational earths. (See Soil Association 4).

Units:
R 5 (Rises, soil type 5)
Sg 5 (Gentle slopes, soil type 5)
DSg 5/2 (Gentle drainage slopes, soil type 5/2)

Location:
The units are small in area and are restricted to the north east near Mansfield Township.

Description:
These units form a well defined group. The very gently inclined often weakly undulating drainage slopes (DSg) with gradients of approximately 2% are the principle unit. It is the chief drainage system for a number of creeks originating to the east of Mansfield. Within the group are smooth rounded rises (R), with gentle slopes of approximately 4% and very low relief which appear to be remnants of the larger undulating plain to the north. The gentle slope (Sg) rests downslope from adjacent hill units and is essentially a foot slope. All areas have smooth, rock free, cleared surfaces with improved pastures.

Stream Description:
The chief drainage patterns are tributary and integrated with numerous streams converging within the drainage slopes into Ford Creek and subsequently into Lake Eildon. Within the drainage slope areas the streams become incised with shallow vertically sided often well treed gullies. The principle drainage line (Ford Creek) is very much more incised than other areas and may extend to a depth of 3-6 metres. Runoff from the steep hilly unit passes through the gently sloping foot slope in a generally unidirectional, non-tributary pattern. Although heading NE towards Ford Creek, a large proportion of this flow is diverted NW towards Mansfield. The NE flowing channels are typically a smoother more concave extension of the incised erosional systems of the steep hilly terrain. The smaller rises generally have no discernible drainage pattern, with runoff channels typically running around their base.

Present Land Use:
The upland areas are used almost exclusively for grazing with sparse rural residential development on the adjacent undulating plain. The drainage slope unit is host to a range of development. The township of Mansfield and its associated development lies in the far east of the unit. Extensive areas are used for fodder cropping and fine seed production. The Mansfield sewerage treatment plant north west of the township is on this group. Given the attractions associated with Jamieson, Lake Eildon and the nearby mountains to the north, this area has large numbers of tourists passing through at all times during the year and is in demand for rural residential subdivision.

Land Degradation:
Under the natural conditions these areas are generally stable, with the gentle to very gentle slopes leading to slow runoff. Other areas (the drainage slopes and low rises) tend not to dry out and consequently have an adequate grass cover throughout most of the summer months to limit any erosion.

Surface runoff	Slow to very slow
Flood Risk	Nil (except in some drainage areas)
Waterlogging Class	Temporarily ponded in lower areas
Erosion Type	Some wind sheeting on crests of rises
Salinity	Nil

Soil Description:
Deep well structured uniformly fine textured to gradational reddish brown-brown earths. The profiles often include a hardsetting impermeable gravelly and unbleached A_2 horizon, together with mottling at depth. Sand may be incorporated in lower situations. (See Soil Association 5).

Units:
Ru 6 (Undulating rises, soil type 6)
Rug 6 (Gently undulating rises, soil type 6)

Location:
The unit occupies a small area south of Mangalore in the north west.

Description:
A landform pattern of undulating rises, of some 10 km^2 with a relative relief of 20 m, in which elevations rise from approximately 145 m to 165 m ASL. Slopes are gently to very gently inclined with gradients in the range of 3-8%. The units are restricted to the Mangalore area adjacent to the recent alluvium AP 9, PI 8 units, and the higher upland terrain of Siluro-Devonian sandstone. A considerable area has been stripped for gravel extraction. Although only small, the units may be subdivided into components comprising broad convex to almost flat crests; gentle to very gentle sideslopes and numerous broad concave, well grassed drainage courses.

Stream Description:
Drainage courses exhibit a fixed centrifugal and integrated channel network. Stream courses have a close to moderate spacing and tend to flow only in the wetter months. Channels may be shallow, broad, well grassed and seasonally flooded but gullies also occur. It is in these shallow erosional gullies that block fall along sidebanks may occur if areas are disturbed by cattle or sheep.

Present Land Use:
The land in general is farmed but scrub vegetation occurs in some areas. Sheep and cattle production on improved pastures commonly occurs while the gravelly nature of the soil restricts extensive cropping. Limited rural residential development from Seymour exists with grazing the main agricultural use. Minor areas have been surface stripped for gravel, but no recent workings seem to be operating.

