

SOIL AND LANDFORMS

OF

SOUTH-WESTERN VICTORIA

PART 1

INVENTORY OF SOILS AND THEIR ASSOCIATED

LANDSCAPES

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ABSTRACT

The higher rainfall regions of the basalt plains of south-western Victoria are seen as having a potential for increased cropping. In order to obtain economic levels of production it is considered important to identify, characterize and map the distribution of the various soils and their associated landforms. Such information will allow planners and researchers to identify likely areas in which to concentrate resources, or to identify areas with limiting soil properties and landform features that may require further investigation.

Within the 2.4 million hectares investigated 237 different soils have been recognized using the classification scheme outlined in the report. The distribution of soil and landform combinations is shown in the accompanying maps with a more detailed description of the map units being included in the report.

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1. INTRODUCTION

1.1 Background

The decision to survey the soils and landforms of a 2.4 million hectare area of south-western Victoria (Figure 1) was based on the perceived opportunity for major changes in land use management. It is believed that a combined knowledge of critical soil properties and landform features is essential for success in such decision making if changes in land use practices are being considered.

Economic circumstances during the nineteen seventies suggested that substantial gains could be made from increasing wheat production. It was also recognized that farmers relying on single enterprises would benefit financially from the adoption of more flexible, multi-enterprise systems. In response to this economic environment the Department of Agriculture initiated research and development programs concerned with alternative land use, particularly the expansion of wheat production into the traditional grazing areas. To realize the potential for cropping in the higher rainfall regions of south-western Victoria, landform features (eg. %slope), critical soil properties (eg. pH), climatic requirements and crop phenology must be considered.

Part I of the report presents an inventory of the soils and landforms which includes a statement, in map format, of the areal distribution of the different soil-landform units. It is envisaged that, for Part II, the land and climatic requirements of selected plants will be matched with the inventory to enable the development of flexible management systems for sustainable agriculture.

1.2 Scope

Although the area has been included in small scale soil and landscape surveys, for example continental resource mapping (Northcote 1960, 1962), and some parts of the area in larger scale land systems surveys (Newell 1962, 1979; Martin and Maher 1985), this investigation was restricted to a uniform soil and landform survey at the field scale of 1:100 000 over the entire area.

Landforms and soils were described according to the Australian Soil and Land Survey Field Handbook (McDonald et al., 1984). Soils and landforms are presented on the maps as compound soil-landform units. This precludes the need to use map overlays and yet still reflect the field situation. This system has resulted in a relatively large number (267) of different map units.

1.3 Presentation and use

The classification system and presentation of soil morphological and landform data have been designed to facilitate the use of the report by the many individuals and organizations concerned with aspects of land use planning and management. The dominant and sub-dominant soils are described in detail for each different map unit, however the mapping scale is too broad to allow the actual location of individual soil features. The final map unit symbols also include a code for the dominant landform pattern and element which are described in the text. The second chapter of the report fully explains and presents the overall classification system. This chapter should be read carefully before using the accompanying maps.

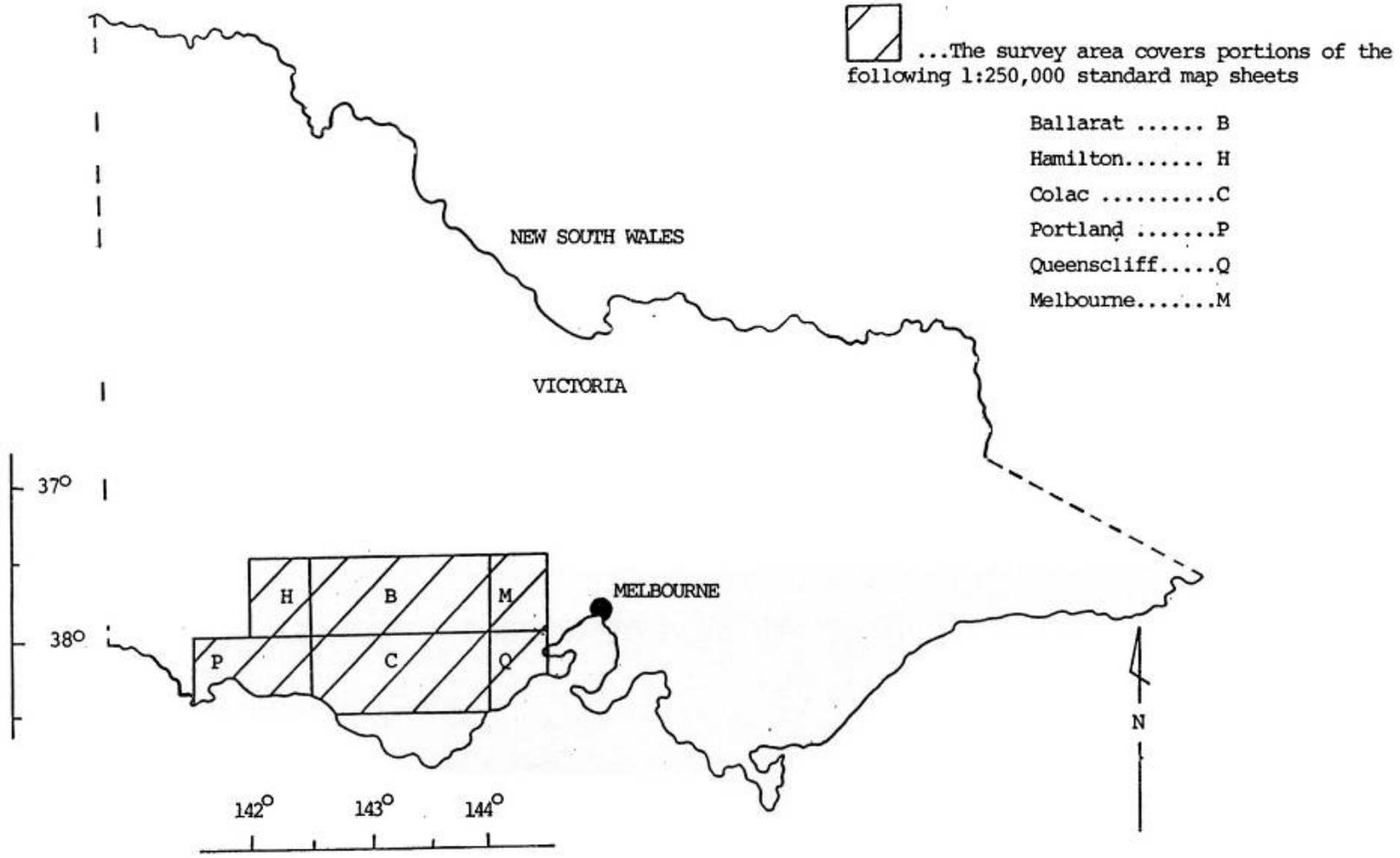


Figure 1: Index to Soil - Landform Map Sheets

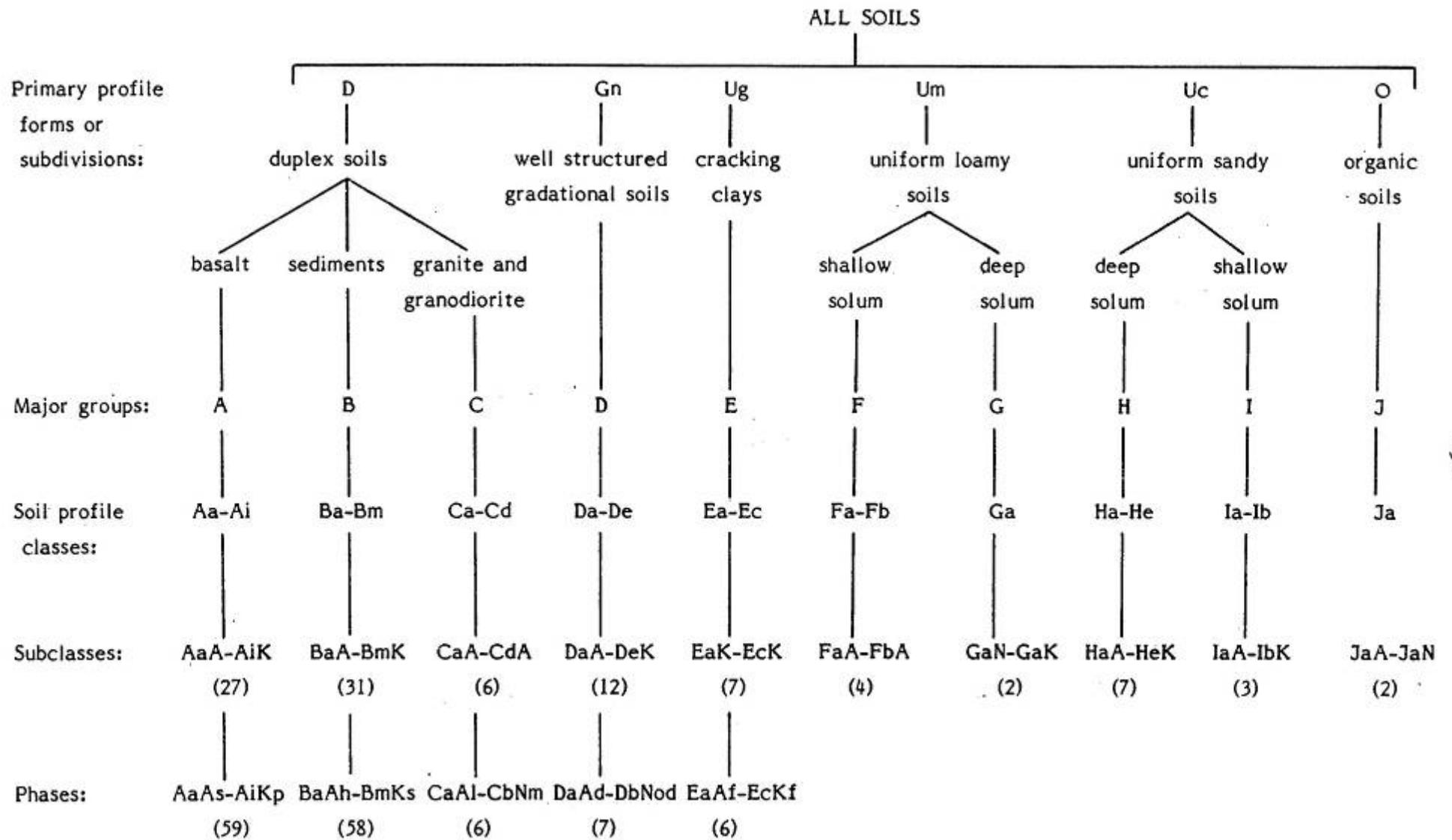
2. CLASSIFICATION 2.1

Soils

The soil classification system used in this project was developed by the authors to specifically provide a framework for the formulation of hypotheses about the response of soils to management (ie. their expected use). This classification should also aid in projecting a knowledge of soils in specific localities to other areas having similar soils.

As the classification reflects the existing knowledge concerning a 'sample' population of soils described in the south-west region of the State, it is expected that modification to the system could be made in the light of new information. If the related purposes of the soil classification have in fact been achieved by the scheme outlined below, then it should allow relationships to be seen among kinds of soils, their properties and their associated landscapes.

The soil classification system (Figure 2) is based on both the Factual Key (Northcote 1979) and the scheme adopted for a regional land use study carried out by the CSIRO on the south coast of New South Wales (Gunn 1978). The procedure involved the compilation of a list of soil profile classes which were derived by converting conceptual classes into defined classes. The soil profile is the basic soil entity used in erecting a soil profile class and their boundaries were defined using the permitted variation of certain properties contained in the Factual Key. The properties used in defining the soil profile classes were texture, horizon depth, colour, mottling, structure and the nature of the A₂ horizon, if present. According to Butler (1980) the conceptual classes are initially felt rather than created logically; they are described rather than defined, and the perception of their central concepts is stronger than the realization of their boundaries. However, the original conceptual classes were not so loosely described as this due to the influence of the Factual Key in the development of soil profile classes. The soil profile class has been retained as a category within the present, classification system and it is this level of generalization around which the scheme has been structured.



NOTE: The number of subclasses or phases in each major group is shown in parentheses.

The major groups were formed by grouping the soil profile classes on the basis of similar texture profiles and their depth, and the nature of the substrate material. This resulted in the formation of 10 major groups. A series of lower categories of subclasses and phases were developed by a rationalized subdivision of the soil profile classes. The soil profile attributes concerned in defining subclass and phase boundaries were:

- profile pH trends and drainage.
- surface depth, texture and structure.
- subsurface waterlogging.
- subsoil structure and colour.

Soil profile classes within any major group are simply listed alphabetically. For example, within major group A, the duplex soils found on basalt, nine soil profile classes have been recognized and are coded Aa to Ai. The additional symbols used to differentiate the subclasses and phases are listed in Table 1.

Table 1. Symbols used to differentiate between subclass and phases.

Subclass	Symbol Definition
A	acid soil reaction trend
N	neutral soil reaction trend
K	alkaline soil reaction trend

<u>Phase</u>	
a	non-waterlogging subsurface
c	whole coloured subsoil
d	deep surface
f	shallow solum
h	heavy textured surface
l	light textured surface
m	massive subsoil
o	mottled subsoil
p	poorly drained
s	shallow surface
t	structured surface

The subdivision of soil profile classes into subclasses on the basis of soil reaction (pH) trends is considered important for a number of reasons. Researchers (Soil Survey Staff 1951) point out that differences in subsoil pH are important to the growth of some deeply rooted crops and pasture species, and that it is likely these differences are also associated with other related characteristics. Northcote (1983) elaborates on some of these related characteristics and points out that "the soil reaction trends give good clues about the likely supply of nutrients available to plants: soils with an acidic trend have a low supply of nutrients; those with a neutral trend are moderately well supplied; and those with an alkaline trend may be well supplied but some nutrients (e.g. zinc and iron) may be of low availability". Northcote (1983) also states that a pH value greater than 9.0 indicates that salinity and sodicity are likely.

Some common misconceptions about soil maps and the function of a soil classification system are mentioned in order to warn users against unrealistic expectations and incorrect usage of maps.

1. The user must appreciate that there are certain limits which are imposed by the nature of survey itself which depends on the size of the area involved, the natural complexity of the landscape, and the staff and other resources available for survey. Soils information that is collected during the course of a survey is obtained from point sources therefore necessitating generalizations to be made about the mapped units. Once soil maps have been compiled they are not designed to identify the soils in a particular mapped unit but to predict their probable occurrence. Field observations should be made if positive confirmation is required.
2. Unfortunately, the complexity of soils and landscapes, and the scale of mapping prevent a classification system from always being simple or easily understood by the inexperienced user.

2.2 Landform

The purposes of describing landform in soil and land surveys are outlined by Speight. (1984) as being:

- it has direct application to land use planning.
- it is useful for finding relationships to support the extrapolation of point observations.
- it helps to predict the impact of various land use options on the future incidence of landforming processes.

The first two points in particular are seen as being relevant to the present study. The landform description is also seen as being a useful aid in that it allows the report users to locate themselves within the terrain or to identify that part which

is under discussion.

Landform individuals (as defined in Appendix 3) were first delineated using air photo interpretations. At the working scale of 1:100 000 the most appropriate individuals that could be mapped were landform patterns, which include the whole toposequence. Occasionally, prominent landform elements, which are the landform individuals within a toposequence, were mapped separately, e.g. some swamps, cones and lunettes.

Field observations, together with appropriate topographic maps, were then used to describe and subsequently define the mapped landform individuals (in most cases the landform^m pattern). Although landform patterns have a characteristic relief (Table 2), their modal terrain slopes may vary and this has been used to further define particular landform patterns (Table 3). A complete list of the landform patterns identified in the region, together with their code is used on the map legends is given in Appendix 1.

The relief has been defined for mountains, hills, low hills, rises and plains and their class boundaries (Speight 1984), together with the landform patterns identified and mapped in the region, are given in Table A.

Table 2. Landform patterns and their typical relief class.

<u>Typical Relief</u>		<u>Landform Patterns</u>
Very high	>300m	Mountains
High	90 - 300m	Hills
Low	30 - 90m	Low hills
Very Low	9 - 30m	Rises, lava plain, dunefield
Extremely low	<9m	Plains, alluvial plain, alluvial fan, sand plain, sheet-flood fan, plateau

The modal slope is defined as the most common class of slope occurring in a landform pattern and the class boundaries, together with their description, are defined in Table 3. Certain adjectives, found on the map legends, have been applied to landform pattern descriptions that characterise units of alternating crests and depressions. These are 'rolling' for moderately inclined slopes (11% to 32%); 'undulating' for gently inclined slopes (4% to 10%); and 'gently undulating' for very gently inclined slopes (1% to 3%).

Table 3. Modal Slope Classes

<u>Class.</u>	<u>Description</u>
<1%	level
1% - 3%	very gently inclined
4% - 10%	gently inclined
11% - 32%	moderately inclined
33% - 56%	steep
57% - 100%	very steep

The landform element relevant to each site was recorded and a glossary of the types of landform elements occurring in the study area and subsequently used to code the map units are listed in Appendix 2.

2.3 Soil-Landforms

All the map units are coded in relation to the dominant soils occurring in a particular unit, the landform element on which the dominant soil is more commonly found, and the landform pattern of which these are components. The derivation of the map unit code is outlined below.

For mapping purposes the landform patterns are the key features because they can easily be recognized and they were also formed by the same geomorphic events that were responsible for providing the substrate material of present day soils (Northcote 1983).

When the landform patterns were delineated on air photos, the field work involved describing soils and landform, elements at sites along traverses located to provide a uniform coverage of the major landform patterns within the given time constraints. Site information included a description of the landform element since it is considered that many relationships between landforms and other phenomena occur at the landform element level (Speight 1984), although at the present scale (that is 1:100 000 working scale and 1:250 000 published scale) it is appropriate to map landform patterns.

Numerical symbols, which appear on the maps, have been given to the different soil-landform combinations recognized. The soil-landform classification code has two forms and examples of both are given below. Example One is the more common form whilst in Example Two a compound landform element has been delineated and not a landform pattern.

Example One

Map Unit Symbol

Classification Code

15

BaK - HSL - HIL

BaK:- dominant soil of the mapped landform individual i.e. hills (for soil description see Section 3)

HSL:- landform element on which the dominant soil commonly occurs (Appendix 2)

HIL:- Landform pattern (Appendix 1)

Example Two

Map Unit Symbol

Classification Code

34

FaA - CON

FaA:- dominant soil of the mapped landform individual i.e. cone (Section 3) . CON:- compound-landform element on which the dominant soil occurs (Appendix 2)

A more complete description of the map units, than the summaries used in the map legends, is given in Section 4.

Although it is likely that too many boundaries have been produced in compiling an inventory of the soils in the manner outlined (Butler 1980), it is seen as a necessary base both for interpreting future research findings and for broad scale land use planning. Rationalitation of the mapping units could be expected to occur as a result of future interpretations for specific problem solving exercises or as experience with regard to certain soil and/or landform relationships demonstrates under what management options or considerations the grouping of mapped units will be applicable.

3. GENERALISED SOIL DESCRIPTIONS

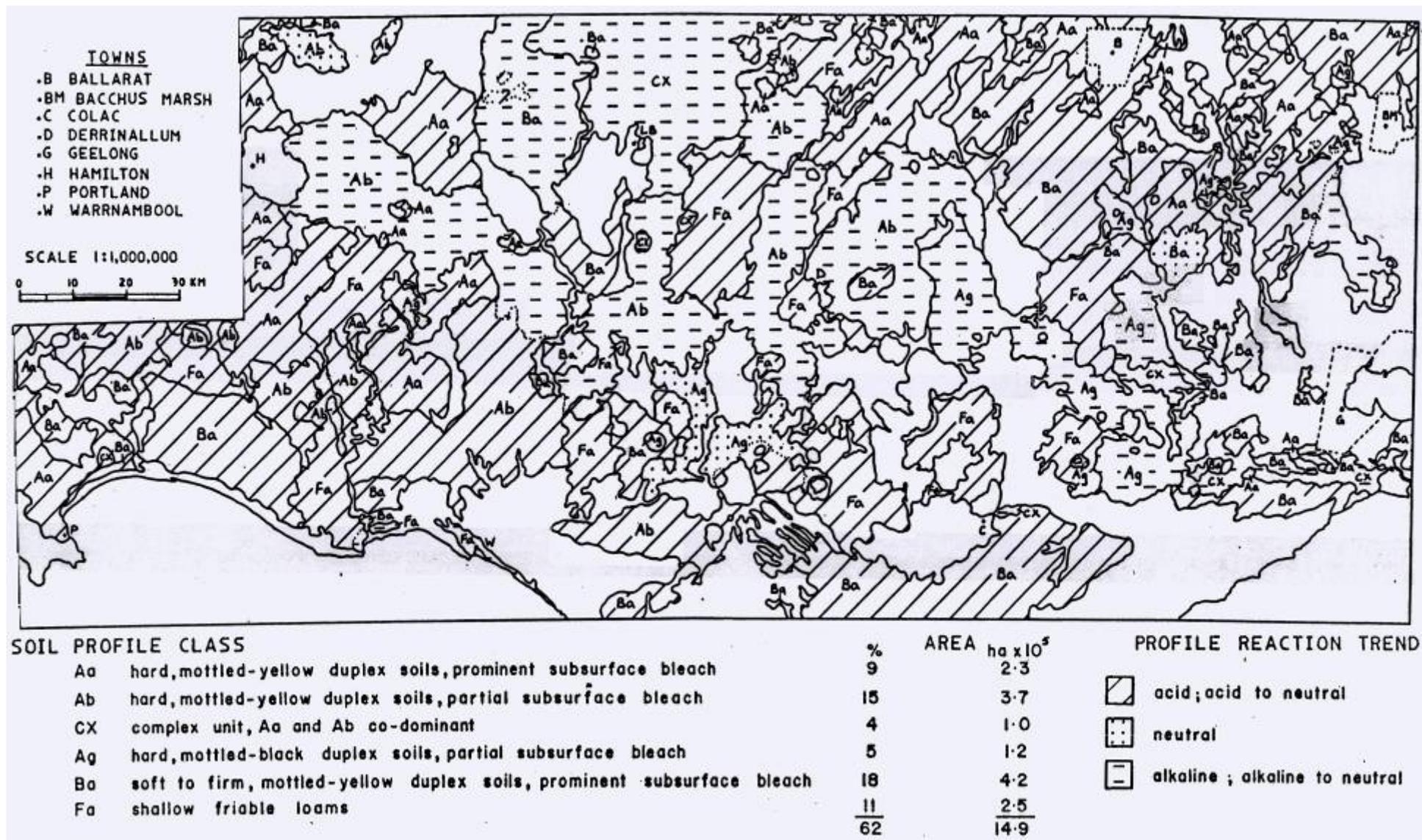
The main characteristics of the ten major groups are described, together with the typical morphological properties of the 45 soil profile classes identified. The distribution of the five dominant soil profile classes and their approximate areas are given in Figure 3. The relative areas occupied by the subclasses (based on profile reaction trends) within the dominant soil profile classes are given in Table 4.

Table 4

Percentage Areas of Subclasses Within the Dominant Soil Profile Classes

Soil Profile Class	<u>Profile Reaction Trend</u>			Topography
	acid; acid to neutral	neutral	alkaline; alkaline to neutral	
Aa	99	<1	<1	Mainly gently undulating plains and rises.
Ab	35	2	63	
CX	1	-	99	
Ag	7	17	76	
Ba	82	2	16	Gently undulating plains and rises to undulating hilly terrain.
Fa	98	-	2	Undulating and rolling rises.

FIG.3. DISTRIBUTION OF DOMINANT SOIL PROFILE CLASSES



3.1 MAJOR GROUP: A

The main characteristic of these soils is the distinct texture contrast between relatively light to medium textured surface horizons and clayey subsoils. Nine soil profile classes were formed from the profile descriptions of duplex soils occurring on basalt.

3.1.1 Soil Profile Class: Aa

General Features: These soils have strongly developed hardsetting surface horizons over mottled clay subsoils that are yellow or yellow-grey. A conspicuously bleached subsurface horizon, indicative of intermittent waterlogging is a feature of the soils of this class which are one of the dominant soils of the basalt plains of south western Victoria. Soils with acid, neutral or alkaline soil reaction trends all occur throughout the region, ie. subclasses AaA, AaN and AaK.

Soil Description:

Surface Soil

A₁ horizon

- loam, fine sandy clay loam, silty clay loam, but more commonly day loam. 20cm thick, ranges from 10-30cm.
- very dark greyish brown to dark brown.
- massive, immediate surface may have weak structure under permanent pasture situation.

A₂ horizon

- loam, fine sandy clay loam, silty clay loam, but more commonly clay loam.
- 20cm thick, ranges from 5-40cm.
- conspicuously bleached white or very pale brown dry, brown to light brownish grey moist.
- massive.
- moderate to abundant levels of ironstone gravel are usually concentrated in the lower portion of this horizon.

Subsoil

- medium or heavy clay.
- greyish brown to yellowish brown with red and/or bright yellow being the common mottles.
- moderate to strong medium or coarse blocky structure that tends to break down to smaller blocky units when disturbed.
- varying amounts of gravel or rock fragments may occur; trace to moderate amounts of hard and soft carbonate segregations may be present in the deep subsoils of subclass AaK.
- total soil depth is usually greater than 100cm but on upper slopes and broad level crests in undulating topography the total thickness may be as shallow as 40-80cm; if not already cleared these rises may have many basalt stones and boulders scattered on the surface.

Phases:

AaAs,AaNs: shallow surface phases - conspicuously bleached subsurface horizons are absent and the common thickness of the shallow surface soil is 10-20cm; these soils usually occur on crests of rises.

AaAa,AaNa: non-waterlogging subsurface phases - paler subsurface horizons are present but are not bleached due to better subsoil aggregate stability; the top of the subsoils are non-sodic (av ESP- 5.4) compared to the normal sodic subsoils of AaA,AaN and AaK (av ESP of upper subsoil - 12.3).

AaAp,AaNp,AaKp: poorly drained phases - the top of the subsoil is dark greyish brown rather than the more common yellowish brown; subsoil texture is heavy clay; these soils tend to occur in the poorer drained portions of the landscape.

AaAps: as for above, but also has shallow surface.

AaAI,AaNI,AaKI: light surface phases - surface textures range from sandy loam to fine sandy loam.

3.1.2 Soil Profile Class: Ab

General Features: These soils have strongly developed hardsetting surface horizons over mottled clay subsoils that are yellow or yellow-grey. They are very similar to the soils of class Aa except that the subsurface horizon is sporadically bleached. Although this indicates intermittent waterlogging, it is not as severe as in the soils of class Aa. Soils with acid, neutral and alkaline soil reaction trends all occur throughout the region, ie. subclasses AbA, AbN and AbK.

Soil Description:

Surface Soil

A₁ horizon

- fine sandy clay loam, silty clay loam but more commonly clay loam.
- 20cm thick, ranges from 5-30cm.
- very dark greyish brown to dark brown.
- massive, immediate surface may have weak structure development under permanent pasture situation.

A₂ horizon

- fine sandy clay loam, silty clay loam but more commonly clay loam. 20cm thick, ranges from 10 - 35cm.
- sporadically bleached light grey dry, dark brown moist.
- massive.
- moderate to abundant levels of ironstone gravel are usuall* concentrated in the lower portion of this horizon.

Subsoil

- medium or heavy clay.
- greyish brown to yellowish brown with red and/or bright yellow being the common mottles.
- moderate to strong medium or coarse blocky structure that tends to break down to smaller blocky units when disturbed.
- varying amounts of gravel or rock fragments may occur; very few to many hard and soft carbonate segregations may be present in the deep subsoils of subclass AbK.
- total soil depth is usually greater than 100cm but on upper slopes and broad level crests in undulating topography the total thickness may be as shallow as 40-80cm; if not already cleared these rises may have many basalt stones and boulders scattered on the surface.

Phases:

AbNs,AbKs: shallow surface phases - the sporadic bleach occurs as whitish blotches or nests at the AB interface and the common surface depth is 10-20cm.

AbAp,AbNp,AbKp: poorly drained phases - the top of the subsoil is dark greyish brown rather than the more common yellowish brown; subsoil texture is heavy clay.

AbNps,AbKps: as above, but also has a shallow surface.

AbA1,AbN1,AbK1: light surface phases - surface texture is fine sandy loam. 3.1.3 Soil Profile

Class : Ac

General Features: These soils have strongly developed hardsetting surface horizons over mottled clay subsoils that are dominantly brown. A conspicuously bleached subsurface horizon, indicative of intermittent waterlogging, is a feature of these soils. Soils with acid, neutral and alkaline soil reaction trends all occur, ie. subclasses AcA,AcN and AcK, however the soils of subclasses AcK are less common.

Soil Description:

Surface Soil

A₁ horizon

- fine sandy clay loam, silty clay loam, but more commonly day loam.
- 20cm thick, ranges from 10-30.
- very dark greyish brown to dark brown.
- massive.

A₂ horizon

- fine sandy clay loam, silty clay loam, but more commonly clay loam.
- 20cm thick, ranges from 15-40cm.
- conspicuously bleached light grey to near white dry, brown moist.
- massive.
- moderate to abundant levels of ironstone gravel usually occur in the lower portion of this horizon and may extend into the top of the B horizon. Subsoil
- medium or heavy clay.
- dark brown, dark yellowish brown of—brown with red or bright yellow being the common mottles
- moderate to strong, medium or coarse blocky structure.
- total soil thickness is usually greater than 100cm.

Phases:

AcAs,AcNs,AcKs: shallow surface phases - conspicuously bleached subsurface horizons are absent and hence intermittent waterlogging is less severe; the average surface depth is 20cm and ranges from 5-35cm; these soils usually occur on upper slopes and crests.

AcAa,AcNa: non-waterlogging subsurface phases - paler subsurface horizons are present but are not bleached.

AcAt: structured surface phase - surface horizons do not set hard but are friable and strongly pedal both moist and dry.

3.1.4 Soil Profile Class: Ad

General Features: These soils have strongly developed hardsetting surface horizons over mottled clay subsoils that are dominantly brown. They are very similar to the soils of class Ac except that the subsurface horizon is sporadically bleached. Although this indicates periodic waterlogging it is not as severe as the soils of class Ac. Soils with acid, neutral and alkaline soil reaction trends all occur, ie. subclasses AdA, AdN and AdK.

Soil Description:

Surface Soil

A₁ horizon

- fine sandy clay loam, silty clay loam, but more commonly clay loam.
- 15cm thick ranges from 10 - 20cm.
- very dark greyish brown to dark brown.
- massive, but may break down to a weak blocky or granular structure when moist under permanent pasture situations.

A₂ horizon

- fine sandy clay loam, silty clay loam, but more commonly clay loam.
- 15cm thick, ranges from 5 - 25cm.
- sporadically bleached light grey dry, dark brown moist.
- massive.
- common to moderate levels of ironstone gravel may be concentrated in the lower portion of this horizon or in the top of the 13 horizon; some profiles may have ironstone gravel throughout their entire solum.

Subsoil

- medium or heavy clay.
- dary brown, dark yellowish brown or brown with red and/or bright yellow being
- the common mottles.
- usually breaks down to a strong fine to medium blocky structure.
- very few to many hard and soft carbonate segregations may be present in the deep subsoils of subclass AdK.
- total soil depth is usually 100-150cm but may be shallower when overlying volcanic ash layers; shallow profiles 60-80cm deep may occur on upper slopes and
- crests of rises which may have few to many basalt boulders and stones scattered on the surface if not already cleared.

3.1.5 Soil Profile Class : Ae

General Features: These soils have strongly developed hardsetting surface horizons over clay subsoils that are dominantly brown. Bleached subsurface horizons are absent and soils with acid, neutral and alkaline trends all occur, ie. subclasses AeA, AeN and AeK, with the soils of subclass AeA being more common.

Soil Description:

Surface Soil

- fine sandy clay loam or, more commonly, clay loam.
 - very dark greyish brown to dark brown and less commonly dark reddish brown or brown.
 - 20cm thick, ranges from 10-30cm.
 - massive.
 - moderate to abundant levels of gravel may occur where these soils are found on rises in undulating terrain.

Subsoil

- medium or heavy clay.
 - dark brown to dark yellowish brown, may become yellower with a red mottle with an increase in depth.
- moderate to strong, medium and coarse blocky structure which may break down to strong fine blocky peds.
 - varying amounts of gravel are common throughout the subsoil and are usually concentrated in the top of the B horizon.
 - total soil thickness is usually greater than 100cm, but on some rises may be as shallow as 35cm.

Phases:

AeAp,AeNp,AeKp: poorly drained phases - sporadic bleached A₂ horizons or patches at the AB interface are present.

AeAt: structured surface phase - surface soils are granular and friable both moist and dry and usually occur on the slopes of stony rises

AeAl: light surface phase - surface texture is fine sandy loam.

AeNd,AeKd: deep surface phases - a paler subsurface horizon may be present and the total thickness of the surface soil is 40-45cm.

3.1.6 Soil Profile Class: Af

General Features: These soils have strongly developed hardsetting surface horizons over mottled clay subsoils that are dominantly black. A conspicuously bleached subsurface horizon, indicative of intermittent waterlogging, is a feature of these soils. Soils with acid, neutral and alkaline soil reaction trends all occur, ie. subclasses Af A, AfN and AfK, with the soils of subclass AfK being the more common.

Soil Description:

Surface Soil

A₁ horizon

- fine sandy clay loam, silty clay loam, but more commonly clay loam.
- 15cm thick, ranges from 10-20cm.
- very dark greyish brown to dark brown.
- massive.

A₂ horizon

- fine sandy clay loam, silty clay loam, but more commonly clay loam.
- 20cm thick, ranges from 5-35cm.
- conspicuously bleached light grey to near white dry, pale brown moist.
- massive.
- moderate to abundant levels of ironstone gravel are normally concentrated in the lower A₂ horizon and may continue into the top of the B horizon.

Subsoil

- heavy clay:
- very dark greyish brown to black, with red being the common mottle; colours of
 - the subsoil grade to a light yellowish brown with an increase in depth.
- strong, coarse to medium blocky structure which may break down to finer units.
- hard and soft carbonate segregations may occur in the deep subsoils of subclass Af K.
 - total soil thickness is usually greater than 100cm but may be as shallow as 40-50cm on rises in undulating terrain which may also have scattered boulders on their surface.

Phases:

AfAa,AfNa: non-waterlogging subsurface phases - paler subsurface horizons are present but are not bleached; if waterlogging does occur, it is less severe than for the normal soils, that is, AfA,A1N,AfK; these soils usually occur on crests and upper slopes in gently undulating to undulating terrain.

AfAs,AfKs: shallow surface phases - conspicuously bleached subsurface horizons are absent and surface depths are usually 5-10cm thick.

AfNt,AfKt: structured surface phases surface horizons do not set hard but are friable and strongly pedal both moist and dry.

AfKl: light surface phase - surface texture is fine sandy loam. 3.1.7 Soil Profile

Class: Ag

General Features: These soils have strongly developed hardsetting surface horizons over mottled clay subsoils that are dominantly black. They are very similar to the soils of class Af except that the subsurface horizon is sporadically bleached. Although it indicates intermittent waterlogging, it is not as severe as in the soils of class Af. Soils with acid neutral and alkaline soil reaction trends all occur, ie. subclasses AgA, AgN and AgK.

Soil Description:

Surface Soil

A₁ horizon

- fine sandy clay loam, silty clay loam or, more commonly, clay loam.
- 15cm thick, ranges from 10-25cm..
- very dark brown, dark brown or very dark greyish brown.
- massive.

A₂ horizon

- fine sandy clay loam, silty. clay loam or, more commonly, clay loam.
- 20cm thick, ranges from 5-35cm.
- sporadically bleached light grey dry, brown to dark brown moist.
- massive.
- abundant levels of ironstone gravel may be present and is usually concentrated in the lower portion of the A₂ horizon.

Subsoil

- heavy clay.
- very dark grey, very dark greyish brown or black, with red being the common mottle.
- strong, coarse blocky structure which may break down to finer units. hard and soft carbonate segregations may occur in the deep subsoils of of subclass AgK.
- total profile thickness is usually greater than 100cm but on some rises may be as shallow as 60cm; in undulating terrain surface boulders may be present on the upper slopes and crests of rises.

Phases:

AgAs,AgNs,AgKs: shallow surface phases - the average surface depth is 10cm and ranges from 5-15cm; the sporadic bleach occurs as whitish blotches at the AB interface; the alkaline phase, AgKs, is the most common phase.

AgAt,AgNt: structured surface phases - surface horizons do not set hard but are friable and strongly pedal both moist and dry.

3.1.8 Soil Profile Class: Ah

General Features: These soils have strongly developed hardsetting surface horizons over clay subsoils that are dominantly black. Bleached subsurface horizons are absent and soils with acid, neutral and alkaline soil reaction trends all occur, ie. subclasses AhA,AhN and AhK, with the soils of subclass AhK being more common.

Soil Descriptions:

Surface Soil

- fine sandy clay loam, but more commonly clay loam.
- 10cm thick, ranges from 5-30cm.
- very dark greyish brown, dark brown or black.
- massive, but may have a weak granular or blocky structure at the immediate surface under an permanent pasture.

Subsoil

- heavy clay.
- very dark greyish brown, very dark grey, very dark brown or black.
- strong, coarse blocky structure which may break down to finer units.
- very few to abundant hard and soft carbonate segregations may occur in the deep subsoils of subclass AhK.
- although total profile thickness is usually greater than 100cm, shallow profiles ranging from 35-55cm are common on slopes and crests of rises and hillslopes; variable amounts of basalt boulders and stone usually occur on these slopes.

Phases:

AhAd,AhNd,AhKd: deep surface phases - the average surface depth is 30cm and the range is 15-45cm; sporadic bleached paler subsurface horizons are present indicating that • the intermittent waterlogging is slightly more severe than the normal soils.

AhAp,AhKp: poorly drained phases - a sporadic bleach occurs as whitish blotches at the AB interface; the drainage status is similar to the deep surface phase; the alkaline phase, AhKp, is the dominantly occurring phase.

AhAt,AhNt: structured surface phases - surface horizons do not set hard but are friable and strongly pedal both moist and dry.

3.1.9 Soil Profile Class: Ai

General Features: These soils have strongly developed hardsetting surface horizons over clay subsoils that are dominantly red. Bleached subsurface horizons are absent and soils with acid, neutral and alkaline soil reaction trends all occur, ie. subclasses AiA, AiN and AiK, with the soils of subclass AiK being more common.

Soil Description:

Surface Soil

- loam or more commonly clay loam.
- 10cm thick, ranges from 5-15cm.
- dark reddish brown to brown.
- massive.

Subsoil

- medium or heavy clay.
- reddish brown, red or dark red.
- strong to moderate, medium or coarse blocky structure that may break down to finer structural units.
- very few to abundant hard and soft carbonate segregations are present in the subsoils of subclass AiK; variable amounts of coarse gravel and rock fragments may occur throughout the B horizon.
- total profile thickness is usually about 100cm or greater, but may be as shallow as 30-60cm on rises and hillslopes; if not already cleared there are usually many basalt boulders on the upper slopes and crests of rises in gently undulating terrain and on basalt hills.

Phases:

AiAt,AiNt,AiKt: structured surface phases - surface horizons do not set hard but are friable and strongly pedal both moist and dry.

AiAd,AiNd: deep surface phases - the average surface depth is 35cm and the common range is 30-40cm; dark reddish brown surface horizons grade to a reddish brown subsurface horizon (not bleached) before the clay B horizon.

AiKp: poorly drained phase - a conspicuously bleached subsurface horizon is present indicating intermittent waterlogging is likely to be more severe than in the normal Soils.

3.2 MAJOR GROUP : B

The main characteristic of these soils is the distinct texture contrast between relatively light textured surface soils and clayey subsoils. Thirteen soil profile classes were formed from the profile descriptions of duplex soils occurring on sediments.

3.2.1 Soil Profile Class: Ba

General features: These soils have weakly developed hardsetting or soft surface horizons over mottled clay subsoils that are yellow or yellow-grey. A conspicuously bleached subsurface horizon indicative of intermittent waterlogging, is a feature of the soils of this class, and soils with acid, neutral and alkaline soil reaction trends all occur, ie. subclasses BaA, BaN and BaK, with the soils of subclass BaA being the most common.