Land Degradation:
The areas are very gravelly and typically have limited grass cover. As a result wind erosion and surface sheeting, caused by rapid runoff, has in a number of instances resulted in a gravel lag cover. Without adequate surface protection, continued soil loss is to be expected. The small active erosional gullies found in the higher situations are prone to block fall if left unprotected.

Surface runoff	Rapid
Flood Risk	Nil
Waterlogging Class	Nil
Erosion Type	Surface water sheeting Active gully erosion
Salinity	Nil

Soil Description:
Moderately deep to deep, yellowish red to strong brown apedal to weakly structured very gravelly gradational earths. (See Soil Association 6).

Units:
Ru 7 (undulating rises, soil type 7)
Sg 7 (Gentle slopes, soil type 7)
DSg 7 (Gentle drainage slopes, soil type 7)
DSvg 7 (Very gentle drainage slopes, soil type 7)

Location:
These units in the west of the survey area. The rise units (Ru) form a discontinuous band from west of Seymour towards High Camp and onto Kilmore.

Description:
The rises are a recurring undulating pattern which are interspersed with drainage depressions. Typically the units have varying amounts of exposed rock which is more prevalent along the narrower components. The units abut the Silurian hilly and low hill terrain. Typically rock outcrop is less on flatter terrain than within the rises. Generally the areas are moderately dissected, well grassed and smooth. The included drainage systems are somewhat complex as sediment from the adjacent Silurian geology is incorporated.

Stream Description:
Stream definition is diffuse with drainage tending to be via very shallow open depressions sometimes with rocky floors. Generally the floors are well grassed. The drainage patterns take on a non-directional tributary form with spacings of 200 m to 300 m.

Present Land Use:
Typically areas are grazed by sheep and to a lesser extent cattle. Cropping is restricted due to slope and rock. Grazing relies on natural seepage and stream channels for water because dam construction is difficult and would require moderate to extensive management inputs.

Land Degradation:
The areas have limited tree protection and grass is often grazed out in summer months. Wind and sheet wash occurs which is accentuated by the high runoff from the impermeable soil and exposed rock. Overgrazing by stock and lack of protection in the drainage courses could lead to soil loss down slope, although this is usually less than off the associated sedimentary terrain.

Surface runoff	Moderately rapid
Flood Risk	Nil
Waterlogging Class	Temporarily ponded in local depression areas
Erosion Type	Minor wind erosion in summer months, sheet erosion the shoulders of rise units
Salinity	Nil

Soil Description:
Shallow to deep uniformly heavy textured well structured impermeable clays. Three types identified based on subsoil colour:
- greyish brown subsoils;
- reddish brown subsoils;
- black subsoils.

(See Soil Association 7).

Units:
Ru 8 (Undulating rises, soil type 8)
Svg (Very gentle slopes, soil type 8)

Location:
The units are adjacent and occur in the north west of the study area east of the Goulburn Flood Plain near Nalinga Homestead.

Description:
Gentle to very gently inclined drainage slopes which are bounded by the rises of Tertiary gravels and Devonian sandstone with slopes in the order of 2-5%. The units have an open woodland and are weakly dissected by drainage courses from adjacent rise units.

Stream Description:
The unit has a convergent drainage system where the majority of channels move immediately westward to the Goulburn River. Upslope the stream channels are rounded and well grassed in cross section. To the west they are somewhat incised. The drainage system is considerably influenced by material from the sandstone rises in the east.

Present Land Use:
The area is principally used for grazing, particularly by sheep. Some small areas are sown to wheat and spring sown fodder crops. Mangalore Airport together with the township of Avenel are the principal urban development areas, although rural residential development from Seymour is starting to occur. The wooded areas are used for grazing where some protection from winter conditions is possible.

Land Degradation:
Low levels of land degradation were observed, although during drought there is risk of wind erosion. Runoff is slightly higher than on other related units. The concentration of the drainage system in the west also could cause serious erosion if mismanaged.