Soil Description:

Surface Soil

A₁ horizon

- fine sandy loam, sandy loam, light sandy clay loam, or occasionally loamy sand.
- 20cm thick, ranges from 5-- 30 cm.
- very dark greyish brown to brown.
- massive, generally hardsetting characteristics are weakly developed. A₂ horizon
- fine sandy loam, sandy loam, light sandy clay loam, or occasionally loamy sand.
- 20cm thick, ranges from 15-50cm.
- conspicuously bleached white or light grey dry, pale brown moist.
- massive, with soft to slightly hard consistence dry and readily breaks down to single grains when disturbed.
- variable amounts of fine and coarse gravel, particularly quartz, may be concentrated in the lower portion of this horizon; some profiles have a thin band of cemented sand as a "capping" on top of the B horizon.

Subsoil

- medium or heavy clay, may become sandy with an increase in depth, ie. medium clay (sandy), heavy clay (sandy) or sandy clay.
- yellowish brown with red and bright yellow being the common mottles.
- moderate or strong, medium to coarse blocky structure which may break down to finer structural units; the structure may become massive with an increase in depth as the textures become sandier..
- variable amounts of coarse gravel or quartz fragments may be present throughout the subsoils.
- total soil depth is usually greater than 100cm but in undulating to hilly terrain the total thickness may be as shallow as 60-80cm.

Phases:

BaAh,BaNh,BaKh: heavy surface phases - surface textures are fine sandy clay loam or sandy clay loam; the hardsetting characteristics are more strongly developed.

BaAa,BaNa,BaKa: non-waterlogging subsurface phases - paler subsurface horizons are present but are not bleached due to better subsoil aggregate stability; top of subsoils are non-sodic; moderate to abundant levels of fine and coarse gravel are present in the subsurface horizon; these soils are commonly found on crests in gently undulating to hilly terrain.

BaAah,BaKah: as above, but surface textures fine sandy clay loam or sandy clay loam.

BaAs,BaNs,BaKs: shallow surface phases - conspicuously bleached subsurface horizons are absent and the common thickness of the shallow surface soil is 15-20cm.

BaAsh: as above, but surface textures are fine sandy clay loam or sandy clay loam.

BaAm,BaNm,BaKm: massive subsoil phases - subsoils are structureless and textures are usually sandy clay, medium clay (sandy) or heavy clay (sandy); A₂ horizon may grade into a brown, sandy A₃ horizon that contains 'coffee rock' nodules, or it may consist of a coffee rock pan.

3.2.2 Soil Profile Class : Bb

General Features: These soils have loose sandy surface horizons over mottled clay subsoils that are yellow or yellow-grey. A conspicuously bleached subsurface horizon indicative of intermittent waterlogging is a feature of the soils of this class, and soils with acid, neutral and alkaline soil reaction trends all occur, ie. subclasses BbA,BbN and BbK, with the soils of subclass BbA being, by far, the most common.

Soil Description:

Surface Soil

A₁ horizon:

- loamy sand, occasionally sand or sandy loam.
- 20cm thick, ranges from 5 - 35cm.
- very dark grey to dark brown.
- loose, becoming single grained when disturbed.

A₂ horizon:

- sand or loamy sand.
- 35cm thick, ranges from 20-60cm.
- conspicuously bleached white or light grey dry, pale brown moist, occasionally the A₂ horizon may grade into a brown to light yellowish brown, sandy A₃ horizon.
- loose.
- variable amounts of fine and coarse gravel.

Subsoil

- medium clay, less commonly sandy clay, medium clay (sandy) or heavy clay.
- yellowish brown with red and bright yellow being the common mottles.
- moderate, medium blocky structure that usually breaks down to finer structural
 - units; the subsoil may become massive with an increase in depth.
- total soil depth is usually greater than 100cm.

Phases:

BbAm,BbNm,BbKm: massive subsoil phases - subsoils are structureless and textures are usually sandy clay or medium clay (sandy); the average thickness of surface soil is 60cm; the A₂ horizon may grade into a brown, sandy A₃ horizon that contains nodules of 'coffee rock' or that consists of a 'coffee rock' pan which may vary from 15-35cm thick.

BbAc,BbKc: whole-coloured subsoil phases - subsoils are not mottled and drainage may be slightly better than in the normal soils; heavy amounts of carbonate occur in the subsoils of BbKc.

BbKca: as above, but subsurface horizons are not bleached.

BbAcm: as for BbAc, but subsoils are whole - coloured and structureless.

BbNa: non-waterlogging subsurface phase - paler subsurface horizons are present but are not bleached.

3.2.3 Soil Profile Class : Bc

General Features: These soils have weakly developed hardsetting or soft surface horizons over mottled clay subsoils that are yellow or yellow-grey. They are similar to the soils of class Ba except that the subsurface horizon is sporadically bleached. Although this indicates intermittent waterlogging, it is not as severe as in the soils of class Ba. Although this is only a minor class, soils with acid, neutral and alkaline soil reaction trends all occur, ie. subclasses BcA,BcN and BcK.

Soil Description:

Surface Soil

A₁ horizon

- fine sandy loam, sandy loam or light sandy clay loam.
- 20cm thick, ranges from 15-25cm.
- very dark grey to very dark greyish brown.
- massive, generally hardsetting characteristics are weakly developed. A₂ horizon
- fine sandy loam, sandy loam or light sandy clay loam.
- 10cm thick, ranges from 5-20cm.
- sporadically bleached light grey dry, greyish brown moist.
- massive, with a soft to slightly hard consistence dry.

Subsoil

- medium or heavy clay, occasionally medium clay (sandy) or heavy clay (sandy). yellowish brown to light olive brown with bright yellow being the common mottle. moderate or strong, coarse to medium blocky structure.
- variable amounts of carbonate segregations occur in the deep subsoils of subclass BcK.

Phases:

BcAh,BcNh,BcKh: heavy surface phases - surface textures are fine sandy clay loam or clay loam and hardsetting characteristics are more strongly developed.

BcAhs: as above, but the sporadic bleach occurs as whitish blotches or nests at the AB interface; total surface thickness is usually 15cm and ranges from 5-20cm. BcAhc: as for BcAh, but subsoil is whole-coloured yellowish brown.

BcAp,BcNp,BcKp: poorly drained phases - the top of the subsoil is dark greyish brown to dark grey rather than the more common yellowish brown; subsoil texture is heavy clay. j

BcAph,BcNph,BcKph: as above, but surface texture is fine sandy clay loam or clay loam; where the sporadic bleach occurs at the AB interface surface depths range from 15-20cm.

3.2.4 Soil Profile Class Bd

General Features: These soils have weakly developed hardsetting or soft surface horizons over mottled clay subsoils that are dominantly brown. A conspicuously bleached subsurface horizon, indicative of intermittent waterlogging, is a feature of the soils of this class, and soils with acid, neutral and alkaline soil reaction trends all occur, ie. subclass BdA,BdN and BdK.

Soil Description:

Surface Soil

A₁ horizon

- fine sandy loam, sandy loam or loam (fine sandy).
- 25cm thick, ranges from 15-30cm.
- very dark grey to dark brown.
- massive, generally hardsetting characteristics are weakly developed.

A₂ horizon

- fine sandy loam to sandy loam.
- 25cm thick, ranges from 10-40cm.
- conspicuously bleached white dry, pale brown moist.
- massive.
- may have variable amounts of fine gravel.

Subsoil

- medium or heavy clay.
- dark brown to dark yellowish brown with red being the common mottle.
- moderate to strong, medium or coarse blocky structure which may break down to finer structural units.
- total soil depth is usually greater than 100cm.
- variable amounts of carbonate may occur in the deep subsoil of subclass BdK.

Phases:

BdAh,BdKh: heavy surface phases - surface texture is fine sandy clay loam and the hardsetting surface characteristics are more strongly developed.

BdAs,BdNs,BdKs: shallow surface phases - conspicuously bleached subsurface horizons are absent and the common thickness of the shallow surface soil is 10-20cm; surface texture is fine sandy loam to fine sandy clay loam.

BdAa: non-waterlogging subsurface phase - paler subsurface horizons are present but are not bleached due to better subsoil aggregate stability.

3.2.5 Soil Profile Class : Be

General Features: These soils have weakly developed hardsetting or soft surface horizons over mottled clay subsoils that are dominantly brown. They are similar to the soils of class Bd except that the subsurface horizon is sporadically bleached. Although this indicates intermittent waterlogging, it is not as severe as in the soils of class Bd. This is only a minor class and soils with acid and alkaline soil reaction trends occur, ie. subclass BeA and BeK.

Soil Description:

Surface Soil

A₁ horizon

- fine sandy loam.
- 15cm thick.
- very dark greyish brown to black.
- massive, generally hardsetting characteristics are weakly developed.

A₂ horizon

- fine sandy loam.
- 25cm thick.
- sporadically bleached light grey dry, greyish brown moist; sproadic bleach may occur at AB interface.
- massive.
- very slight levels of fine gravel may occur at the AB interface.

Subsoil

- medium or heavy clay.
- dark brown to brown with red being the common mottle.
- moderate, medium blocky structure.
- total soil depth is usually greater than 100cm.
- variable amounts of carbonate segregations may occur in the deep subsoil of class BeK.

Phases:

BeAh,BeKh: heavy surface phases - surface textures are fine sandy clay loam or, less commonly, clay loam; the hardsetting characteristics are more strongly developed.

3.2.6 Soil Profile Class : Bf

General Features: These soils have weakly developed hardsetting or soft surface horizons over whole-coloured clay subsoils that are dominantly brown. Pale subsurface horizons are present, but they are not bleached. This is only a minor class with soils only occurring in subclass Bf A.

Soil Description:

Surface Soil

A₁ horizon

- fine sandy loam.
- 20-25cm thick.
- very dark brown. massive.

A₂ horizon

- fine sandy loam.
- 5-15cm thick.
- brown.
- massive.
- moderate amounts of coarse gravel and rock fragments may occur where these soils are found on crests.

Subsoil

- heavy clay.
- dark yellowish brown.
- moderate, medium to fine blocky structure. total soil depth usually greater than 100cm.

Phases:

BfAp: poorly drained phase - subsurface horizons are conspicuously bleached. 3.2.7 Soil Profile

Class : Bg

General Features: These soils have weakly to moderately developed hardsetting surface horizons over mottled clay subsoils that are dominantly black. A conspicuously bleached subsurface horizon indicative of intermittent waterlogging, is a feature of the soils of this class and soils with a neutral soil reaction trend occur, ie. subclass BgN.

Soil Description:

Surface Soil

A₁ horizon

- fine sandy loam to light sandy clay loam.
- 35cm thick, ranges from 20-50cm.
- very dark greyish brown.
- massive.

A₂ horizon

- fine sandy loam, sandy loam or loamy sand.
- 35cm thick, ranges from 20-45cm.
- conspicuously bleached light grey dry, brown moist.
- massive, with soft consistence dry and readily breaks down to single grains when disturbed. may contain moderate to abundant levels of fine gravel in the lower portion of this horizon.

Subsoil

- medium or heavy clay.
- very dark grey, very dark brown or black with red and brown being the common mottles.
- moderate to strong, coarse blocky structure.
- total soil depth usually greater than 100cm.

Phases:

BgNh: heavy surface phase - surface texture is clay loam and the hardsetting characteristics are strongly developed.

3.2.8 Soil Profile Class : Bh

General Features: These soils have strongly developed hardsetting surface horizons over mottled clay subsoils that are dominantly black. A sporadic bleached subsurface horizon is a feature of the soils of this class, and soils with acid, neutral and alkaline soil reaction trends all occur, ie. subclasses BhA, BhN and BhK, with the soils of subclass BhK being the most common.

Soil Description:

Surface Soil

A₁ horizon

- fine sandy day loam or clay loam.
- 15cm thick, ranging from 10-25cm.
- very dark grey to very dark greyish brown,
- massive.

A₂ horizon

- fine sandy day loam or clay loam.
- 15cm thick, ranges from 5-40cm.
- sporadically bleached light grey dry, brown to dark greyish brown moist. massive.
- variable amounts of fine gravel may be present.

Subsoil

- medium or heavy clay.
- black, very dark grey or very dark greyish brown with brown or red being the common mottles.
- moderate to strong coarse blocky structure that may break down to finer structural units.
- variable amounts of carbonate segregations may be present in the deep subsoils of subclass BhK.
- total soil depth is usually greater than 100cm

Phases:

BhAl, BhNI: light surface phases - surface texture is fine sandy loam; total surface depth ranges from 30-60cm thick.

BhKs: shallow surface phase - the sporadic bleach occurs as whitish blotches or nests at the AB interface and the common surface thickness is 10-15cm.

3.2.9 Soil Profile Class : Bi

General Features These soils have strongly developed hardsetting surface horizons over clay subsoils that are dominantly black. A sporadic bleached subsurface horizon is a feature of the soils of this class. Although soils have only been identified in subclasses BiA and BiN, BiK is included to accommodate the alkaline soils of phases BiKs and BiKl.

Soil Description:

Surface Soil

A₁ horizon

- clay loam or fine sandy clay loam.
- 20cm.
- very dark brown or black.
 - massive.

A₂ horizon

- clay loam or fine sandy clay loam.
- 20cm ranges from 10-30 cm.
- sporadically bleached light grey dry, greyish brown to dark greyish brown moist.
- massive.
- may contain variable amounts of fine gravel

Subsoil

- medium or heavy clay.
- very dark grey to black.
- strong medium to coarse blocky structure that may break down to finer structural units.
- total soil depth is usually greater than 100cm.

Phases:

BiAs,BiNs,BiKs: shallow surface phases - the sporadic bleach occurs as whitish blotches or nests at the AB interface and the common surface depth is 20cm; occasionally the sporadic bleach at the AB interface is absent.

BiAsl: as for above, but surface texture is fine sandy loam.

BiKl: light surface phase - the surface texture is fine sandy loam.

3.2.10 Soil Profile Class : Bj

General Features: These soils have strongly developed hardsetting surface horizons over clay subsoils that are dominantly yellow or yellow-grey. This minor class of soils occupies the lower or more poorly drained areas of the terrain in which it occurs and soils with acid, neutral and alkaline soil reaction trends all occur, ie. subclasses BjA, BjN and BjK.

Soil Description:

Surface Soil

- clay loam or occasionally fine sandy clay loam.
- 25cm thick, ranges from 20-30cm.
- very dark greyish brown to black.
- massive.
- there may be a common abundance of fine gravel.

Subsoil

- medium or heavy clay.
- dark greyish brown.
- strong medium blocky structure.
- moderate to abundant levels of fine gravel occur throughout the subsoil. total soil depth is usually greater than 100cm.

Phases:

BjNI: light surface phase - surface texture is fine sandy loam.

BjKp: poorly drained phase - a conspicuously bleached subsurface horizon is present indicating that intermittent waterlogging is more severe.

3.2.11 Soil Profile Class : Bk

General Features: These soils have strongly developed hardsetting surface horizons over clay subsoils that are dominantly red. Although this is a minor class, soils with neutral and alkaline soil reaction trends occur, ie. subclasses BkN and BkK, with BkA being included to accommodate the acid soils of the phase BkAd.

Soil Description:

Surface Soil

- clay loam or fine sandy clay loam.
- 15cm thick, ranges from 5-20cm.
- dark reddish brown, reddish brown or brown.
- massive.
- very few to few amounts of coarse gravel or rock fragments may occur.

Subsoil

- medium or heavy clay.
- dark red to reddish brown, occasionally yellowish red.
- moderate, medium blocky structure.
- variable amounts of carbonate segregations may occur in the deep subsoils of subclass BkK.
- total soil depth is usually greater than 100cm.

Phases:

BkAd,BkKd: deep surface phases - the surface depth is 20-40cm and paler subsurface horizons may be present.

3.2.12 Soil Profile Class : B1

General Features: These soils have loose sandy surface horizons over clay subsoils that are dominantly red. A conspicuously bleached subsurface horizon, indicative of intermittent waterlogging is a feature of the soils of this minor class and soils with acid and alkaline soil reaction trends have been described, ie. subclasses B1A and B1K.

Soil Description:

Surface Soil

A₁ horizon

- loamy sand.
 - 15-30cm thick.
- very dark greyish brown to black.
- loose, becoming single grained when disturbed.

A₂ horizon

- sand to loamy sand.
 - 25-6(km thick.
- conspicuously bleached pink dry, light brown to reddish yellow moist. loose, becoming single grained when disturbed.

Subsoil

- heavy clay.
- red.
- breaks down to a strong fine blocky structure; may be a weak blocky structure.
- carbonate segregations occur in the deep subsoils of subclass B1K.
- total soil depths is usually greater than 100cm.

Phases:

B1Ka: non-waterlogging subsurface phase - paler subsurface horizon is present but not bleached.

3.2.13 Soil Profile Class : Bm

General Features: These soils have loose sandy surface horizons over clay subsoils that are dominantly black. A conspicuously bleached subsurface horizon, indicative of intermittent waterlogging, is a feature of the soils of this minor class, and soils with an alkaline soil reaction trend have been described, ie. subclass BmK.

Soil Description:

Surface Soil

A₁ horizon

- loamy sand. 30cm thick. very dark grey to very dark greyish brown.
- loose, becoming single grained when disturbed.

A₂ horizon

- loamy sand. 10cm thick. conspicuously bleached light grey dry, pale brown moist.
- loose, becoming single grained when disturbed.

Subsoil

- heavy clay.
- very dark grey to black.
- strong, coarse blocky structure, may occasionally be a weak blocky structure. variable amounts of carbonate segregations occur in the deep subsoil.
- total soil depth is usually greater than 100cm.

Phases:

BmKs: shallow surface phase - the paler subsurface horizon is absent and the surface depth is 5cm.

3.3 MAJOR GROUP : C

The main characteristic of these soils is the distinct texture contrast between relatively light to medium textured surface horizons and clayey subsoils. Four soil profile classes were formed from the profile descriptions of duplex soils occurring on granite and granodiorite.

3.3.1 Soil Profile Class : Ca

General Features: These soils have strongly developed hardsetting surface horizons over mottled clay subsoils that are yellow or yellow-grey. A conspicuously bleached subsurface horizon indicative of intermittent waterlogging is a feature of the soils of this class and soils with acid and neutral soil reaction trends occur, ie. subclasses CaA and CaN.

Soil Description:

Surface Soil

A₁ horizon

- coarse sandy clay loam or sandy clay loam or occasionally light sandy clay loam.
- 15cm thick, ranges from 10-35cm.
- dark greyish brown to very dark brown.
- massive.

A₂ horizon

- coarse sandy clay loam or sandy clay loam.
- 25cm thick, ranges from 10-55cm.
- conspicuously bleached light grey or very pale brown dry, light yellowish brown, greyish brown or pale brown moist.
- massive.
- may have variable amounts of quartz fragments.

Subsoil

- medium or heavy clay, may occasionally be coarse sandy clay.
- yellowish brown with red being the common mottle.
- strong to moderate, medium or coarse blocky structure, may break down to finer structural units.
- a few rock or quartz fragments may occur throughout the subsoil, moderate to abundant levels of mica may occur.
- total soil depth is usually greater than 100cm but may be shallower on crests in hilly terrain.

Phases:

CaAl,CaNl: light surface phases - surface textures are coarse sandy loamy to light sandy clay loamy.

CaAlm: as for above, but subsoil has a weak to massive structure.

CaAla: as for CaAl, but paler subsurface is not bleached indicating that intermittent waterlogging is not as severe as for CaA and CaN.

3.3.2 Soil Profile Class : Cb

General Features: These soils have loose sandy surface horizons over mottled clay subsoils that are yellow or yellow-grey. A conspicuously bleached subsurface horizon indicative of intermittent waterlogging, is a feature of the soils of this class, and soils with acid and neutral soil reaction trends occur, ie. subclasses CbA and CbN.

Soil Description:

Surface Soil

A₁ horizon

- loamy sand, occasionally coarse sandy loam.
- 10-45cm thick.
- very dark greyish brown to dark brown.
- loose, may be weakly coherent.

horizon

- sand, loamy sand or occasionally coarse sandy loam.
- 25-30cm thick.
- conspicuously bleached white to light grey dry, pale brown to yellowish brown moist.
 - loose.
 - abundant levels of fine and coarse gravel may occur in the lower portion of this horizon; a cemented pan of sand grains up to 10cm thick may occur at the A₂/B boundary.

Subsoil

- medium or heavy clay.
- yellowish brown with red and bright yellow being the common mottles.
- strong, coarse blocky structure which may break down to finer structural units.
- total soil depth usually greater than 100cm.

Phases:

CbAm,CbNm: massive subsoil phases - subsoils are structureless and textures may be sandy clay or medium clay (sandy).

3.3.3 Soil Profile Class : Cc

General Features: These soils have weakly to moderately developed hardsetting surface soils over mottled clay subsoils that are dominantly brown. A conspicuously bleached subsurface horizon, indicative of intermittent waterlogging, is a feature of the soils of this minor class, and soils with a neutral soil reaction trend have been described ie. subclass CcN.

Soil Description:

Surface Soil

A₁ horizon

- fine sandy 1Qam.
- 20cm thick.
- very dark greyish brown.
- massive.

A₂ horizon

- fine sandy loam.
- 20cm thick.
- conspicuously bleached very pale brown dry, light yellowish brown moist. massive.
- slight amount of fine gravel may occur in the lower portion of this horizon.

Subsoil

- medium clay.
- dark yellowish brown with a red mottle.
- breaks down to a strong, fine blocky structure when disturbed.
- total soil depth may be as shallow as 75cm where these soils occur on slopes in hilly terrain.

3.3.4 Soil Profile Class : Cd

General Features: These soils have moderately developed hardsetting surface soils over mottled clay subsoils that are dominantly black. A conspicuously bleached subsurface horizon indicative of intermittent waterlogging is a feature of the soils of this minor class and soils with an acid soil reaction trend have been described, ie. subclass CdA.

Soil Description:

Surface soil

A₁ horizon

- coarse light sandy clay loam.
- 25cm thick.
- very dark greyish brown.
- massive.

A₂ horizon

- coarse sandy clay loam.
- 15cm thick.
- conspicuously bleached light grey dry, brown moist.
- massive.

Subsoil

- medium or heavy clay.
- very dark greyish brown to black, with bright yellow being the common mottle. moderate, medium to coarse blocky structure.
- may have a slight amount of rock fragments in lower subsoil.
- total soil depth is usually greater than 100cm.

MAJOR GROUP : D

The main characteristic of these soils is their gradational texture profiles that are well-structured and mainly friable, particularly when moist. Soil profiles show increasingly more clayey textures on passing down the solum and boundaries between horizons are usually gradual, diffuse or clear. Five soil profile classes were formed from the profile descriptions of gradational soils.

Soil Profile Class : Da

General Features: These soils have friable, well-structured surface horizons which grade into more clayey subsoils that are dominantly red. The smooth-ped fabric of the B horizon is a feature of the soils of this class, and soils with acid, neutral and alkaline soil reaction trends occur, ie. subclasses DaA, DaN and DaK. Within the region, the more common acid and neutral classes are usually found on basalt or other igneous rocks.

Soil Description:

Surface Soil

- clay loam or loam.
- 20cm thick, ranges from 15-30cm.
- dark reddish brown, reddish brown, and occasionally black or dark brown.
- moderate to strong, fine or medium granular structure.
- variable amounts of gravel and rock fragments may occur.

Subsoil

- light or medium clay, may become heavier with an increase in depth.
- dark reddish brown, reddish brown, dark red, red and occasionally yellowish red. moderate or strong, medium to fine blocky structure.
- variable amounts of coarse gravel and rock fragments may occur.
- total soil depth is usually greater than 100cm but may be as shallow as 40-60cm in undulating and hilly terrain.

Phases:

DaAd, DaNd: deep surface phases - the surface depth ranges from 30-50cm and a paler subsurface horizon may be present.

3.4.2 Soil Profile Class : Db

General Features: These soils have friable, well-structured surface horizons which grade into more clayey subsoils that are dominantly brown. The smooth-ped fabric of the B horizon is a feature of the soils of this class, and soils with acid and neutral soil reaction trends occur, ie. subclasses DbA and DbN. The class DbK has been included to accommodate the alkaline phases.

Soil Description:

Surface Soil

- clay loam.
- 20cm thick, ranges from 10-30cm.
- dark brown to very dark greyish brown.
- strong, medium to fine granular or blocky structure
- variable amounts of fine gravel may occur.

Subsoil

- medium or heavy clay.
- brown, dark brown or occasionally dark yellowish brown; deep subsoils may become dark greyish brown to olive brown with a red mottle and the texture is usually heavy clay.
- moderate or strong, medium to fine blocky structure; the moist consistence varies from friable to firm.
 - variable amounts of gravel and rock fragments may occur.
- total soil thickness is usually greater than 100cm, but may be as shallow as 35-40cm on some slopes.

Phases:

DbAd,DbKd: deep surface phases - the average thickness of the surface soil is 35cm and it grades to a brown light clay before the B horizon is reached.

DbNo,DbKo: mottled subsoil phases - the upper portion of the B horizon has a red mottle and the surface soil may be massive.

DbNod: as for above, but the average thickness of the surface soil is 35cm and the surface texture grades from clay loam to light clay.

3.4.3 Soil Profile Class : Dc

General Features: These soils have friable to hard, well-structured surface horizons which grade into more clayey subsoils that are dominantly black. The smooth-ped fabric of the B horizon is a feature of the soils of this class, and soils with acid, neutral and alkaline trends occur, ie. subclasses DcA,DcN and DcK. Within the region the neutral subclass, DcN, is by far the most common in this class.

Soil Description:

Surface Soil

- clay loam, occasionally light clay.
- 25cm thick, ranges from 10 - 50cm.
- black or dark brown.
- strong, fine blocky or medium granular structure.
- shallow profiles in hilly terrain may have variable amounts of rock fragments.

Subsoil

- light, medium or heavy clay.
- black or dark brown.
- strong fine blocky structure; structural units may become coarser with an
 - increase in depth.
- variable amounts of fine and coarse gravel may occur in shallow profiles in hilly terrain; bands of volcanic ash of variable thickness occur at the AB boundary and throughout the B horizon where these soils are formed on basaltic ash; (profiles may be as shallow as 50cm where these soils occur in undulating terrain.)
- total soil depth is usually greater than 100cm, (particularly on quarternary sediments) but may be as shallow as 30-45cm where these soils occur in hilly
 - terrain (older volcanics).

3.4.4 Soil Profile Class : Dd

General Features: These soils have friable, well-structured surface horizons which grade into more clayey subsoils that are dominantly brown. The porous, rough-ped fabric of the B horizon is a feature of the soils of this class, and soils with a neutral soil reaction trend occur, ie. subclass DdN.

Soil Description:

Surface Soil

A₁ horizon

- clay loam.
- 25-35cm thick.
- very dark greyish brown.
- moderate to strong, fine blocky or medium granular structure; friable moist and dry.

A₂ horizon

- clay loam or light clay.
- 35-45cm thick.
- brown.
- breaks down to a strong fine blocky structure.
- may have abundant levels of fine and coarse gravel.

Subsoil

- light clay.
- dark brown to dark yellowish brown.
- moderate to strong fine blocky structure.
- may have moderate to heavy amounts of fine rock fragments. total soil depth usually greater than 100cm.

3.4.5 Soil Profile Class : De

General Features: These soils have friable (moist) to slightly hard (dry), well-structured surface horizons which grade into more clayey subsoils that are dominantly black. The porous, rough-ped fabric of the B horizon is a feature of the soils of this class, and soils with neutral and alkaline soil reaction trends occur, ie. subclass DeN and DeK.

Soil Description:

Surface Soil

- clay loam.
- 20-25cm thick.
- black to very dark brown.
- strong, medium granular or blocky structure.

Subsoil

- light or medium clay, may become lighter with an increase in depth. black, may become greyer with an increase in depth.
- moderate to strong, medium blocky structure.
- bands of volcanic ash may occur throughout the B horizon, or variable amounts of hard and soft carbonate segregations may occur in the deep subsoil.
- total soil depth is usually greater than 100cm.

3.5 MAJOR GROUP : E

The main characteristic of these soils is their uniform, clay textured profiles. They are strongly structured clays with a dominantly smooth-ped fabric and they exhibit significant cracking on drying. Three soil profile classes were formed from the profile descriptions of uniform clay soils.

3.5.1 Soil Profile Class : Ea

General Features: These uniform clay soils are characterized by the presence of a black clay horizon below the immediate surface. This dark clay horizon (referred to as the D.C.H.) usually grades to a grey clay, which may or may not be mottled, in the deep subsoil. Pale or bleached, subsurface horizons are absent and soils with acid, neutral and alkaline soil reaction trends all occur throughout the region, ie subclasses EaA,EaN and EaK. The alkaline subclass EaK, is the more common.

Soil Description:

Surface Soil

- light or medium clay, occasionally heavy clay.
- 5-20cm thick.
- black, dark grey or very dark greyish brown.
- strong, fine to coarse blocky structure.
- consistence is usually very hard dry and sticky when wet.

Subsoil

- medium or heavy clay.
- black or very dark grey, may become greyish brown with a yellow mottle in the deep subsoil.
- strong, medium or coarse blocky structure.
- variable amounts of hard and soft carbonate segregations may occur in the deep subsoils of the alkaline soils.
- total soil depth is usually greater than 150cm.

Phases:

EaAf,EaNf,EaKf: shallow solum phases - total soil depth varies but the common range is 30-60cm where these soils occur on the slopes of rises and hills; variable amounts of surface rocks and boulders occur; carbonate segregations may occur in the subsoils of the alkaline phase.

3.5.2 Soil Profile Class : Eb

General Features: These uniform clay soils are characterized by the presence of a brown or red clay horizon below the immediate surface. These brown and red clay horizons (referred to as the B.C.H. and the R.C.H. respectively) usually grade to a greyish brown or yellowish brown clay, which may be mottled red in the deep subsoil. Pale, or bleached, subsurface horizons are absent and soils with an alkaline soil reaction trend occur, ie. subclass EbK.

Soil Description:

Surface Soil

- medium clay.
- 20-30cm thick.
- dark reddish brown to black.
- strong, medium to coarse blocky structure.
- may have a few hard and soft carbonate segregations where these soils are formed on limestone.

Subsoil

- medium or heavy clay, may become light clay with an increase in depth.
- dark reddish brown to dark brown, becoming greyish brown to yellowish brown with an increase in depth; the deep subsoil may have a red mottle.
- strong coarse blocky structure where these soils occur in depressions, but on hillslopes they have a moderate to strong fine blocky structure.
- common to moderate levels of hard and soft carbonate segregations occur in the deep subsoil, but are found throughout the subsoil where these soils are formed on limestone.
- total soil depth is usually greater than 100cm.

Phases:

EbKf: shallow solum phase - total soil depth is about 60cm.

3.5.3 Soil Profile Class : Ec

General Features: These uniform clay soils are characterized by the presence of a grey clay horizon below the immediate surface. This grey clay horizon (referred to as the G.C.H.) usually grades to a paler grey clay, which may or may not be mottled. Pale, or bleached, subsurface horizons are absent and soils with acid, neutral and alkaline soil reaction trends all occur throughout the region, ie. subclasses EcA, EcN and EcK. The alkaline subclass, EcK, is by far the more common

Soil Description:

Surface Soil

- light, medium or heavy clay.
- 5-25cm thick, may occasionally be deeper.
- dark grey, very dark greyish brown or black.
- strong, coarse blocky structure, may occasionally be strong, fine blocky particularly when dry.

Subsoil

- medium or heavy clay.
- grey, dark grey or dark greyish brown; may become greyish brown, olive brown, grey or light brownish grey, with or without a yellow mottle, with an increase in depth.
- moderate to strong, coarse blocky structure, which may break down to finer structural units; deep subsoil is sometimes massive.
- moderate to abundant hard and soft carbonate segregations may occur in the deep subsoil of the alkaline soils; moderate to abundant levels of fine gravel may occur in the subsoils of some depression soils.
- total soil depth is usually greater than 150cm.

EcNf,EcKf: shallow solum phases - total soil depth may be as shallow as 55-60cm in some depressions and plains.

Phases:

3.6 MAJOR GROUP : F

The main characteristics of these soils is their uniform medium textured (loamy) profiles which exhibit a porous, rough-ped fabric. They are shallow to very shallow soils and B horizons are absent. Two soil profile classes have been formed from the profile descriptions of shallow uniform medium textured soils.

3.6.1 Soil Profile Class : Fa

General Features: These are friable, well-structured black or red loamy soils which lack the development of a bleached subsurface horizon. They are most commonly associated with the stone barriers of the basalt "stony rise" country and occur extensively throughout the region. Soils with acid, neutral and alkaline soil reaction trends occur, ie. subclasses FaA, FaN and FaK, with the acid subclass being the most common.

Soil Description:

Surface Soil

- clay loam or loam; may be fine sandy clay loam to fine sandy loam on limestone. commonly 10-30cm thick, may occasionally be 60-100cm thick; where these soils are found on limestone the depth is more variable and may be as thick as 60-120 cm.
- black, very dark brown and dark reddish brown, or less commonly, dark brown or brown.
- moderate or strong, medium to fine crumb or fine blocky structure; the immediate surface may occasionally have a weak to massive structure.
- variable amounts of fine and coarse gravel. and rock fragments are common throughout the profile; a slight amount of hard carbonate segregations may occur in the lower portion of the alkaline soils, especially those formed on limestone.
- over substrate material.

3.6.2 Soil Profile Class : Fb

General Features: These are shallow, massive loamy soils that have a pale subsurface horizon which is directly underlain by rock. Soils with an acid soil reaction trend occur, ie. FbA.

Soil Description:

Surface Soil

A₁ horizon

- fine sandy clay loam to sandy clay loam.
- 5-20cm thick.
- very dark greyish brown to light brownish grey.
- massive.
- light amount of quartz fragments.

A₂ horizon

- fine sandy clay loam.
- 10-35cm thick.
- conspicuously bleached white dry, light grey moist or greyish brown dry if not bleached.
- common to moderate levels of fine gravel or quartz fragments.
- massive.
- over substrate material.

3.7 MAJOR GROUP : G

The main characteristic of these soils is their uniform medium textured (loamy) profiles which exhibit a porous, earthy fabric. They are deep soils that show weak horizon differentiation and are developed in alluvium. One soil profile class has been formed from the profile descriptions of deep, uniform medium textured soils.

3.7.1 Soil Profile Class : Ga

General Features: These are deep, very poorly structured loamy soils that lack the development of a bleached subsurface horizon. Soils with a neutral and alkaline soil reaction trend occur, ie. subclasses GaN and GaK.

Soil Description:

Surface Soil

- silty loam to clay loam.
- 30-40cm thick before a gradual change to a weakly developed B horizon, very dark greyish brown to dark brown.
- massive or weak, medium blocky structure.
- friable moist and hard dry.
- the higher spots in the terrain in which these soils occur contain a common amount of coarse gravel (mainly quartz) throughout the solum.

Subsoil

- silty loam to clay loam.
- brown, light yellowish brown and light olive brown are the most common colours.
- massive structure; friable consistence moist.
- total soil depth is greater than 100cm.

MAJOR GROUP : H

The main characteristic of these soils is their deep, uniform sandy textured profiles. They have been separated on the basis of the development of profile characteristics, and five soil profile classes have been formed from the profile descriptions of deep, uniform textured sands.

Soil Profile Class : Ha

General Features: These are deep, uniform sandy soils that have little or no pedologic organisation apart from the surface accumulation of organic matter. Soils with an acid soil reaction trend occur, ie. subclass HaA.

Soil Description:

Surface Soil

- loamy sand. 35cm thick. black.
- loose.

Subsurface Soil

- sand.
- dark greyish brown to greyish brown. loose.
- deeper than 100 cm.

3.8.2 Soil Profile Class : Hb

General Features: These are deep, uniform sandy soils that have a conspicuously bleached subsurface horizon. Soils with an acid and a neutral soil reaction trend occur, ie. subclasses HbA and HbN.

Soil Description:

Surface Soil

A₁ horizon

- loamy sand or sand; coarse sandy loam where these soils are formed on granite.
- 20-30cm thick.
- black, dark greyish brown or greyish brown.
- loose.

A₂ horizon

- sand, coarse sandy loam where these soils are formed on granite.
- 30-90cm thick.
- conspicuously bleached white, pinkish white, pink or light greyt dry, pale brown,
- brown, light yellowish brown, brownish yellow or greyish brown moist; the dark surface horizon may grade to a brown transition horizon before the paler bleached layer.
- loose.

Subsoil

- sand to sandy loam; coarse sandy loam where these soils are formed on granite. light brown, yellowish brown, greyish brown, brownish yellow, reddish yellow or yellowish red where formed on granite, darker subsoils may have a yellow mottle.
- loose, but more coherent than the surface soils.
- total soil depth greater than 120cm.

3.8.3 Soil Profile Class : He

General Features: These are deep, uniform sandy soils that have a conspicuously bleached subsurface horizon which overlies a cemented or compacted pan. Soils with an acid soil reaction trend occur, -ie. subclass HcA.

Soil Description:

Surface Soil

A₁ horizon

- loamy sand.
- 20-50cm thick.
- black to dark grey.
- loose.

A₂ horizon

- sand.
- 20-100cm thick.
- conspicuously bleached white or light grey dry, light brownish grey to pale brown moist.
- loose.

Subsoil

- cemented pan of sand or clayey sand.
- pan 15-25cm thick.
- 'coffee rock' pan black or dark brown; consistence pan (very hard dry) yellowish brown.
- may grade to a light yellowish brown sand below the pan which is loose. total soil depth is greater than 150cm.

3.8.4 Soil Profile Class: Hd

General Features: These are deep, uniform sandy soils that lack the development of a bleached subsurface horizon but have colour and textural changes throughout the profile. Soils with acid and alkaline soil reaction trends occur, ie. subclasses HdA and HdK.

Soil Description

Surface Soil:

- loamy sand, occasionally fine sandy loam. 20-30cm thick, occasionally up to 80cm thick. black to dark greyish brown.
- loose to weakly coherent.

Subsoil:

- sand, coarse loamy sand or coarse light sandy clay loam.
- brown or dark reddish brown, grading to yellowish brown or very pale brown in the deep subsoil.
- weakly coherent.
- variable amounts of fine quartz gravel and mica; where these soils are formed on limestone a calcrete pan or variable amounts of hard and soft carbonate segregations occur in the subsoil.
- total soil depth is greater than 120cm.

3.8.5 Soil Profile Class: He

General Features: These are deep, uniform sandy soils that have little or no pedologic organisation apart from the surface accumulation of organic matters. Soils with an alkaline soil reaction trend occur, ie. subclass HeK.

Soil Description:

- coarse sand.
- deeper than 100cm. light yellowish brown. loose.
- many shell fragments.

3.9 MAJOR GROUP : I

The main characteristic of these soils is their shallow, uniform sandy textured profiles. They have been separated on the basis of the presence or absence of a bleached subsurface horizon and those lacking this horizon are usually found on limestone in the survey area. Two soil profile classes have been formed from the profile descriptions of shallow, uniform textured sands.

3.9.1 Soil Profile Class : Ia

General Features: These are shallow, uniform sandy soils that have a conspicuously bleached subsurface horizon that is directly underlain by rock. Soils with an acid soil reaction trend occur, ie. subclass IaA.

Soil Description:

Surface Soil

A₁ horizon

- loamy sand.
- 20cm thick.
- very dark grey.
- weakly coherent.

A₂ horizon

- sand
- 10cm thick over bedrock.
- conspicuously bleached light grey dry, greyish brown moist.
- loose.
- slight amount of quartz gravel.
- over substrate material.

3.9.2 Soil Profile Class : lb

General Features: These are shallow uniform sandy soils that are formed on limestone. They lack the development of a bleached subsurface horizon and soils with acid and alkaline soil reaction trends occur, ie. subclasses lbA and lbK, with lbK being the more common.

Soil Description:

Surface Soil

- loamy sand to fine sandy loam. 15-50cm thick.
- black or dark reddish brown. loose to weakly coherent.

Subsoil

- sand, loamy sand or fine sandy loam.
- 20-50cm thick over limestone.
- dark red, dark reddish brown or brown.
- loose to weakly coherent.
- the alkaline subclass contains variable amounts of hard and soft carbonate segregations.

3.10 MAJOR GROUP :

The main characteristic of these soils is the high organic content of a relatively deep surface soil overlying a clay . subsoil. One soil profile class has been formed from the profile descriptions of organic soils.