Surface runoff	Moderate
Flood Risk	Nil
Waterlogging Class	Nil
Erosion Type	Minor wind erosion
	Minor gullying
Salinity	Minor salting in some of the lower reaches

Soil Description:
The area is influenced by adjacent geologies, particularly those of sandstone lithology in the east. Generally materials are deep gradational earths and polygenetic soils; gravels are common. (See Soil Association 8)

Land units associated with plains

Units:
Pu 2 (Undulating plain, soil type 2)
Pl 2 (Level plain, soil type 2)

Location:
The units are scattered throughout the study area with the gently undulating terrain occurring near the Hume Highway and Eildon Reservoir and the level plains around Seymour.

Description:
These units are low lying to flat non flooding topographic units. They include the very low relief patterns with level (Pl) or gently undulating (Pu) terrain which have slopes up to 5%. The Pu unit in the east near the Eildon Reservoir have the highest elevations to 335 m ASL. Moving west and around Seymour some undulating areas are approximately 140 m ASL. The units involve small areas (in the order of 50 km^2) and can be subdivided into components including crests, sideslopes, small minor depressions and billabongs.

Stream Description:
Water courses are fixed with integrated and interrupted channel network patterns common. Some areas have had artificial drainage channels constructed to improve removal of water. Upper channels are typically dry in summer months with small gullies.

Present Land Use:
The areas have been cleared and are used principally for agriculture. Generally grazing with cattle is the prime pursuit however some sheep are run. Recreation such as horse racing takes place in close proximity to major townships. Rural residential development now impinges on these areas because of ease of building and to recreation areas.

Land Degradation:
The units have been extensively cleared for grazing. Some areas, because of their ease of access and proximity to water points, have been overgrazed and sheet erosion is common on the flat crests. In drainage situations gullying often occurs with B horizon basal sapping, blockfall and receding of the surface A horizon. The loss of the A horizon leaves the bare hardsetting A_2 horizon exposed to further severe sheeting.

Surface runoff	Slow to very slow
Flood Risk	Moderate to low
Waterlogging Class	Temporarily ponded to waterlogged
Erosion Type	Wind sheeting
	Gully bank breakdown
Salinity	Low to moderate

Soil Description:
Deep polygenetic alluvials with clay loam surfaces underlain by a moderately structured clay subsoil which may incorporate boundings of gravel and sand. Areas exhibit alkaline to slightly acidic subsoils. (See Soil Association 2)

Units:
Pu 5 (Undulating plain, soil type 5)

Location:
The unit is small, occurring in the far north east of the survey area.

Description:
The unit is weakly undulating with low smooth sometimes rounded raised areas. The plain unit is essentially very gently inclined to flat with slopes of 3-4%. Within it are smooth broad rounded convex crests, flats, very broad swales, low terraces and minor isolated swamps. In some areas east of Mansfield, rock mantles have been exposed and suffer erosion and other land degradation.

Stream Description:
The chief drainage patterns are tributary and integrated with numerous streams converging within the drainage slopes into Ford Creek and subsequently into Lake Eildon. The undulating plain is relatively undissected. Typically streams are concave becoming somewhat incised nearer to Sg 2/5 units.

Present Land Use:
The upland areas are used primarily for grazing with some sparse rural residential development. Extensive areas are used for fodder cropping and seed production.

Land Degradation:
Under natural conditions these areas are generally stable with the gentle slopes giving slow runoff. Some rock mantles have been exposed and sheet erosion is common when overgrazing occurs.

Surface runoff	Slow to moderate
Flood Risk	Nil
Waterlogging Class	Temporarily ponded in lower areas
Erosion Type	Wind and water sheet erosion on exposed rock mantles
Salinity	Nil

Soil Description:
Generally deep uniform mottled clays and silty clays with highly apedal subsoils. In some areas sand is common, particularly in swales. (See Soil Association 5)

Units:
Pu 7 (Undulating plain, soil type 7)

Location:
The unit extends in an essentially north-south band passing from areas south of Glenaroua through to High Camp. It occurs in low hill and hilly Silurian/Devonian sedimentary terrain. The boundary between Pu 7 and the abutting Ru 2 and Sg 2 units is sometimes diffuse.