3.10.1 Soil Profile Class : Ja

General Features: These soils have peaty surfaces over black clay subsoils. Soils with acid and neutral soil reaction trends occur, ie. subclasses JaA and JaN.

Soil Description:

Surface Soil

- peaty loam, occasionally peaty clay loam. 40-60cm thick.
- black.
- may have a platy structure.

Subsoil

- light clay, becomes medium clay with an increase in depth.
- black, very dark grey or very dark brown; deep subsoil may have a yellowish brown mottle.
- blocky structure.
- total soil depth is greater than 120cm.

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APPENDIX 1

GLOSSARY OF LANDFORM PATTERNS The

definitions in this glossary are taken from Speight (1984).

LF - Alluvial Fan

Level to very gently inclined complex landform pattern of extremely low relief.- The rapidly migrating alluvial stream channels are shallow to moderately deep, locally numerous, but elsewhere widely spaced. Incision in the up-slope area may give rise to an erosional stream bed between scarps.

ALP - Alluvial Plain

Level landform pattern with extremely low relief. The shallow to deep alluvial stream channels are sparse to widely spaced, forming a unidirectional integrated network. There may be frequently active erosion and aggradation by channelled and overbank stream flow, or the landforms may be relict from these processes.

DUN - Dunefield

Level to rolling landform pattern of very low or extremely low relief without stream channels, built up or locally excavated, eroded or aggraded by wind.

ESC - Escarpment

Steep to precipitous landform pattern forming a linearly extensive, straight or sinuous inclined surface which separates terrains at different altitudes, that above the escarpment commonly being a plateau. Relief within the landform pattern may be high (hilly) or low (planar). The upper margin is often marked by an included cliff or scarp.

AIL - Hills

Landform pattern of high relief (90 - 300m) with gently inclined to precipitous slopes. There is continuously active erosion by wash and creep and, in some cases, rarely active erosion by landslides.

LAV - Lava Plain

Level to undulating landform pattern of very low to extremely low relief typically with widely spaced fixed erosional stream channels. The landform pattern is aggraded by volcanism (lava flow) that is generally relict; it is subject to erosion by continuously active sheet flow, creep and channelled stream flow.

LOW.-Low Hills

Landform pattern of low relief (30-90m) and gentle to very steep slopes. There is continuously active sheet flow, creep, and channelled stream flow.

MOU - Mountains

Landform pattern of very high relief (greater than 300m) with moderate to precipitous slopes. There is continuously active erosion by collapse, landslide, sheet flow, creep and channelled Stream flow.

PLA - Plain

Level to undulating or, rarely, rolling landform pattern of extremely low relief (less than 9m).

PLT Plateau

Level to rolling landform pattern of plains, rises or low hills standing above a cliff, scarp or escarpment that extends around a large part of its perimeter.

RIS - Rises

Landform pattern of very low relief (9 - 30m) and very gentle to steep slopes. The pattern is eroded by continuously active to barely active creep and sheet flow.

SAN - Sand Plain

Level to gently undulating landform pattern. of extremely low relief and without channels; formed possibly by sheet flow or stream flow, but now relict and modified by wind action.

SHF - Sheet-Flood Fan

Level (less than 1% slope) to very gently inclined landform pattern of extremely low relief with numerous rapidly migrating very shallow incipient stream channels. The pattern is aggraded by frequently active sheet flow and channelled stream flow; with subordinate wind erosion.

TER - Terrace (alluvial)

Former flood plain on which erosion and aggradation by channelled and over-bank stream flow is barely active or inactive because deepening or enlargement of the stream channel has lowered the level of flooding.

APPENDIX 2

GLOSSARY OF LANDFORM ELEMENTS The

definitions in this glossary are taken from Speight (1984). BKP Backplain

Large flat resulting from aggradation by over-bank stream flow at some distance from the stream channel and in some cases biological (peat) accumulation; often characterized by a high water table and the presence of swamps or lakes.

BOU - Blow Out

Usually small, open or closed depression excavated by the wind.

C - Crest

Landform element that stands above all, 'or almost all, points in the adjacent terrain. It is characteristically smoothly convex upwards.

CON - Cone (volcanic)

Hillock with a circular symmetry built up by volcanism. The crest may form a ring around a crater.

CRA - Crater

Steep to precipitous closed depression excavated by explosions due to volcanism, human action, or impact of an extraterrestrial object.

Depression

Landform element that stands below all, or almost all, points in the adjacent terrain. A 'closed depression' (D) stands below all such points; an 'open depression' (V) extends at the same elevation, or lower, beyond the locality where it is observed.

DDE - Drainage Depression

Level to gently inclined shallow open depression with smoothly concave cross-section, rising to moderately inclined side slopes, eroded or aggraded by sheet wash.

DUN - Dune

Moderately inclined to very steep ridge or hillock built up by the wind.

F Flat

Landform element that is neither a crest nor a depression and that is level or very gently inclined.

FAN - Fan

Large gently inclined to level element with radial slope lines inclined away from a point, resulting from aggradation, or occasionally from erosion, by channelled, often braided, stream flow, or possibly by sheet flow.

FOO - Footslope

Moderately to very gently inclined waning lower slope resulting from aggradation or erosion by sheet flow, earth flow or creep.

FOR - Foredune

Elongated, moderately inclined to very steep ridge built up by the wind from material from an adjacent beach.

H - Hillock

Compound landform element comprising a narrow crest and adjoining slopes, the crest length being less than the width of the landform element.

HSL - Hillslope

Gently inclined to precipitous slope, commonly simple and maimal, eroded by sheet wash or water-aided mass movement.

L - Lower 'Slope

Slope element adjacent above a f t r depression but not adjacent below a crest or flat.

LUN Lunette

Elongated, gently curved,- low ridge built up by wind on the margin of a playa (shallow, level-floored closed depression), typically with a moderate, wave-modified slope towards the player and a gentler outer slope.

MAA Maar

Level-floored, commonly water-filled closed depression with a nearly circular steep rim, excavated by volcanism.

OXB - Ox-bow

Long, curved, commonly water-filled closed depression eroded by channelled stream flow but closed as a result of aggradation by channelled or over-bank stream flow. The floor of an ox-bow may be more or less aggraded by over-bank stream flow, wind and biological (peat) accumulation.

PLA - Plain

Large very gently inclined or level element, of unspecified geomorphological agent or mode of activity.

R - Ridge

Compound landform element comprising a narrow crest and adjoining slopes, the crest length being greater than, the width of the landform element.

S - Slope

Landform element that is neither a crest nor a depression and that has an inclination greater than about 1%.

STC - Stream. Channel

Linear, generally sinuous open depression, in parts eroded, excavated, built up and aggraded by channelled stream flow. This element comprises stream bed and banks.

SWP Swamp

Almost level, closed, or almost closed depression with a seasonal or permanent water table at or above the surface, commonly aggraded by over-bank stream flow and sometimes biological (peat) accumulation.

TOR - Tor

Steep to precipitous hillock, typically convex, with a surface mainly of bare rock, either coherent or comprising subangular to rounded large boulders (exhumed corestones, also themselves called tors) separated by open fissures; eroded by sheet wash .or water-aided mass movement.

U - Upper Slope

Slope element adjacent below a crest or flat but not adjacent above a flat or depression.

APPENDIX 3

GENERAL GLOSSARY

Aggradation - refers to the presence of material deposited on a pre-existing soil surface as a result of wind and/or water erosion.

Boundary between soil horizons - defines the nature of the change from one horizon to that below. It is specified by two terms - one a measure of the thickness or width of the transition zone between horizons, the other a measure of its shape, -as. expressed in the vertical section. It may be described as follows:

(1) Boundary distinctness or width

Sharp	<5mm
Abrupt	5-20mm
Clear	20-50mm
Gradual	50-100mm
Diffuse	>100mm

(2) Boundary Shape

Smooth	Almost a plane surface
Wavy	Undulations wider than they are deep
Irregular	Undulations deeper than they are wide
Broken	. Discontinuous

Condition of Surface- The characteristic appearance of the surface soil when dry. The following conditions are not necessarily mutually exclusive:

Periodic Cracking - Cracks 6mm or more wide, 300mm or more deep and at least 1 crack per m². Cracks may lie below a massive surface.

Self-mulching - Highly pedal loose surface mulch forms on drying.

Loose - Incoherent mass of individual particles or aggregates. Surface easily disturbed by pressure of forefinger.

Soft - Coherent mass of individual particles or aggregates. Surface easily disturbed by pressure of forefinger.

Firm - Coherent mass of individual particles or aggregates. Surface disturbed or indented by moderate pressure of forefinger.

Hard Setting - Compact, hard, apparently apedal condition forms on drying. Surface not disturbed or indented by pressure of forefinger. Surface seal is not necessarily associated with hard setting.

Consistence - Refers to the strength of cohesion and adhesion in soil. Strength of soil is the resistance to breaking or deformation and will vary according to soil water status.

Fabric - Describes the appearance of the soil material. Differences in fabric are associated with the presence or absence of peds, the lustre or lack of lustre of the ped surfaces, and the presence, size and arrangement of pores (voids) in the soil mass. The descriptions given below apply primarily to B horizons.

Rough-ped fabric - Peds are evident, and characteristically more than 50 per cent of the peds are rough-faced, that is, they have relatively porous surfaces with a general floc condition.

Smooth-ped fabric - Peds are evident, and characteristically more than 50 per cent of them are dense and smooth-faced, that is, have a general lac condition on their surfaces, although the degree of lustre may vary.

Field texture - Is a measure of the behaviour of a small handful of soil when moistened and kneaded into a ball and then passed out between thumb and forefinger. Although strongly influenced by clay content, texture is also affected by other properties such as, the type of clay mineral, silt, organic matter, oxides, calcium - magnesium carbonates, exchangeable cations and strong fine-structured aggregation.

Gilgai microrelief - a surface microrelief associated with soils containing shrink-swell clays. Gilgai consist of mounds and depressions showing varying degrees of order, sometimes separated, by a subplanar or slightly undulating surface. Some gilgai types are:

crabhole gilgai - irregularly distributed small mounds and depressions separated by a more or less continuous shelf. Vertical interval usually less than 300mm. Horizontal interval usually 3-20m, surface almost level.

normal gilgai - irregularly distributed small mounds and subcircular depressions varying in size and spacing. Vertical interval usually less than 300mm, horizontal interval usually 3-10m, surface almost level.

Horizons - a soil horizon is a layer of soil, approximately parallel to the land surface, with morphological properties different from layers below and/or above it. Tongues of material from one horizon may penetrate into adjacent horizons. The following horizons may be recognised:

A horizons - these horizons either consist of one or more surface mineral horizons with some organic accumulation and darker in colour than the underlying horizons, or consist of surface and subsurface horizons that are lighter in colour but have a lower content of silicate clay/and/or sesquioxides than the underlying horizons.

A₁ horizon: The surface layer more or less darkened by organic matter – a zone of maximum biological activity.

A₂ horizon: A subsurface layer lower in organic matter than the A₁ and, consequently, usually lighter in colour. It is a zone of maximum leaching.

Bleached A₂ horizon:

A₂ horizons that are white, near white or much paler than adjacent horizons. Two kinds of bleached horizons, are recognised:

Conspicuous bleach - 80 per cent or more of A₂ horizon bleached.

Sporadic bleach - bleach occurs irregularly through the A₂ horizon; as blotches often less than 6mm thick at the interface of A and B horizons, as nests of bleached grains of soil material often at the interface of A and B horizons, when no other evidence of A₂ horizon may occur.

B horizons - These horizons consist of one or more mineral soil layers characterised by one or more of the following: a concentration of silicate clay, iron, aluminium, organic material or several of these; a structure and/or consistence unlike that of the A horizons above or of any horizons immediately below; stronger colours than those of the A horizons above or those of the horizons below.

Landform element - landform individual that forms only a part of a toposequence. A landform element may be described by the following attributes, assess within a circle of about 20m radius.

1. Slope eg. level, gently inclined, steep.
2. Morphological type eg. crest, flat, open depression.
3. Dimensions ie. length, width and height expressed in metres.
4. Mode of geomorphological activity eg. eroded, aggraded, built up.
5. Geomorphological agent eg. gravity, precipitation, stream flow, wind, internal forces (eg. volcanism)

As occurrence of a landform element extends as far as its attributes remain constant.

Landform individual - is a basic unit chosen to be described, classified and mapped. The mapping unit may be larger but not smaller than a landform individual.

Landform pattern - landform individual that includes the whole toposequence. Significant kinds of landform pattern may be described and differentiated by seven attributes assessed within a circle of about 300m radius. These attributes are:

1. relief.
2. modal slope.
3. stream channel occurrence.
4. mode of geomorphological activity.
5. geomorphologic & agent.
6. status of geomorphological activity eg. continuously active, seldom active, relict.
7. component landform elements.

Mottled - spots, blotches or streaks of subdominant colours different from the matrix colour and also different from the colour of the ped surface, nodules or concretions.

Pan - a hardened and/or cemented horizon in or below the soil profile.

Ped - an individual natural soil aggregate consisting of a cluster of primary particles, and separated from adjoining peds by surfaces of weakness which are recognisable as natural voids or by the occurrence of cutans (a modification of the texture, structure or fabric of natural surfaces in soil materials; it arises from concentration of particular soil constituents).

Pedality - refers to the relative proportion of peds in the soil. apedal soils have no observable peds

pedal: soils have observable peds.

Phase - a subdivision of a classification category (in this case a subclass) where the basis of subdivision is a Characteristic or combination of characteristics potentially significant to man's use or Management of soils.

Primary Profile. Form - is textural in character and is the term given to the first or primary division of all soils in the Factual Key classification. So far four primary profile forms have been recognised, as follows:

1. Organic
2. Uniform U
3. Gradational G
4. Duplex D

Profile - the soil profile is the face of soil exposed in a vertical section. More realistically it is a column or prism of soil of small • cross-sectional area and extending from the soil surface to the parent material.

Profile Form - is the term used to express the overall material impression created by the soil properties as these are considered at different stages of the Factual Key classification.

Rock Outcrop - this refers to any exposed area of rock that is inferred to be continuous with underlying bedrock. The abundance of rock outcrop is described as:

no bedrock exposed

rocky <10% bedrock exposed

very rocky 10% - 50% bedrock exposed

rockland >50% bedrock exposed

Segregations - discrete formations that have accumulated in the soil because of the concentration of some constituent, usually by chemical or biological action. The abundance of segregations can be described as

no segregations

very few, very slightly <2%

few; slightly 2 - 10%

common 10 - 20%

many; moderately 20 - 50%

Very many; abundant >50%

Soil Profile Class - A basic soil grouping obtained by grouping profiles of similar morphology where the variation in characteristic soil morphological properties is less within classes than between classes.

Soil Reaction Trends - Describes the change in pH with depth. Three trends termed acid, neutral and alkaline are defined as follows:

•

Acid trend - the surface soil has a pH* value lower than pH 7.0 and the deep subsoil has a pH value less than pH 6.5.

Neutral trend - the surface soil has a pH value between pH 5.0 and pH 8.0 and the deep subsoil has a pH value between pH 6.5 and pH 8.0

Alkaline trend - the surface soil has a pH value higher than pH 5.0 and the deep subsoil has a pH value higher than pH 8.0

Soil - Sites - the subject of the most intensive examination of soils; here all pertinent soil features and properties can be observed, recorded and measured. Soil-sites range from single soil profiles to several neighbouring profiles and include their surface topography.

Structure - refers to the distinctness, size and shape of peds

Substrate material - is the material below the soil profile. It may be the soil parent material or it may be unlike the material from which the soil has formed

Surface coarse fragments - coarse fragments defined in terms of the size of particles coarser than 2mm. They include rock fragments inferred to be not continuous with underlying bedrock, and other fragments.

Abundance of coarse fragments:

no surface coarse fragments	0
very slightly; or very few	<2%
slightly; or few	2% - 10%
(for example slightly stony; few stones)	
common	10% - 20%
moderately; or many	20% - 50%
very; or abundant	50% - 90%
extremely; or very abundant	>90%.

Size of coarse fragments:

fine gravelly; or small pebbles	2 - 6mm
medium gravelly; or medium pebbles	6 - 20mm
coarse gravelly; or large pebbles	20 - 60mm
cobbles	60 - 200mm
stony; or stones	200 - 600mm
boulders	600mm - 2m
large boulders	>2m

* determined in a 1:5 soil:water suspension.

Map Unit: 1

Classification Code: BbA,BaA - S - PLA

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
BbA,BaA		S	PLA

Soil Distribution:

These soils have been formed on outwash deposits of the Grampians and occupy the gently undulating plains at the base of the steeper mountain slopes. The soils are very similar apart from surface textures which range from loamy sand to fine sandy loam and the degree of development of hardsetting surfaces, ie. there is no development in the BbA soils and only weak development in the soils of subclass BaA.

Map Unit: 2

Classification Code: EaK,EcK - SWP - ALP

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
EaK,EcK	EaA	SWP	ALP

Soil Distribution:

The grey days, EcK, tend to be the dominant soils of the smaller swamps and depressions which occur on the lava plains. On the other hand the black clay soils, EaK, are commonly found in the swamps and depressions associated with stony rise landscapes and the larger alluvial plains with cracking clay soils. The soils of subclass EaA are occasionally found in swamps and depressions. Due to the map scale only the larger swamps and depressions have been delineated and either the element only is mapped or the element is part of an alluvial plain landform pattern.

Map Unit: 3

Classification Code: AaK,AaN,AbKps - S - LAV

Co-dominant Soils	Sub-Dominant Soils	Landform Element	Landform Pattern
AaK,AaN,AbKps	AbK,AbKp EcK,AiNd,DbKd	S SWP	LAV

Soil. Distribution:

These mainly alkaline soils occur on the gently undulating plains in the Willaura area. The conspicuously bleached soils, class Aa, tend to occur on the broad flat crests and other level areas, while the soils with sporadically bleached subsurfaces, class Ab, tend to occur on slopes. Sporadically bleached soils with deep surfaces (AbK and AbKp) are not as widespread as those with shallow surfaces (AbKps). Numerous grey clay (EcK) swamps and depressions are scattered throughout this map unit. Occasionally red or brown soils (AiNd or DbKd) may be found on banks surrounding these swamps.

Map Unit: 4

Classification Code: AaK,AaN,AbKps - HSL - LAV

Co-dominant Soils	Sub-Dominant Soils	Landform Element	Landform Pattern
AaK,AaN,Abkps	AbK,AbKp EcK,AiNd,DbKd	HSL SWP	LAV

Soil Distribution:

The soils of this unit, which occur to the east of Willaura, consist of conspicuously bleached alkaline and neutral soils (AaK and AaN) in association with alkaline, sporadically bleached soils (AbKps) on the rises and grey clays (EcK) in the numerous swamps and depressions between the rises. Sporadic bleached soils with a shallow surface are more common than those with a deep surface (AbK and AbKp). Red or brown soils (AiNd or DbKd) may occur on the banks bordering the clay depressions. These banks tend to be the best yielding areas, whereas the neutral soils (AaN) are more easily managed and higher yielding than the alkaline soils. Some rises may have basalt boulders and stones scattered on their surface.

Map Unit: 5

Classification Code: BaA,BaN - PLA - PLA

Co-dominant Soils-	Minor Soils	Landform Element	Landform Pattern
BaA,BaN	EbK,EcA	PLA	PLA

Soil Distribution:

This unit consists of an association of acid and neutral mottled-yellow (BaA and BaN) duplex soils on level plains. Either subclass may be dominant locally. Acidic grey clay (EcA) flats or alkaline brown clay (EbK) drainage depressions may occur on these plains.

Map Unit: 6

Classification Code: BaA,BaN - S - PLA

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
BaA,BaN	BaNa,BcAh	S	PLA

Soil Distribution:

The soils of this unit are common on the gently undulating sedimentary plains in the eastern portion of the survey area. Either the acidic (BaA) or neutral (BaN) subclass may be dominant locally and they occur in association with soils that have unbleached subsurface horizons (BaNa) in the better drained areas. Heavier surface textured soils (BcAh) may occur in drainage lines.

Map Unit: 7

Classification Code: BaA,BaN - HSL - RIS

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
BaA,BaN	BbN,BbNm,BaNa	HSL	RIS

Soil Distribution:

The unit consists of an association of acid (BaA) and neutral (BaN) mottled-yellow duplex soils on gently undulating rises which are scattered throughout the survey area. There are minor occurrences where the condition of the surface soil is loose (BbN and BbNm) and others that have unbleached surface horizons (BaNa) in the better drained areas. Either the acidic or neutral subclass may be dominant locally.

Map Unit: 8

Classification Code: BaA,BaN - HSL - R1S

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
BaA,BaN	BaAa,BaN _a ,BcN, BdA,BdN,BdN _s	HSL	RIS

Soil Distribution:

The unit consists of an association of acid (BaA) and neutral (BaN) mottled-yellow duplex soils on undulating rises. Either subclass may be dominant locally. There are minor occurrences of mottled-brown duplex soils (BdA,BdN and BdN_s) and RLSEs where the severity of the seasonal waterlogging is less severe (BaAa,BaN_a and BcN) than the dominant soils.

Map Unit: 9

Classification Code: BaA,BaN - HSL - LOW

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
BaA,BaN	BcN,BeA,BaAa, BaNa	HSL	LOW

Soil Distribution:

The unit consists of an association of acid (BaA) and neutral (BaN) mottled-yellow duplex soils on the slopes of undulating low hills. Banks with deeper surface soils (up to 80cm) may occur in some areas and either the acid or neutral subclass may be dominant locally. There are minor occurrences of both mottled-yellow (BcN) and mottled-brown (BeA) duplex soils with sporadically bleached subsurface horizons and in the better drained situations, soils that lack a bleached subsurface horizon (BaAa and BaNa). Relatively small salty patches, due to saline seepage, occur on some slopes, particularly in the Colac area.

Map Unit: 10

Classification Code: BaA,BaN - HSL - LOW

Co-dominant	Minor Soils	Landform Element	Landform Pattern
BaA,BaN	FbA,laA, BaAm,Bf A	HSL	LOW

Soil Distribution:

The unit consists of an association of acid (BaA) and neutral (BaN) mottled-yellow duplex soils on the slopes of rolling low hills, with either subclass being dominant locally. Areas of shallow, light-textured soils (FbA and laA) on country rock occur, along with minor occurrences of mottled-yellow duplex soils with massive subsoils (BaAm) and brown duplex soils (Bf A). The upper slopes and crests generally have lighter textured surface soils compared to lower down the slope. Gully and sheet erosion are a common problem in cleared areas.

Map Unit: 11

Classification Code: BaA,BaN - HSL - 1111..

Co-dominant	Minor Soils	Landform Element	Landform Pattern
BaA,BaN	-	HSLSL	HIL

Soil Distribution:

The unit consists of an association of acid (BaA) and neutral (BaN) mottled-yellow duplex soils on the slopes of undulating hills.

Map Unit: 12

Classification Code: BaK - PLA - PLA

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
BaK	BdAa	PLA	PLA

Soil Distribution:

The largest area occupied by this unit occurs on the colluvial plains in the Balliang area south of Bacchus Marsh. Alkaline mottled-yellow duplex soils (BaK) are dominant with minor occurrences of mottled-brown duplex soils (BdAa) particularly in the Hexham area.

Map Uhit: 13

Classification Code: BaK -S,C - PLA

Dominant Soils	Sub-Dominant Soils	Landform Element	Landform Pattern
BaK	BbNm,BbN,BbA BcKp EcK BkK	S,C F SWP LUN	PLA

Soil Distribution:

Alkaline mottled-yellow duplex soils (BaK) are the dominant soils of the gently undulating plains of this map unit. To the north of Glenthompson the unit is a complex pattern of gently undulating plains of alkaline mottled-yellow duplex soils (BaK) in association with acid and neutral sandy mottled-yellow duplex soils (BbNm, BbN and BbA) and numerous grey clay swamps (EcK). Associated with some of the swamps are lunettes of alkaline red duplex soils (BkK). There are minor occurrences of mottled-yellow duplex soils with a sporadic bleached subsurface horizon (BcKp) on the flats between the swamps and the rises.

Map Unit: 14

Classification Code: BaK - S - PLA

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
BaK		S	PLA

Soil Distribution:

The dominant soils of the undulating plains of this map unit are alkaline mottled-yellow duplex soils (BaK).

Map Unit: 15

Classification Code: BaK - HSL - HLL

Dominant Soils	Sub-Dominant Soils	Landform Element	Landform Pattern
BaK	BbA,BbAm, BcAh,BaKa,CaA	HSL	HIL

Soil Distribution:

The dominant soils of the undulating hills are alkaline mottled-yellow duplex soils (BaK) in association with sandy mottled-yellow duplex soils (BbA and BbAm) which usually occur on upper slopes and crests. There are minor occurrences of soils with unbleached subsurface horizons (BaKa), heavier surface textured soils with sporadic bleached subsurface horizons (BcAh), which usually occur in drainage lines, and acidic mottled-yellow duplex soils on the granitic areas (CaA).

Map Unit: 16

Classification Code: BaK,BaKm - HSL - LOW

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
BaK,BaKm	BjKp,CaA CaAl,CaAlm	HSL	LOW

Soil Distribution:

The unit consists of an association of alkaline mottled-yellow duplex soils with structured (BaK) or massive (BaKm) subsoils, with the main occurrences being on the colluvial slopes associated with the granite substrate material of the You Yangs. On upper slopes and crests where granite outcrops or boulders occur, acidic mottled-yellow duplex soils are more common (CaA,CaAl and CaAlm). There are minor occurrences on the colluvium of relatively poorer drained soils (BjKp). Sheet and gully erosion are common problems on these slopes.

Map Unit: 17

Classification Code: BaK,BaKm- HSL - LOW

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
BaK,BaKm		HSL	LOW

Soil Distribution:

The unit consists of an association of alkaline mottled-yellow duplex soils with structured (BaK) or massive (BaKm) subsoils on rolling low hills.

Map Unit: 18

Classification Code: DbKo,FaA - CON

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
DbKo,FaA		CON	

Soil Distribution:

This unit consists of volcanic cones with brown gradational soils (DbKo) on mid and lower slopes and shallow friable soils (FaA) on upper slopes which usually have many basalt stones and boulders on the surface.

Map Unit: 19

Classification Code: DbKo,FaA - CON

Co-dominant Soils -	Minor Soils	Landform Element	Landform Pattern
DbKo,FaA		CON	

Soil Distribution:

This unit consists of volcanic cones with brown gradational soils (DbKo) usually occurring on mid and lower slopes and shallow friable soils (FaA) on the rocky upper slopes. If the cones are completely strewn with basalt boulders and stones the shallow friable soils (FaA) are usually dominant.

Map Unit: 20

Classification Code: EaK - PLA - ALP

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
EaK	EaK,EcK EaKf,EbKf,AhA BcAph	PLA BKP HSL FOO	ALP BAD

Soil Distribution:

There are numerous alluvial plains throughout the survey area of predominantly black uniform clay soils (EaK). At the published scale only the major valleys with these soils on their plains have been delineated. The dissection of the basalt plains by stream channels ranges in depth from very shallow to deep and are characterized by the presence of almost vertical valley walls. Black duplex soils (AhA) and shallow black uniform clay soils (EaKf) occur on the slopes above the level of the basalt parent material of the adjoining plains. Black (EaK) and grey (EcK) clay soils are commonly found on terraces and backplains, while there are minor occurrences of shallow brown uniform clays (EbKf) on limestone valley walls and acidic mottled-yellow duplex soils (BcAph) on fan deposits particularly in the valleys to the south of Cobden.

Map Unit: 21

Classification Code: AaA,AaN - S - LAV

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
AaA,AaN	AaAa,AaNa,AaAs AbA,AbN AhAd	S V	LAV

Soil Distribution:

The gently undulating basalt plains between Hamilton and Dunkeld consist of an association of acid (AaA) and neutral (AaN) mottled-yellow duplex soils, and either subclass may be dominant locally. There are minor occurrences of mottled-yellow duplex soils with unbleached subsurface horizons (AaAa and AaNa) and sporadic bleached subsurface horizons (AbA and AbN). Mottled-yellow duplex soils with a shallow surface horizon (AaAs) usually occur on the upper slopes and crests of very slight rises which may have scattered surface boulders. These rises are considered, by the farmers, to be the most productive areas. Black duplex soils with a sporadic bleached subsurface horizon (AhAd) are usually found in open depressions or drainage lines.

Map Unit: 22

Classification Code: AaA,AaN - HSL - LAV

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
AaA,AaN	AaAa,AaN _a ,AaA _s , AbA,AbN AhAd	HSL V	

Soil Distribution:

The gently undulating basalt rises in the Penshurst and Caramut areas consist of an association of acid (AaA) and neutral (AaN) mottled-yellow duplex soils, with either subclass AaNa dominant locally. There are minor occurrences of mottled-yellow duplex soils with unbleached (AaAa and AaNa) and sporadic bleached (AbA and AbN) subsurface horizons. Mottled-yellow duplex soils with a shallow surface horizon (AaAs) usually occur on the upper slopes and crests of rises which may have scattered surface boulders. Black duplex soils with a sporadic bleached subsurface horizon (AhAd) are usually found in open depressions or drainage lines.

Map Unit: 23

Classification Code: AaA,AaN - HSL - LAV

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
AaA,AaN		HSI,	

Soil Distribution:

This unit consists of an association of acid (AaA) and neutral (AaN) mottled-yellow duplex soils on undulating basalt rises. Either subclass may be dominant locally.

Map Unit: 24

Classification Code: BbA,BbN - HSL - LOW

Co-dominant	Sub-Dominant Soils	Landform Element	Landform Pattern
BbA,BbN	BbNm,BaN,CaA	HSL	LOW

Soil Distribution:

The unit consists of an association of acid (BbA) and neutral (BbN) sandy mottled-yellow duplex soils on the slopes of undulating low hills in the Wickliffe-Chatsworth area. The sub-dominant soils that occur throughout these hills have either structureless subsoils (BbNm) or hard to soft surfaces (BaN), ie. they are coherent both moist and dry and are not loose. Acidic mottled-yellow duplex soils (CaA) occur on slopes with granite or granodiorite substrate material.

Map Unit: 25

Classification Code: AbK,AbKs,AbKps - S - LAV

Co-dominant	Sub-Dominant Soils	Landform Element	Landform Pattern
AbK,AbKs,AbKps	bKp,AaK,AbN AgN,AgK,FaA EcK	S HSL SWP	LAV

Soil Distribution:

The alkaline mottled-yellow duplex soils of class Ab are the dominant soils on the gently undulating basalt plains of this unit. On the gentler rises, which generally lack any surface stones or boulders, the soils have mainly sporadic bleached subsurface horizons (AbK) although those with a conspicuously bleached subsurface horizon (AaK) may also occur but are less common. Although the shallow phases (AbKs and AbKps) of subclass AbK occur throughout the unit they are more commonly found on the steeper rises with scattered surface boulders and stones. The sub-dominant soils of these stonier rises are AaK and neutral (AgN) or alkaline (AgK) mottled - black duplex soils. On the rises with many surface stones and boulders, which are mainly concentrated on upper slopes and crests, the soils are dominantly the shallow phase (AbKs) of subclass AbK and shallow friable loamy soils (FaA). Cracking grey clays (EcK) occur on the flats between the steeper rises and in the numerous swamps and depressions that are scattered throughout the unit. Gilgai patches commonly occur on these plains with the dominant soils of both the mounds and depressions being AbK, AbKs or AbKps. In the Hamilton area around Lake Linlithgow, black clay soils (EaN) occur on some banks and are highly prized because of their productivity. There are also minor occurrences of neutral soils (AbN) of class Ab and the phase AbKp which is usually found in the more poorly drained areas, and acidic black duplex soils (AhA).

Map Unit: 26

Classification Code: BaN, BkN - HSL - RLS

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
BaN, BkN	BaK, BcN, BaNa FaA EaK, EcK	HSL	RIS

Soil Distribution:

The unit consists of an association of neutral mottled-yellow (BaN) and red (BkN) duplex soils on the gently undulating rises to the south and south-west of Lake Bolac. The mottled-yellow duplex soils commonly occur on the crests and mid to lower slopes of the rises, whereas the red duplex soils occur on mid to upper slopes. Cracking black (EaK) and grey (EcK) clay soils occur in the swamps and depressions between the rises. Alkaline mottled-yellow duplex soils (BaK) occur on the flats between the depressions and the lower slopes of the rises. There are minor occurrences of shallow friable loamy soils (FaA) and mottled-yellow duplex soils with sporadic bleached (BcN) or unbleached (BaNa) subsurface horizons on the rises.

Map Unit: 27

Classification Code: BaA - R - LOW

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
BaA	FbA	R	LOW

Soil Distribution:

The unit consists of acidic mottled-yellow (BaA) duplex soils on undulating low hills between Lake Bolac and Woorndoo. There are minor occurrences of shallow loamy soils (FbA) which are found on upper slopes and crests.

Map Unit: 28

Classification Code: AbKs - PLA - LAV

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
AbKs	AbA	PLA	LAV

Soil Distribution:

The unit consists of alkaline mottled-yellow duplex soils (AbKs) on the near level basalt plain in the Lake Wongan area to the north of Streatham. Minor areas of acidic soils (AbA) also occur on these plains.

Map Unit: 29

Classification Code: AbKs - S - LAV

Dominant Soils	Minor Soils	Landform Element	Landform, Pattern
AbKs	AbKps,AbK,Aa N	S	

Soil Distribution:

The gently undulating basalt plains between Skipton and Lismore are dominantly alkaline mottled-yellow duplex soils with shallow surface horizons and a sporadic bleach at the interface of the surface and subsoil horizons (AbKs). There are minor occurrences of other closely related soils (AbKps and AbK) and neutral mottled-yellow duplex soils with a conspicuously bleached subsurface horizon (AaN).

Map Unit: 30

Classification Code: AbKs - HSL - LAV

Dominant Soils	Sub-Dominant Soils	Landform Element	Landform Pattern
AbKs	AbKps,AaN AiNt	HSL	

Soil Distribution:

This unit occupies a small area near Pitfield, west of Rokewood. The dominant soils are alkaline mottled-yellow duplex soils with a shallow surface horizon (AbKs) which occur in association with closely related, more poorly drained soils (AbKps), neutral mottled-yellow duplex soils with a conspicuously bleached subsurface horizon (AaN) and well-structured red duplex soils (AiNt).

Map Unit: 31

Classification Code: AbK,AaK - HSL - LOW

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
AbK,AaK		HSL	

Soil Distribution:

This minor map unit consists- of an association of alkaline mottled-yellow duplex soils with subsurface horizons that either have a spFaAic (AbK) RLSa conspicuous bleach (AaK).

Map Unit: 32

Classification Code: .FaA - HSL - RIS

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
FaA	AcK,AbK EaK	HSL SWP	

Soil Distribution:

The unit consists of an irregular surface of widespread basalt lava flows in which hummocks, depressions, ridges and blind channels have given a completely confused topography, with a relief usually of about 10 metres. The soils of the undulating stony mounds or 'stony rises' are shallow, red or black loamy soils (FaA) which also occur on the stony areas between the rises. Black cracking clays (EaK) occupy the numerous swamps between the rises and the crests of the relatively lower and broader rises that may be less rocky. Very little open country is found amongst the rises, but where it does the soils are usually alkaline mottled-brown (AcK) or mottled-yellow (AbK) duplex soils.

Map Unit: 33

Classification Code: FaA - HSL - RLS

Dominant	Minor Soils	Landform Element	Landform Pattern
FaA	-	HSL	RIS

Soil Distribution:

The unit consists of shallow, red or black loamy soils (FaA) on the relatively steep rocky slopes of an eruption point in the Scarsdale area.

Map Unit: 34

Classification Code: FaA - CON

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
		CON	

Soil Distribution:

The unit consists of shallow, red and black friable loamy soils on the gently inclined rocky slopes of Mount Fyans, a low broad one in the Dundonnell area.

Map Unit: 35

Classification Code: FaA - CON

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
	AaN	CON	

Soil Distribution:

The unit consists of shallow, red and black friable loamy soils and surface stones on the gently inclined slopes of a low cone in the Cargerie area. The gentler lower slopes, which have less surface stones, are neutral mottled-yellow duplex soils (AaN).

Map Unit: 36

Classification Code: FaA - CON

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
		CON	

Soil Distribution:

The unit consists of shallow, red and black friable loamy soils on the moderately inclined very stony slopes of Mounts Hamilton and Widderin.

Map Unit: 37

Classification Code: FaA - CON

Dominant Soils.	Minor Soils	Landform Element	Landform Pattern
		CON	

Soil Distribution:

The steep, high cone of Mount Elephant at Derrinallum consists of shallow, red and black friable loamy soils and many surface stones.

Map Unit: 38

Classification Code: BaN - FOO,FAN - ALF

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
		FOO,FAN	ALF

Soil Distribution:

The unit consists of neutral mottled-yellow (BaN) duplex soils on the footslopes and fan deposits of the granite hills south of Pittong.

Map Unit: 39

Classification Code: AbKps - HSL - LOW

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
AbKps	EaKf	HSL U	

Soil Distribution:

Emu Hill consists of alkaline, relatively poorly drained mottled-yellow duplex soils with shallow surfaces (AbKps) on the middle and lower slopes. On the upper slopes where there are many surface stones the soils are shallow, black cracking clays (EaKf).

Map Unit: 40

Classification Code: AbA - S - LAV

Dominant Soils	Sub-Dominant Soils	Landform Element	Landform Pattern
AbA	AdA,AcAs,AbN AbNp,AaA AgA,EcA FaA	S DDE HSL	

Soil Distribution:

The gently undulating basalt plains of this unit occur mainly in the Woolsthorpe - Caramut area and consist of acidic, mottled-yellow duplex soils with sporadic bleached subsurface horizons (AbA) in association with acidic mottled-brown (AdA) and brown (AcAs) duplex soils. Some upper slopes and crests may have a few surface stones that are easily cleared. There are minor occurrences of neutral mottled-yellow (AbN and AbNp) duplex soils on the slopes and relatively poorer drained mottled-yellow duplex soils (AaA) on the flats. Some steeper parts of the plain have few to common amounts of surface stone on upper slopes and crests where the soils are shallow, friable towns (FaA). The drainage lines and depressions are commonly acidic mottled-black (AgA) duplex soils or grey cracking clays (EcA). Gilgai patches occur on these plains where the common soils of both mounds and depressions (approx. 1 m diameter) are acidic (AbA) or neutral (AbN) mottled-yellow duplex soils. Levels of buckshot in the surface horizons are higher in the depressions compared to the mounds.

Map Unit: 41

Classification Code: AaA,AaN - S - LAV

Co-dominant Soils	Sub-Dominant Soils	Landform Element	Landform Pattern
AaA,AaN	AcN,AcA,AgA,AbAp AhNd,AbKps,EaK	S	LAV

Soil Distribution:

The major occurrences of this unit occur on the gently undulating basalt plains in the Mount Emu - Lake Burrumbeet area to the west of Ballarat, and the Meredith and Ballan areas. The dominant soils are acidic (AaA) and neutral (AaN) mottled-yellow duplex soils which, occur in association with acidic (AcA) and neutral (AcN) mottled-brown duplex soils. There are minor occurrences of mottled-black (AgA) and mottled-yellow (AbAp) duplex soils with sporadic bleached subsurface horizons. The dominant soils of the unit also occur on the mounds and in the depression of gilgai areas.. Other soils often found associated with gilgais are black duplex soils (AhNd), mottled-yellow duplex soils with shallow surface horizons (AbKps), and black cracking clays (EaK). A few surface stones may occur in these gilgai areas.

Map Unit: 42

Classification Code: AaA,AaN - HSL

Co-dominant Soils	Sub-Dominant Soils	Landform Element	Landform Pattern
AaA,AaN	AcA,AcN,AfA,AfN,AgA	HSL	LAV

Soil Distribution:

The unit consists of acidic (AaA) and neutral (AAfN) mottled-yellow duplex soils in association with mottled-brown (AcA and AcN) and mottled-black (Af A and A/N) duplex soils on gently undulating rises chiefly in the Ballan and Nanimia Hill areas. Areas of gilgai microrelief are usually found in this unit and the soils associated with these" areas are commonly mottled-black (AgA) duplex soils with minor occurrences of mottled-yellow (AbA) duplex soils. The soils on the mounds and in the depressions are similar apart from those on the mounds having shallower surfaces. A few scattered surface stones may occur on the upper slopes and crests of some rises.