Description:
Undulating plain units which have slopes up to 3-4%, comprising the more level lower units the basalt country. The units are moderately dissected with recurring very low rises interspersed with shallow, broad, usually rock free drainage areas. Rocks are common on the surface.

Stream Description:
These units exhibit very diffuse stream definition and drainage tends to be through very shallow open depressions. Along the shoulders of channels and on channel floors rocks are common. The drainage areas and surrounds are well grassed and are grazed.

Present Land Use:
Typically the areas are grazed by sheep and to a lesser extent cattle. Cropping is restricted due to rockiness, soil depth and soil type. Grazing relies on natural seepage and stream channels because dam construction is difficult due to shallow rock.

Land Degradation:
The areas have limited tree cover except for some areas of scattered open woodland. Overgrazing by stock and lack of protection in some drainage courses can lead to surface soil loss. Overgrazing in higher situations tends to strip grass cover in the drier periods and lead to a general lack of perennial pastures.

Surface runoff	Slow to very slow
Flood Risk	Nil
Waterlogging Class	Temporarily ponded in lower depressions
Erosion Type	Sheet erosion Wind erosion in drier months
Salinity	Nil

Soil Description:
Shallow, reddish brown, fine textured gradational and duplex soils. (See Soil Association 7).

Units:
Pu 8 (Undulating plain, soil type 8)

Location:
The unit occurs in the far north west of the study area near Bungarra Homestead. It abuts the Goulburn River flood plain to the east and the sedimentary low hill terrain in the west.

Description:
An undulating to flat plain with a recurring pattern of rises, remnant levees and wet depressions. The area has very gentle gradients up to 3-4%. The unit has been cleared of native bush and is now used primarily for agriculture. The landscape is influenced by runoff from the sedimentary upland terrain and parts suffer flooding from the adjacent Goulburn River.

Stream Description:
The area drains very slowly from a drainage pattern with channels having a converging tributary form. The channels incorporate materials principally washed from the upland low hill terrain together with material from the Goulburn River system. Streams are narrow and deep when they run off the

sandstone terrain but become broad and shallow, linear depressions which typically flow northward into the Goulburn River flood plain.

Present Land Use:
The area is presently used for grazing and minor cropping including some wheat. Although not specifically highlighted for rural-residential subdivision, a number of dwellings presently exist and potential exists for further development by way of demand emanating from Seymour.

Land Degradation:
The gentle gradients lead to minimal runoff and erosion. Flooding of the low lying areas causes some loss of areas as does minor salting which is possibly a response to wash and seepage from the sandstone terrain.

These effects are restricted to the lower depressions. On some of the small rises, overgrazing in summer may give rise to loss of topsoil.

Surface runoff	Slow to very slow
Flood Risk	Moderate
Waterlogging Class	Temporarily waterlogged
Erosion Type	Sheet erosion
	Very minor wind erosion when dry
Salinity	Minor isolated moderate to high in some depressions

Soil Description:
Soils are variable and typically polygenetic. In the upland areas particularly in association with drainage courses, wash from the sandstone low hills is common. Some levee areas incorporate gravel, sands and clay.

Generally soils are deep, fine textured and gradational structured earths with gravel and sand inclusions common. (See Soil Association 8).

Units:
AP 8 (Alluvial plain, soil type 8)

Location:
The unit occurs in the north west of the survey area near the township of Avenel.

Description:
Flat, level, sometimes very gently inclined plain unit. The land has been cleared of native vegetation and now is almost totally farmed. The unit has been greatly influenced by runoff from upland gravel and sandstone terrains. Historically a large proportion of the AP unit was inundated from the periodically flooded Goulburn River.

Stream Description:
The flatter areas exhibit a disintegrated to tributary drainage pattern. Typically channels are broad, shallow and well grassed. Minor old meandering discontinuous streams occur as depressions. These lower areas are usually flood prone and boggy in the autumn-spring periods.

Present Land Use:
The principle land use is grazing by sheep. Some small areas are sown to wheat and spring sown fodder crops. Mangalore Airport together with the township of Avenel are the principal urban development areas, although rural retreat development from Seymour is starting to occur. The wooded areas are used for grazing where some protection from the winter conditions is possible.

Land Degradation:
Being nearly level, the areas have been slow to very slow runoff with the result that surface disturbance from overland flow is limited. Some wind erosion may occur following overgrazing in the dry summer months. Gullying occurs to a limited extent. Minor bank degradation is found in stock accessible where surface stripping and exposing of the harder A_2 horizon occurs. On some of the depression components and about their perimeters, minor salting is evident. In these cases pastures appear stunted, but no

surface salt is visible. Typically the areas are well managed with introduced pastures protecting the soil surface.

Surface runoff	Slow to moderate
Flood Risk	Low to moderate
Waterlogging Class	Temporarily waterlogged
Erosion Type	Minor wind erosion
Salinity	Very minor

Soil Description:
Soils are polygenetic and variable. Generally they are deep uniformly fine textured and gradational brown structured earths. Gravel and sand inclusions are site specific. (See Soil Association 8).

Land units associated with drainage courses and flood plains

Units:
DC 2 (Drainage course, soil type 2)
DC 2/3 (Drainage course, soil type 2/3)
DC 2/7 (Drainage course, soil type 2/7)

Location:
The units occur running in a southerly direction from the Strathbogie and Puzzle Range and north in the King Parrot and Sunday Creeks, Yea and Acheron River systems.

Description:
The units are typically flat areas often 1 km wide, which run between the upland hills and mountainous terrain forms. Surfaces are typically cleared, firm and well grassed.

In a number of instances they may include influences from Rhyodacite/Basalt and Granitic geology.

Stream Description:
Within the stream bounds the drainage course is a weakly meandering incised channel. Components include billabongs, levees, flats, terraces and incised channels.

Present Land Use:
The areas are used for a variety of uses including cattle and sheep grazing, fodder crop production and rural residential development. The units often abut State Forests, Reserves and National Parks and as such they are often associated with conservation and recreation uses.

Land Degradation:
At the base of higher terrain types and in the main stream area, some salting is evident. Along stream channels bank erosion from block fall occurs. Serious disturbance along banks and terraces is present in many areas where uncontrolled access has occurred. Cattle and sheep tracks down to the main channels often cause minor gully incisions.

Surface runoff	Varied
Flood Risk	Often high
Waterlogging Class	Seasonally waterlogged
Erosion Type	Salting, gully/stream bank block fall
Salinity	Low, moderate, high, varies with position

Soil Description:
Varied, generally similar to type 2 soils, however there may be inconsistencies in stone and inclusions or with lenses of different alluvial material. Polygenetic soils are common. (See Soil Association 2).

Units:
DC 4 (Drainage course, soil type 4)

Location:
These drainage courses occur in granitic terrain and have been delineated at the base of the steep and rolling units in the north in the vicinity of Mangalore and south near Marysville.

Description:
The areas are generally flat or very gently sloping rock free alluvium with somewhat incised narrow sandy drainage courses. In their lower reaches the areas often abut alluvial units off sandstone geologies. The units are more heavily treed and vegetated than upper terrain types.

Stream Description:
Often individual stream channels show moderately deep to deep incised areas with unstable side walls. Some gravels may occur.

Present Land Use:
Generally these areas are associated with grazing, particularly by sheep and some areas have been cropped.

Land Degradation:
The units show potentially unstable side walls and are prone to overgrazing and subsequent wind erosion during prolonged droughts. When sheet erosion occurs, the hardsetting A_2 horizon is exposed which restricts further vegetation establishment. Minor boulders occur which have been overgrazed at the base with the exposure of very sand or hard A_2 materials.

Surface runoff	Very slow to slow
Flood Risk	Low to nil
Waterlogging Class	Nil on flatter areas
	Some depressions show seasonal waterlogging
Erosion Type	Wind erosion
	Stream bank breakdown
Salinity	Nil

Soil Description:
Soils are variable and relate to the hilly and mountainous terrain which they abort. Generally soils are deep brown to yellow gravelly gradational earths with mottling present in the more stable areas. (See Soil Association 4).