Map Unit: 43

ClassClassification: AaN - HSL - LAV

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
AaN	AaA,AcA	HSL	LAV

Soil Distribution:

The dominant soils of the rolling hillslopes of Nanimia Hill are neutral mottled-yellow (AaN) duplex soils. There are minor occurrences of acidic mottled-yellow (AaA) and mottled-brown (AcA) duplex soils.

Map Unit: 44

Classification Code: AaN,AaNp - HSL - LOW

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
AaN,AaNp	-	HSL	LOW

Soil Distribution:

The unit consists of neutral mottled-yellow (AaN and AaNp) duplex soils on the undulating hillslopes of a low hill in the Cargerie area. Profile depths on the crest are shallow due to underlying rock.

Map Unit: 45

Classification Code: BcAph,BcNph - BKP - ALP

Co-dominant	Minor Soils	Landform Element	Landform Pattern
BcAph,BcNph	EaK	BKP PLA, OXB	ALP

Soil Distribution:

The unit is located on the alluvial plains to the north of Mount Emu. The dominant soils of the backplain or flats some distance from the stream channel are poorly drained acidic (BcAph) and neutral (BcNph) mottled-yellow duplex soils. The watertable is close to the surface with some water ponding occurring in winter. Black cracking clays (EaK) occur on the plains adjacent to stream channels and in ox-bows.

Map Unit: 46

Classification Code: EaK - PLA - ALP

Dominant Soils	Sub-Dominant Soils	Landform Element	Landform Pattern
EaK	GaN, BdKs	PLA	ALP

Soil Distribution:

The unit consists of black cracking clays (EaK) on the alluvial plains and in the ox-bows of the Leigh River and the Barwon north of Winchelsea. Where there are areas of active aggradation by channelled or over-bank stream flow the common soils found are deep, very poorly structured loams (GaN). There are minor occurrences of alkaline mottled-brown (BdKs) duplex soils on the alluvial plains particularly in the Inverleigh area.

Map Unit: 47

Classification Code: AhK - PLA - LAV

Dominant Soils	Sub-Dominant Soils	Landform Element .	Landform Pattern
	AbK,AbN	PLA	LA V

Soil Distribution:

The unit consists of alkaline black (AhK) duplex soils in association with alkaline (AbK) and neutral (AbN) mottled-yellow duplex soils on the level basalt plains in the Woorndoo area. Gilgai microrelief occurs with the soils of both mounds and depressions being alkaline black (AhK) duplex soils.

Map Unit: 48

Classification Code: EaK - LUN

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
		LUN	

Soil Distribution:

These gently undulating lunettes occur near Derrinallum and on the north-east shore of Lake Corangamite near Lake Martin and consist of black, self-mulching clays (EaK).

Map Unit: 49

Classification Code: EaK - LUN

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
EaK		LUN	

Soil Distribution:

The unit consists of black, self-mulching cracking clays (EaK) on rolling lunettes. The presence of many hard and soft calcareous segregations is a common feature of their deep subsoils. These lunettes have been built up on the margins of Lake Eyang (Woorndoo area), Lake Rosine (Cressy area), Lake Murdeduke (Winchelsea area) and Lakes Gnarpurt and Corangamite, to the name the major occurrences.

Map Unit: 50

Classification Code: BbA,BbAm - S - PLA

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
BbA,BbAm	-	S	PLA

Soil Distribution:

The unit consists of acidic, sandy mottled-yellow duplex soils with structured (Bba) and massive (BbAm) subsoils on gently undulating plains in the Narrapumelap area, north of Wickliffe. Soils occurring on crests may have landform surface horizons that are not bleached.

Map Unit: 51

Classification Code: BaN - HSL - LOW

Dominant Soils	Sub-Dominant Soils	Landform Element	Landform Pattern
BaN	BbA	HSL	U

Soil Distribution:

The unit consists of neutral mottled-yellow (BaN) duplex soils on the hillslopes of the undulating low hills in the area of the Bamganie State Forest. Acidic, sandy mottled-yellow (BbA) duplex soils usually occur on upper slopes. Minor to moderate gully erosion occurs in some cleared areas.

Map Unit: 52

Classification Code: DaNd - HSL - LOW

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
DaNd	- FaA	HSL	U

Soil Distribution:

The rolling slopes of Ritchie Hill, north of Streatham, consist of friable, well-structured, red gradational soils (DaNd). The upper slopes and crests have many surface stones where the soils are shallow, friable loams (FaA).

Map Unit: 53

Classification Code: DaA - C - LAV

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
-DaA	-	C	

Soil Distribution:

The unit consists of acidic, friable, well-structured red gradational soils (DaA) on the gently undulating broad crests of the basalt plains near Mount Buninyong.

Map Unit: .54

Classification Code: DaN, DaA - HSL - LAV

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
DaN, DaA	AiA, DcN Ai Nd, AeNd AaN, AaNp	HSL	LAV

Soil Distribution:

The unit consists of neutral (DaN) and acidic (DaA) friable, red gradational soils in association with acidic red duplex soils (AiA) on the gently undulating basalt rises in the Bungaree - Wallace area. A few scattered surface stones occur on the rises and there are minor occurrences of black gradational soils (DcN). The lower slopes, particularly near the perimeter of the unit, are usually neutral red (AiNd) and brown (AeNd) duplex soils. Poorly drained neutral mottled-yellow (AaN and AaNp) duplex soils occur in open depressions and low positions in the terrain prone to waterlogging. Potato crops are often failures on these soils (AaN and AaNp) in wet winters.

Map Unit: 55

Classification Code: DaA - HSL - LAY

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
DaA		HSL	LA V

Soil Distribution:

The unit consists of acidic, friable red gradational soils (DaA) on undulating rises in the Mount Buninyong area.

Map Unit: 56

Classification Code: DaA, DaN - CON

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
DaA, DaN			

Soil Distribution:

The gently undulating low cones to the north of Mount Buninyong (eg. Green Hill) consist of acidic (DaA) and neutral (DaN) friable red gradational soils.

Map Unit: 57

Classification Code: DaA, DaN - CON

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
DaA, DaN			

Soil Distribution:

The moderately inclined low cones in the Ballarat area (eg. Mount Rowan) consist of acidic (DaA) and neutral (DaN) friable red gradational soils.

Map Unit: 58

Classification Code: DaA, DaN - CON

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
DaA, DaN			

Soil Distribution:

The unit consists of acidic (DaA) and neutral (DaN) friable red gradational soils on the moderately inclined cone of Mount Buninyong.

Map Unit: 59

Classification Code: DaA, DaN - CON

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
DaA, DaN		CON	

Soil Distribution:

The steep high cone of Mount Warrenheip consists of acidic (DaA) and neutral (DaN) friable red gradational soils.

Map Unit: 60

Classification Code: AiN, AiNt - CON

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
AiN, AiNt	DaN, FaA	CON	

Soil Distribution:

The unit consists of neutral red duplex soils with hard (AiN) or . friable (AiNt) surfaces on the gently inclined very low cone west of Skipton.. There are minor occurrences of friable red gradational soils (DaN) and on upper slopes and crests where there are many surface stones the soils are shallow friable loams (FaA).

Map Unit: 61

Classification Code: AiN,AiNt - CON

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
AiN,AiNt	DaN,FaA	CON	

Soil Distribution:

The unit consists of neutral red duplex soils with hard (AiN) or friable (AiNt) surfaces on the steep very low cone of Monmot Hill, north of Skipton. There are minor occurrences of friable red gradational soils (DaN) and on upper slopes and crests where there are many surface stones the soils are shallow friable loans (FaA).

Map Unit: 62

Classification Code: AiN,AiNt - HSL - LOW

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
Ai N,AiNt	DaN,FaA	HSL	LOW

Soil Distribution:

The undulating low basalt hills to the south-east of Skipton and Mount Duneed consist of neutral red duplex soils with hard (AiN) or friable (AiNt) surfaces. There are minor occurrences of friable red gradational soils (DaN) and on upper slopes and crests where there are many surface stones the soils are shallow friable loans (FaA).

Map Unit: 63

Classification Code: AiN,AiNt - CON

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
AiN,AiNt	DaN,FaA	CON	

Soil Distribution:

Mounts Vite Vite and Hesse and The Cap, all moderately inclined low cones occurring north of Derinallum and around lake Murdeduke, consist of neutral red duplex soils with hard (AiN) or friable (AiNt) surfaces. There are minor occurrences of friable red gradational soils (DaN) and on upper slopes and crests where there are many surface stones the soils are shallow friable loams (FaA).

Map Unit: 64

Classification Code: AiNt, DaN - CON

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
AiNt, DaN	- EaNf	CON L	

Soil Distribution:

The moderately inclined very low cone south of Mount Mercer consists of shallow, friable red duplex (AiNt) and gradational (DaN) soils on the relatively steeper middle and upper slopes. The gentler lower slopes contain patches of shallow, black self-mulching clays (EaNf).

Map Unit: 65

Classification Code: AiNt, DaN - CON

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
AiNt, DaN	AiKt EaNf	CON L	

Soil Distribution:

The moderately inclined low cones - Mounts Mercer, Moriac, Wallace and Clever Hill, consist of shallow, friable red duplex (AiNt) and gradational (DaN) soils on the relatively steeper middle and upper slopes. The gentler lower slopes contain patches of shallow, black self-mulching clays (EaNf). There are minor occurrences of alkaline (AiKt), friable red duplex soils where the profiles are relatively deep.

Map Unit: 66

Classification Code: AaN, AaN_a - HSL - LOW

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
AaN, AaN _a	AiN, FaA	HSL	LOW

Soil Distribution:

The rolling hillslopes of Stockyard Hill consist of an association of neutral mottled-yellow duplex soils with bleached (AaN) and unbleached (AaN_a) subsurface horizons. Shallow red duplex soils (AiN) or friable loam (FaA) may occur around the rim of the water filled maar.

Map Unit: 67

Classification Code: AaA - S - LAV

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
	DaA	S	LAV

Soil Distribution:

The gently undulating basalt plains in the Navigators - Yendon area consist of acidic mottled-yellow duplex soils (AaA). The colour of the surface soil on the upper slopes tends to be browner than the grey lower slopes. There are minor occurrences of acidic, friable red gradational soils (DaA).

Map Unit: 68

Classification Code: AaA - HSL - LAV

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
	EaKf AgKs	HSL V	LAV

Soil Distribution:

The gently undulating rises in the Pootilla area, east of Ballarat, consist of acidic mottled-yellow duplex soils (AaA), with minor occurrences of shallow, black cracking clays (EaKf). The soils of the open depressions are alkaline, mottled-back duplex soils (AgKs).

Map Unit: 69

Classification Code: HbA - R

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
HbA	-	R	

Soil Distribution:

The unit consists of deep, uniform sands on the gently undulating, extremely low ridge in the Lal Lal area.

Map Unit: 70

Classification Code: CaA,HdA - HSL - LOW

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
CaA,HdA	CaN,HbA,CaAla CcN,CdA	HSL	LOW

Soil Distribution:

The undulating slopes of the low granitic hills south of Pittong consist of an association of acidic mottled-yellow (CaA) duplex soils and deep brownish sands (HdA). Areas of rocky outcrop occur on some upper dopes and crests, and it is in the vicinity of these outcrops that the deep sands usually occur (HdA and HbA). There are minor occurrences of neutral mottled-yellow (CaN) and mottled-brown (CcN) and acidic, mottled-black (CdA) duplex soils which usually occur on mid to lower slopes. Unbleached mottled-yellow duplex soils with lighter textured surfaces (CaAla) may also occur on some of the lower crests.

Map Unit: 71

Classification Code: HdA - HSL - LOW

Dominant.	Sub-Dominant Soils	Landform Element	Landform Pattern
	CaA	HSL	LOW

Soil Distribution:

The unit consists of deep, brownish sands (HdA) on the rolling low granite hills adjacent to Nanimia Hill. The abundance of granite outcrop on the upper slopes and crest is very rocky to rockland and there are occurrences of acidic, mottled-yellow duplex soils (RLS) on mid and lower slopes.

Map Unit: 72

Classification Code: CaA - HSL - RIS

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
		HSL	RIS

Soil Distribution:

The unit consists of acidic, mottled-yellow duplex soils (CaA) on the undulating granite and granodiorite rises which are scattered throughout the survey arRLS

Map Unit: 73

Classification Code: CaA - HSL - HLL

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
CaA		HSL	HIL

Soil Distribution:

The soils of Mount Emu, a steep granite hill, are mainly acidic, mottled-yellow duplex soils (CaA). However, the mid and upper slopes consist almost entirely of rock outcrop.

Map Unit: 74

Classification Code: CaA,BaA - HSL - LOW

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
CaA,BaA	-	HSL	LOW

Soil Distribution:

The unit consists of acidic, mottled-yellow duplex soils on granodiorite (CaA) oHLLediments (BaA) of the undulating low hills in the Mount Doran area south of LaLal.

Map Unit: 75

Classification Code: CaN,CaNI - HSL - LOW.

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
CaN,CaNI	CbN	HSL	LOW

Soil Distribution:

The undulating low granodiorite hills around Mount Kinross, north-east of Lismore, consist of neutral, mottled-yellow duplex soils with surface textures ranging from sandy clay loam (CaN) to sandy loam (CaN1). On the rocky upper slopes there are minor occurrences of neutral mottled-yellow duplex soils where the surface condition is loose (CbN).

Map Unit: 76

Classification Code: EaK,AaA - PLA - LAV

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
EaK,AaA		PLA	LAV

Soil Distribution:

There is a minor level plain on the northern shores of Lake Goldsmith of acidic mottled-yellow duplex soils (AaA) with black cracking days (EaK) occurring in the lower. portions.

Map Unit: 77

Classification Code: AhN,EaKf - HSL - LOW

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
AhN,EaKf	AiNt AbKps	HSL L	LOW

Soil Distribution:

The unit consists of shallow black duplex soils (AhN) with patches of alkaline, shallow black self-mulching clays (EaKf) on mid and upper slopes of undulating low hills south-east of Caranballac. There are many surface stones on these slopes and friable red duplex soils (AiNt) occur in the vicinity of the eruption point. The soils of the lower slopes merge with those of the plain and are poorly drained, alkaline mottled-yellow duplex soils (AbKps; see description of map unit 25).

Map Unit: 78

Classification Code: AgK,AgKs - PLA LAV

Co-dominant Soils	Sub-Dominant Soils	Landform Element	Landform Pattern
AgK,AgKs	AhK,AdK	PLA	LAV

Soil Distribution:

The near level basalt plains west of Shelford consist of alkaline mottled-black duplex soils, with relatively deep (AgK) or shallow (AgKs) surface soils, in association with alkaline black (AhK) and mottled-brown (AdK) duplex soils. Some very slight rises on these plains may have many surface stones, which when cleared are cropped. There are minor occurrences of alkaline mottled-brown duplex soils with shallow surface horizons (AcKs).

Map Unit: 79

Classification Code: AgK,AgKs - S - LAV

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
AgK,AgKs	AhK,AbKp,AbKps FaA EcK, EaK	S HSL F,V	LAV

Soil Distribution:

The gently undulating basalt plains to the north and south-east of Cressy consist of an association of alkaline, mottled-black duplex soils with relatively deep (AgK) and shallow (AgKs) surface horizons. There are minor occurrences of closely related relatively poorly drained, alkaline mottled-yellow duplex soils (AbKp and AbKps) and alkaline, black duplex soils (AhK). Some slight rises may have many surface stones on upper slopes and crests where the soils are usually shallow, friable loams (FaA). Black cracking clays (EaK) usually occur around the base of these rises, and grey cracking clays (EcK) are found on flats and open depressions between the rises. Areas of gilgai microrelief may occur on the plains, where the soils of both mounds and depressions are alkaline, mottled-black (AgK and AgKs) duplex soils.

Map Unit: 80

Classification Code: AgK,AgKs - HSL - LAV

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
AgK,AgKs	AhK,AdK,AeAp FaA	HSL	LAV

Soil Distribution:

The unit consists of an association of alkaline, mottled-black duplex soils with relatively deep (AgK) and shallow (AgKs) surface horizons on gently undulating rises in the Mount Mercer area. Shallow friable loams (FaA) occur on those rises which have many surface stones on their upper slopes and crests, and there are minor occurrences of black (AhK), mottled-brown (AdK) and brown (AeAp) duplex soils.

Map Unit: 81

Classification Code: FaA - HSL - RLS

Dominant Soils	Sub-Dominant Soils	Landform Element	Landform Pattern
FaA	- EaKf EaK AgK,AgKs,AfKs,AbKps EcK	HSL C F PLA D	RIS

Soil Distribution:

The undulating basalt 'stony rises', in the Warrambine - Wingeel area south-east of Rokewood, consist of shallow, friable loams (FaA). There are very many surface stones on these rises, however those that are slightly broader and flatter have fewer surface stones on their crests where the soils are shallow, black self-mulching clays (EaKf). Around the base of the rises there is a strip, approximately 15-20 metres wide, of alkaline, black cracking clay soils (EaK). These are considered to be the best cropping soils within the unit. Where there is gently undulating, relatively open country (ie. few surface stones) between the rises the soils are alkaline, mottled-black (AgK,AgKs and AfKs) and mottled-yellow (AbKps) duplex soils. Grey cracking clays (EcK) occur in depressions between rises.

Map Unit: 82

Classification Code: BcNph,BcKph - S - PLA

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
BcNph,BcKph	-	S	PLA

Soil Distribution:

These gently undulating plains with gilgai microrelief, south of Lake Burrumbeet, consist of neutral (BcNph) and alkaline (BcKph), poorly drained mottled-yellow duplex soils . The clay loam surface soils are relatively heavy compared to the surfaces of other sediments.

Map Unit: 83

Classification Code: AcN,AcA - HSL - LAV

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
AcN,AcA	AaA,AaAps,FaA	HSL	LAV

Soil Distribution:

The unit consists of an association of neutral (AcN) and acidic (AcA) mottled-brown duplex soils with conspicuously bleached subsurface horizons on undulating rises. There are minor occurrences of acidic, mottled-yellow duplex soils (AaA and AaAps) and where the rises are slightly stony, shallow friable loamy soils (FaA) are common.

Map Unit: 84

Classification Code: AcN,AcA - HSL - LOW

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
AcN,AcA	AaA DaA EaN	HSL U L	LOW

Soil Distribution:

The undulating low hills in the Grenville - Garibaldi area, south of Ballarat, consist of an association of neutral (AcN) and acidic (AcA) mottled-brown duplex soils. The soils with an acidic trend (AcA) are more common to the flats which are ringed by the low hills. Friable red gradational soils (DaA) occur on some mid and upper slopes, and shallow, black self-mulching clays (EaNf) occur in patches on some slopes, particularly the lower slopes.

Map Unit: 85

Classification Code: AdK,AdN - S - LAV

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
AdK,AdN	AfK,AbKs,AgK AiKp	S	LAV

Soil Distribution:

The gently undulating plains to the west of Rokewood consist of an association of alkaline (AdK) and neutral (AdN) mottled-brown duplex soils. Conspicuously bleached, mottled-black (AfK) duplex soils may occur on the more poorly drained level areas on the plain, and there are minor occurrences of alkaline, mottled-yellow (AbKs) and mottled-black (AgK) duplex soils on some slopes. There are also minor areas with a few surface stones (particularly on crests) of alkaline, red duplex soils (AiKp).

Map Unit: 86

Classification Code: EaNf,EaKf - HSL - LAV

Co-dominant Soils	Sub-Dominant Soils	Landform Element	Landform Pattern
EaNf,EaKf	- EcK,EcKf	HSL F	LAV

Soil Distribution:

The undulating basalt rises in the Lethbridge, Bannockburn and Mount Pollock areas consist of an association of neutral (EaNf) and alkaline (EaKf), shallow, self-mulching clays. These rises have many surface stones, whereas the flats between the rises have only a few stones and the soils are deep (EcK) or shallow (EcKf), grey cracking clays. There are slight open depressions or drainage lines of alkaline, mottled-black duplex soils (AgK) through some of the more level areas of the black clays (EaKf). There are also minor occurrences of alkaline, mottled-brown (AcKs and AdK) duplex soils throughout the area. If cleared, the black, self-mulching clay soils (EaNf and EaKf) are more highly prized than the grey clays (EcK and EcKf) for crop production, eg. cereals, onions and sunflowers.