Units:
FP 9 (Flood plain, soil type 9)

Location:
This unit stretches through the centre of the study area, from Seymour in the west to Lake Eildon in the east.

Description:
The flood plain incorporates the Goulburn River from the Eildon Reservoir west to the township of Seymour then north towards Mitchellstown, together with lower 18 km of the Acheron River. Included within it are numerous billabongs, terraces, small levees and flats. The unit abuts (often abruptly), the steep and rolling hilly to mountainous terrain of Devonian sediments and granite. Drainage is accepted from the Yea and Acheron Rivers and the Sandy and King Parrot Creeks. Originally the area was frequently flooded but Eildon reservoir now greatly restricts this. Nevertheless the water table is generally high with limited vehicle access directly across the unit. Stream floors are often very gravelly and stony with quartz and sedimentary rounded stones to 30 cm in diameter. The principle road runs along the unit's southern fringe. Small areas (generally less than 1 km^2) have been set aside as flora and fauna reserves.

Stream Description:
The rivers flow throughout the year with flow in the Goulburn River influenced by release from Eildon reservoir. Streams usually are less than 2 m deep and somewhat incised with often near vertical banks. Typically there are also many broken, interrupted channels, together with billabongs which have smooth gently inclined banks. In natural flood periods these billabongs would be continuous.

Present Land Use:
The area is used almost solely for agriculture, with grazing by cattle, horticulture and fodder crop production the principle enterprises. A small pine plantation is established near Seymour and commercial gravel extraction occurs in isolated cases. The potential for further gravel extraction is high.

Land Degradation:
The units exhibit a good balance between agrading and degrading processes. With the limited flooding and consequently slower streams flows, erosion effects along the unit's perimeter close to the upland terrain is now minimised. Good grass cover protects the flat situations and erosion arising from overland flow is restricted. The principal degradation area occur along the river banks where some block fall and walkway degeneration has occurred due to uncontrolled stock access.

Surface runoff	Very slow
Flood Risk	Extreme
Waterlogging Class	Water table at or close to surface
Erosion Type	Blockfall
Salinity	Nil, very low

Soil Description:
Deep polygenetic alluvial soils comprising gravels, sands, silts and clays. Soils are site specific and reflect local geology. (See Soil Association 9).

A listing of Maps and Photography used for this chapter is given in Appendix C.

Land Unit Maps

The alpha numeric coding for the Land Units is presented in the two keys shown below. The alpha code is grouped by way of eight Land Zones which follow the Australian Soil and Land Survey Handbook (McDonald et al, 1984).

The numeric soil code is linked to broad geology and soil types.

All maps are coloured so as units can be easily associated with the Land Zone types. This presentation allows for a two step land-form delineation from the broad generalised map shown below (Figure 13.1). This has been done to allow the regional planner a more practical use of the data.

By way of example if a unit is coded Sm2 it has been perceived to be a distinct moderate slope with a gradient of 10%-32% and with a Geology/Soil association number 2. If its colouring is a dark brown it has also been viewed as being an integral part of a broader Escarpment unit but large enough to be separately delineated at the 1:100 000 scale.

The study area is subdivided into twelve areas and is presented on ten separate map sheets. The base maps used are the standard 1:100 000 topographic sheets (as originally supplied by the Royal Australian Survey Corps.). The base details contour, road, drainage and town names. The key to the maps used is shown below in Figure 13.1. Within maps 6A and 6B the broken boundary line indicates where the boundary no longer follows the catchment. Broken map unit lines indicate more uncertain geological divisions.

Landzones and Associated Units Key

LANDZONES	ASSOCIATED MAP UNIT DESCRIPTIONS	SLOPE %	CODE
Plateaux	Plateau of rolling hills	10 – 32	P/Hr
	Plateau of undulating hills	3 – 10	P/Hu
	Plateau with moderate drainage slopes	10 – 32	P/HSm
	Plateau of rolling to undulating low hills	3 – 32	P/LHr-u
	Plateau of undulating low hills	3 – 10	P/Lhu
	Plateau of undulating rises	3 – 10	P/Ru
	Undulating plateaux	3 – 10	P/u
	Plateau with gentle drainage slopes	3 – 10	P/DSg
Escarpments	Steep escarpment	32 – 56	Es
	Moderate escarpment	10 – 32	Em
	Moderate slopes	10 – 32	Sm
	Steep hills	32 - 56	Hs
	Rolling hills	10 – 32	Hr
	Steep to rolling hills	10 – 56	Hs-r
Mountainous terrain	Very steep mountains	> 56	Mvs
	Steep mountains	32 – 56	Ms
	Steep to rolling mountains	10 – 56	Ms-r
	Rolling mountains	10 – 32	Mr
	Moderate drainage slopes	10 – 32	DSm
	Moderate slopes	10 – 32	Sm
Hilly terrain	Steep hills	32 – 56	Hs
	Steep to rolling hills	10 – 56	Hs-r
	Rolling hills	10 – 32	Hr
	Undulating hills	3 – 10	Hu
	Moderate slopes	10 – 32	Sm
Low hills	Rolling low hills	10 – 32	LHr
	Undulating low hills	3 – 10	Lhu
	Low hill	3 – 32	LH
Rises and gentle slopes	Crest	1 – 3	C
	Undulating rises	3 – 10	Ru
	Rises	3 – 10	R
	Gentle drainage slopes	3 – 10	DSg
	Gentle slopes	3 – 10	Sg
Plains	Very gentle drainage slopes	1 – 3	DSvg
	Very gentle slopes	1 – 3	Svg
	Undulating plain	3 – 10	Pu
Floodplains and drainage courses	Alluvial plain	< 1	AP
	Level plain	< 1	PI
	Floodplain	< 1	FP
	Drainage course	< 1	DC

Soil Geology Association Key

SOIL NO.	GEOLOGY	BRIEF SOIL DESCRIPTION
1	Cambrian shales and ash (E).	Moderately deep to deep well structured friable generally whole coloured duplexes (Dr 4, Dr 5).
2	Silurian and Devonian marine and minor non-marine sediments of sandstone, siltstone claystone, greywacke-conglomerate and minor calcareous siltstone lithology. (S-D)	Soils are a complex of uniform fine textured clays and gradational soils which incorporate large percentages of broken rock and gravel in their subsoil. They are typified by a bleached, dry hard, erosion resistant, A2 horizon. Depths are variable and dependent upon topographic position.
3	Middle Devonian igneous extrusions of biotite Rhyodacite. Some Rhyolite grades on fringe areas. Minor basalt areas and shalestone conglomerates occur. (Dc)	Deep friable brown to reddish brown to dark red whole coloured, gradational, well structured rough ped earths. (Gn 4).
4	Middle to Upper Devonian igneous intrusions of fine to medium grained granodiorite and granite. Minor biotite dykes occur. (Dg)	Three principle soil types: (i) deep, red, well structured, very friable uniformly fine textured to gradational profiles; (ii) deep stoney, gravelly and sandy apedal pale brown sometimes mottled gradationals. (iii) moderately deep to shallow, pale brown to yellow, very gravelly duplex and gradational earths.
5	Lower Carboniferous non-marine sedimentary deposits of conglomerate, pebbly sandstones, siltstones and mudstones. (Cl)	Deep, uniformly fine textured clays which have a mottled subsoil and often exhibit a hardsetting A2 horizon in upland areas.
6	Miocene to Pliocene Tertiary alluvium incorporating gravels, sand, and minor clays with some laterised non-marine quartzose sand. (Tp)	Moderately deep to deep yellowish red to strong brown apedal massive, very gravelly gradational earths. Some areas of lag gravels exist.
7	Quaternary igneous extrusions of olivine basalt, minor tuff and integrated sand. (Qv)	Shallow to deep uniformly heavy textured clays which fall into three groups. Soils with (i) greyish brown subsoils; (ii) reddish brown subsoils; (iii) black subsoils.
8	Quaternary alluvial sediments comprising clay, silt, sand and gravel with numerous levee sequences. (Qs)	Deep, uniformly fine textured gradational brown structured earths and complexes of polygenetic soils.
9	Recent Quaternary non-marine alluvium with illsorted gravels sands and silts. (Qc)	A complex of polygenetic soils which are essentially deep non-cracking, uniform massive fine textured profiles. Many sand and gravel areas.

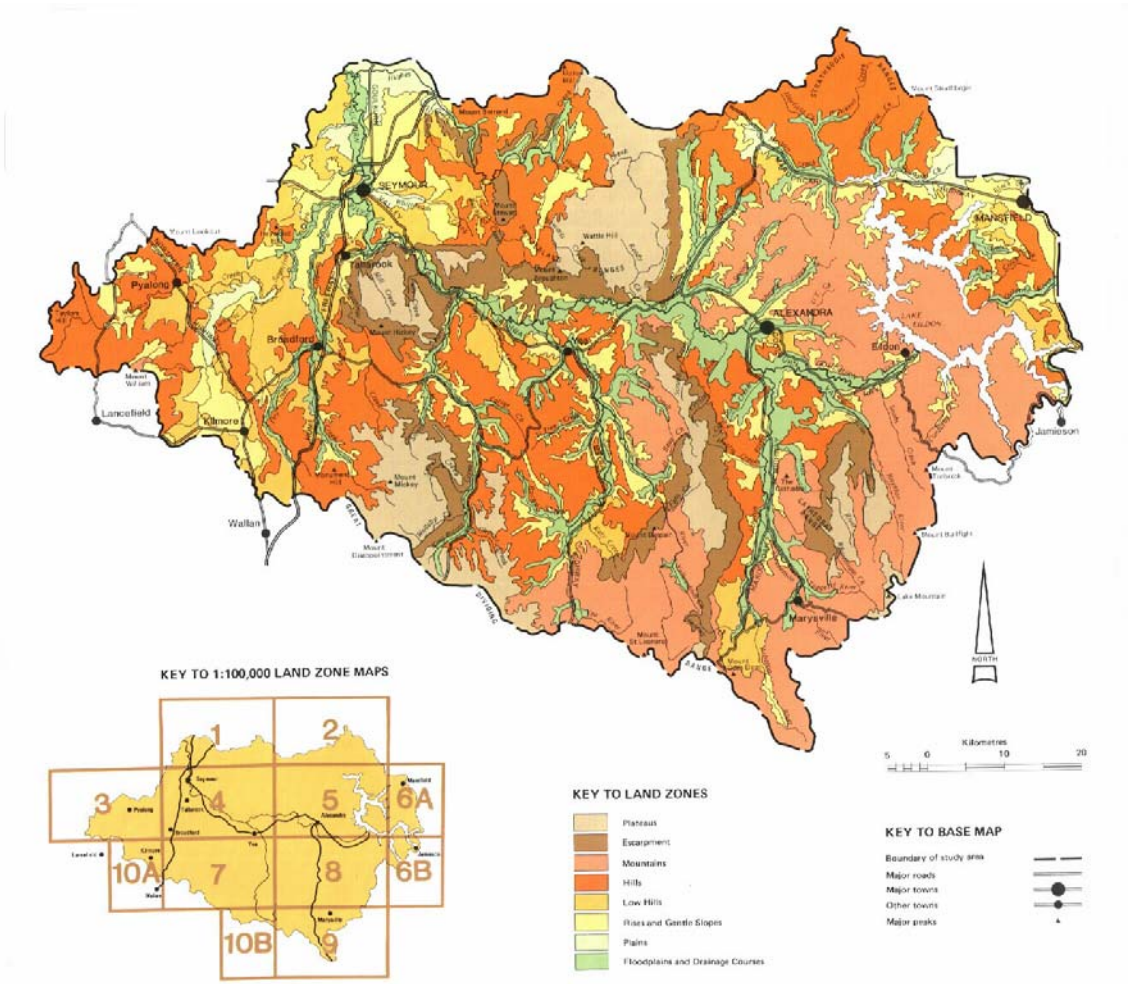

Figure 13.1 A summarised map of the study area highlighting principle Land Zones