Map Unit: 87

Classification Code: HbA,HbN - LUN

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
HbA,HbN	-	LUN	

Soil Distribution:

The undulating lunettes north of Glenthompson consist of acidic (HbA) and neutral (HbN) deep, uniform sandy soils with a conspicuously bleached subsurface horizon.

Map Unit: 88

Classification Code: HbA,HbN - LUN

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
HbA,HbN		LUN	-

Soil Distribution:

The unit consists of acidic (HbA) and neutral (HbN) deep, uniform sandy soils with a conspicuously bleached subsurface horizon on the rolling lunettes around the eastern margins of Brady Swamp, north of Glenthompson.

Map Unit: 89

Classification Code: AaA,AaN - PLA – LAV

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
AaA,AaN	AbA,AbN	PLA	LAV

Soil Distribution:

The level basalt plains around Penshurst consist of an association of acid (AaA) and neutral (AaN) mottled-yellow duplex soils with conspicuously bleached subsurface horizons. There are minor occurrences of mottled-yellow duplex soils with sporadic bleached subsurfaces (AbA and AbN).

Map Unit: 90

Classification Code: AdN - HSL - LAV

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
AdN	AcN,AcNs,AeN	HSL	LAV

Soil Distribution:

The unit consists of gently undulating basalt rises to the north-east of Hamilton. Neutral, mottled-brown duplex soils with sporadic bleached subsurfaces (AdN) usually occur on mid and lower slopes, while there are minor mottled-brown duplex soils with conspicuously bleached subsurfaces (AcN). Mottled-brown (AcNs) or brown (AeN) duplex soils with shallow surfaces usually occur on upper slopes and crests, where there may be a few surface stones and patches of gilgai microrelief.

Map Unit: 91

Classification Code: BbA,BbAm - S - SAN

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
BbA,BbAm	-	S BOU	SAN

Soil Distribution:

The unit consists of sandy, mottled-yellow duplex soils with structured (BbA) or massive (BbAm) subsoils on minor areas of undulating sand sheets near the Wannon River north-east of Hamilton, and near Mapunga east of Warrnambool. The unit near Mepunga also contains small depressions or blow-outs of black duplex soils (BiAs1).

Map Unit: 92

Classification Code: IaA - HSL - MOU

Dominant Soils	Sub-Dominant-Soils	Landform Element	Landform Pattern
IaA	- HcA	HSL L	MOU

Soil Distribution:

The ver(LaA)ep mountain slopes of the Grampians north of Dunkeld consist of shallow, sandy soils (IaA) on sandstone substrate material. Deeper sands with a 'coffee rock' pan (HcA) occur on the gentler colluvial lower slopes.

Map Unit: 93

Classification Code: AbN,AbNs - PLA - LAY

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
AbN,AbNs	AaNi,AaKI	PLA	LAV

Soil Distribution:

The near level basalt plains in the Victoria Valley and to the east of Cavendish consist of an association of neutral, mottled-yellow duplex soils with relatively deep (AbN) and shallow (AbNs) surface horizons. The very slight rises which occur on these plains usually have a few scattered surface stones. There are minor occurrences of neutral (AaNi) and alkaline (AaKI) mottled-yellow duplex soils with light surface textures in the vicinity of sand sheets bordering the Wannon River.

Map Unit: 94

Classification Code: AaN - HSL - LAV

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
AaN	DaA	HSL	LAV

Soil Distribution:

The unit consists of neutral, mottled-yellow duplex soils (AaN) on the slopes of undulating rises or very low cones on the plains to the east of Hamilton. Friable red gradational soils (DaA) may also occur on these slopes.

Map Unit: 95

Classification Code: BbA,BmK - S - PLA

Co-dominant Soils	Sub-Dominant Soils	Landform -Element	Landform Pattern
BbA,BmK	BiKI HbA	S R	PLA

Soil Distribution:

The gently undulating plains south of Victoria Valley consist of an association of sandy, acidic mottled-yellow (BbA) and alkaline black (BmK) duplex soils. The lower portions of the plains between the slight rises are alkaline, black (BiKI) duplex soils, which generally have shallower surface soils compared to those on the higher areas. The numerous ridges of outwash deposits from the Grampians are deep, uniform sands (HbA).

Map Unit: 96

Classification Code: BbA,BmK,BmKs - PLA - SHF

Co-dominant Soils	Sub-Dominant Soils	Landform Element	Landform Pattern
BbA,BmK,BmKs	- EaK HbA	PLA SWP R	SHF

Soil Distribution:

The sheet-flood fan at the eastern footslopes of the Grampians consists of an association of sandy, mottled-yellow (BbA) and black (BmK and BmKs) duplex soil's on the near level plains, ridges of deep sands (HbA) and swamps of black cracking clays (EaK)..

Map Unit: 97

Classification Code: BaAh,BaA - S - PLA

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
BaAh,BaA	BaAa,BaAah	S	PLA

Soil Distribution:

The gently undulating plains in the Cavendish area consist of an association of heavy (BaAh) and relatively light (BaA) surface textured, acidic, mottled-yellow duplex soils. There are minor occurrences of closely related soils with subsurface horizons that are not bleached (BaAa, BaAah).

Map Unit: 98

Classification Code: BaAh,BaA - HSL - RLS

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
BaAh,BaA	BaAa,BaAah	HSL	RIS

Soil Distribution:

The gently undulating rises around Cavendish consist of an association of heavy (BaAh) and relatively light (BaA) surface textured, acidic, mottled-yellow duplex soils. There are minor occurrences of closely related soils with subsurface horizons that are not bleached (BaAa, BaAah).

Map Unit: 99

Classification Code: AcNs, DaN, DaAd - HSL - LOW

Co-dominant Soils	Minor Soils ⁴	Landform Element	Landform Pattern
AcNs, DaN, DaAd	DbA, DbN, DbNod Ai Nd	HSL	LOW

Soil Distribution:

The undulating low basalt hills around Hamilton consist of an association of neutral, mottled-brown (AcNs) duplex soils with shallow surface horizons, and friable red gradational soils (DaN and DaAd). Either of the co-dominant soils may be dominant locally. There are minor occurrences of red duplex soils (AiNd) and friable, mottled-brown (DbA, DbN and DbNod) gradational soils.

Map Unit: 100

Classification Code: AhN,AhNd,AhNt - PLA - LAV

Co-dominant Soils	Sub-Dominant Soils	Landform Element	Landform Pattern
AhN,AhNd,AhNt	A AgNt,JaA,JaN	PLA BKP	LAV

Soil Distribution:

Buckley Swamp consists of a valley infilled by an earlier lava flow, with the subsequent blockage of the drainage line resulting in some peat accumulation. The area has been drained and burnt at various times in the past, resulting in some decomposition and loss of peat. The dominant soils of the plain are neutral black duplex soils with massive (AhN and AhNd) or well-structured surfaces (AhNt). The soils of the backplain are neutral, mottled-black duplex soils with well-structured surfaces (AgNt) and organic soils (JaA and JaN). There are also minor occurrences of neutral, black cracking clays (EaN).

Map Unit: 101

Classification Code: DbA - HSL - LOW

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
DbA	DaA,AaA	HSL	LOW

Soil Distribution:

The unit consists of friable, brown gradational soils (DbA) on the slopes of an undulating low basalt hill, north of Penshurst. There are minor occurrences of friable, red gradational soils (DaA) on upper slopes and acidic, mottled-yellow duplex soils (AaA), particularly on the lower slopes.

Map Unit: 102

Classification Code: FaA,AaA,AaN - HSL - LAV

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
FaA,AaA,AaN	-	HSL	LAV

Soil Distribution:

The undulating rise consists of shallow, friable loams (FaA) on mid and upper slopes, and mottled-yellow duplex soils (AaA and AaN) on lower slopes.

Map Unit: 103

Classification Code: FaA - CON

Dominant Soils	Minor Soils	Landform Element	Landform Pattern.
FaA		CON	

Soil Distribution:

Mount Rouse, a very steep low cone south of Peshurst, consists of shallow, friable loams (FaA).

Map Unit: 104

Classification Code: FaA - CON

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
FaA	DcN	CON	-

Soil Distribution:

Mounts Napier, Shadwell, Noorat and Warrnambool are very steep high cones consisting of shallow, friable loams (FaA). There are minor occurrences of neutral, black gradational soils (DcN) on the lower slopes.

Map Unit: 105

Classification Code: AaA,AaAI - S - LAV

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
AaA,AaAI	AaAa	S	LAV

Soil Distribution:

These gently undulating basalt plains in the Macarthur area consist of acidic, mottled-yellow (AaA) duplex soils in association with the light-textured (AaAI) surface phase where the basalt has been dissected sufficiently to expose the underlying sediments. There are minor occurrences of acidic, mottled-yellow duplex soils with subsurface horizons that are not bleached (AaAa).

Map Unit: 106

Classification Code: AaA,AaAa - HSL - LAV

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
AaA,AaAa	AcA,AcN,AcNa	HSL	LAV

Soil Distribution:

The gently undulating rises in the Hawkesdale area consist of an association of acidic, mottled-yellow duplex soils with bleached (AaA) and unbleached (AaAa) subsurface horizons. Some rises have a few scattered surface stones and there are minor occurrences of mottled-brown duplex soils (AcA, AcN and AcNa).

Map Unit: 107

Classification Code: AgN - HSL - LOW

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
AgN	Af As	HSL	LOW

Soil Distribution:

The undulating low basalt hill at Minhamite north of Hawkesdale, consists of neutral, mottled-black (AgN) duplex soils on upper slopes and the broad undulating crest. Acidic, mottled-black (Af As) duplex soils, with both shallow solums and surface horizons, occur on mid and lower slopes.

Map Unit: 108

Classification Code: AbA,AbAp - S - LAV

Co-dominant Soils	Minor Soils	Landform Element	Landform Patidic
AbA,AbAp	AaA,AgA, AcN,AeAp	S	LAV

Soil Distribution:

The unit consists of an association of acJidic, mottled-yellow (AbAand AbAp) with mottled-black (AgA) duplex soils on the level and more poorly drained portions of the gently undulating basalt plains in the Hawkesdale area. Brown (AeAp), mottled-brown (AcN) and mottled-yellow (AaA) duplex soils usually occur on the slopes and broad crests of very slight rises which have a few scattered surface stones. Water is usually ponded for 1-2 weeks/year and on the poorly drained portions of the plain between the rises.

Map Unit: 109

Classification Code: AgK - HSL – LOW

Dominant Soils	Sub-Dominant Soils	landform Element	Landform Pattern
AgK	AbKp	HSL	LOW

Soil Distribution:

These undulating low basalt hills east of Colac consist of an association of alkaline, mottled-bLandformK) and mottled-yellow (AbKp) duplex soils.

Map Unit: 110Classification Code: AgN - PLA - LAV

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
AgN	-	PLA	LAV

Soil Distribution:

This small unit to the north of *Noorat* consists of neutral, mottled-black (AgN) duplex soils on level basalt plains.

Map Unit: 111Classification Code: AgN - S - LAV

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
AgN	11AhN,A(k)	S	LAV

Soil Distribution:

The gently undulating basalt plains in the Glenormiston - Terang area consist of neutral, mottled-black (AgN) duplex soils. There are minor occurrences of neutral, black (AhN) and brown (AeNp) duplex soils.

Map Unit: 112Classification Code: AgNAhN,Ag - LAV

Co-dominant Soils*	Minor Soils	Landform Element	Landform Pattern
AgN,AgNt	AhK,AgA,AfNt	S	LAV

Soil Distribution:

The gently undulating basalt plains to the north-west of Camperdown consist of an association of neutral, mottled-black duplex soils with hard (AgN) and friable (AgNt) surfaces. There are minor occurrences of closely related mottled-black duplex soils (AgA and Af Nt) on the slopes, and alkaline, black (AhK) duplex soils on the poorly drained flats between the very slight rises. Areas of gilgai microrelief may occur and a few scattered surface stones occur on some slopes.

Map Unit: 113

Classification Code: AgN,AgA - HSL - HIL

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
AgN,AgA	AgNt,AgAt,AbAp, AdA,AiNt,AhNt, AiNt,AgN AgN,EaN or water-filled	HSL CON MAA	HIL

Soil Distribution:

The undulating basalt hills around Camperdown consist of neutral (AgN) and acidic (AgA), mottled-black duplex soils. There are minor occurrences of friable, mottled-black (AgNt and AgAt) and black (AhNt) duplex soils on the hillslopes, friable red (AiNt) and mottled-brown (AdA) duplex soils on upper slopes and crests, and acidic, mottled-yellow (AbAp) duplex soils. The cones within the map unit are friable, red (AiNt) or mottled-black (AgN) duplex soils, and the maars are neutral, mottled-black (AgN) duplex soils, black cracking clays (EaN) or they are water-filled.

Map Unit: 114.

Classification Code: AgA - HSL - RLS

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
AgA	AhAt	HSL	RIS

The gently undulating rises around Lake Keilambete, near Terang, consist of acidic, mottled-black (AgA) duplex soils. Sunflowers are successfully grown in this unit. There may be minor occurrences of acidic, friable black (AhAt) duplex soils on the higher RLStions of the maar rim.

Map Unit: 115

Classification Code: AgA,AhAt - HSL - RIS

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
AgA,AhAt	EaK or water-filled	HSL MAA	RIS

Soil. Distribution:.

The undulating rises surrounding the maars in the Cobden area consist of acidic, hard mottled-black (AgA) and friable black (AhAt) duplex soils. The maars themselves are either water-filled or black, cracking clays (EaK).

Map Unit: 116

Classification Code: EaN,EaK - V - ALP

Co-dominant Soils	Minor Soils	Landform Element	Landform -Pattern
EaN,EaK	- BgN	V BKP	ALP

Soil Distribution:

The alluvial flats found between Lakes Colac and Corangamite consist of neutral (EaN) and alkaline (EaK) black, cracking clays. The backplain, or that part of the flats at some distance from the stream channels or drainage lines, consists of neutral, mottled-black (BgN) duplex soils.

Map Unit: 117

Classification Code: EaN,EaK - PLA - ALP

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
EaN,EaK	BhK	PLA R	ALP

Soil Distribution:

The flats of the Barwon River and its tributaries in the Birregurra area, consist of neutral (EaN) and alkaline (EaK), black cracking clays. The alkaline clays tend to occur in the lower lying portions of the plain. There are some very low rises on the alluvial plains that consist of alkaline, mottled-black (Bh) duplex soils.

Map Unit: 118

Classification Code: EaK - PLA - PLA

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
EaK		PLA	PLA

Soil Distribution:

The map unit consists of alkaline, black cracking clays (EaK) on near level plains. The largest occurrence of this unit occurs south-east of Mortlake.

Map Unit: 119

Classification Code: EaN,EaK - R

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
EaN,EaK	-	R	-

Soil Distribution:

ThisCodeulating extremely low ridge in the Camperdown area consists of neutral (EaN) and alkaline (EaK), black cracking clays.

Map Unit: 120

Classification COde: EaK - MAA

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
EaK	-	MAA	-

Soil Distribution:

The maars, or level floored depressions, near Garvoc and Winslow consist of alkaine, black cracking clays (EaK): They may also be water-filled.

Map Unit: 121

Classification Code: EaK,DcN - LUN

Co-dominant Soils	Minor Soils	Landform Element	Landform PatMortlake,
EaK,DcN	-	LUN	-

Soil Distribution:

The gently undulating luffriabe,, west of MOrtlake, consists of alkaline, black .self-mulching clays (EaK) and friile, black gradational soils (DcN).

Map Unit: 122

Classification Code: aA1 EaKf - HSL - LOW

Co-dominant Soils	Minor Soils	Landform Element	Landform EaAfern
EaAf,EaKf	- EaA	HSL MAA	LOW

Soil Distribution:

The rolling low hills of The Sisters, north-west of Terang, consist of shallow, alkaline (EaKf) and very shallow, acidic (EaA1) black self-mulching clays. A few scattered surface stones are found on the upper slopes and crests. The maars, or level floored depressions, consist of acidic, black cracking clays (EaA).

Map Unit: 123

Classification Code: BhK,BhKs - S - PLA

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
BhK,BhKs	BiKs EcK EaK,EcK EbK, DaK	S SWP LUN H	PLA

Soil Distribution:

The unit is a complex one consisting of gently undulating plains with swamps, lakes, and their lunettes, between Cressy and Colac. The blacks of the plains are alkaline, mottled-black (BhK and BhKs) duplex soils. There are occurrences of alkaline, black (BiKs) duplex soils. The swamps, which are periodically inundated, are extremely alkaline, grey (EcK) cracking clays. The minor soils of the undulating lunettes

are alkaline, black (EaK) and lunette (EcK) self-mulching clays. There are also minor occurrences of alkaline, red (EbK) cracking clays on these lunettes. Scattered throughout the unit are clumps of moderately inclined very low hills consisting of alkaline, red self-mulching clays (EbK) and friable, red gradational soils (DaK) with minor occurrences of black, self-mulching clays (EaK).

Map Unit: 124

Classification Code: BhN - S - PLA

Dominant Soils	Sub-Dominant Soils	Landform Element	Landform Pattern
BhN	- DcN,DcK,EaK EcK	S LUN SWP	PLA

Soil Distribution:

The unit consists of gently undulating plains with periodically inundated swamps, and lunettes east of Mortlake. The soils of the plains are neutral, mottled-black (BhN) duplex soils, while those of the undulating very low lunettes are friable, black gradational soils (DcN and DcK) or alkaline, black self-mulching clays (EaK). The soils of the swamps are alkaline, grey cracking clays (Eck).

Map Unit: 125

Classification Code: BgN,BgNh S - PLA

Co-dominant. Soils	Sub-Dominant Soils	Landform Element.	Landform Pattern
BgN,BgNh	BhA,BhAI,BhNI	S	PLA

Soil Distribution:

The gently undulating plains between Colac and Pirron Yallock consist of neutral, mottled-black duplex soils with relatively light (BgN) or heavy (BgNh) textured surfaces. These soils usually occur BhA1id and upper sIBhN1) and broad crests. The soils of the lower slopes and flats are acidic (BhA and BhAI) and neutral (BhND, mottled-black duplex soils, but differ from the soils on higher positions in the landform in that they have sporadic bleached rather than conspicuously bleached subsurface horizons. There are minor occurrences of mottled-yellow (BaNs) and black (BiA) duplex soils. Patches of gilgai microrelief may ocBhN1on the flats and the soils are usuallyBhA1ack, cracRLSg clays (EaN) or mottled-black duplex soils (BhNI).

Map Unit: 126

Classification CBhA,BhA1,BhN1 - RIS

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
FaA	AgN,DcN	HSL	RIS

Soil Distribution:

The gently undulating rises consist of shallow, red and black, friable loams (FaA). The main areas occur around the base. of Mounts Noorat, Meningorot, Koang and Kurweeton. The amount of surface stones varies from many to very few, and in the less stony areas farmers claim to have grown good wheat and barley crops. However, the amount of stone brought to the surface by cultivation is a major problem to the cropping of these areas. In the relatively clear areas there may be minor occurrences of mottled-black duplex soils (AgN) and friable, black gradational soils (DcN).

Map Unit: 127

Classification Code: FaA - HSL - RLS

Dominant Soils	Minor Soils	- Landform Element	Landform Pattern
FaA	EaK	HSL	SWP RIS

Soil Distribution:

The unit consists of an irregular surface of basalt lava flow, in the Pomborneit - Stoneyford area, in which hummocks, depressions, ridges and blind channels have given a completely confused topography, with a relief of about 1-0-15 metres. The soils of the rolling stony mounds or 'stony rises' are shallow, red or black loams (FaA), which also occur on the stony areas between the rises. Black cracking clays (EaK) occupy the numerous swamps and depressions between the rises.

Map Unit: 128

Classification Code: FaK - HSL - R1S

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
FaK	FaN	HSL	RIS

The rolling rises on limestone, south of Warrnambool, consist of alkaline, shallow, friable loams (FaK). Neutral soils (FaN) may occur, particularly where profiles lack shell fragments.

Map Unit: 129

Classification Code: FaA - CON

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
FaA	-	CON	-

Mounts Meningorot and Porndon are steep low cones consisting of shallow, friable loams (FaA).

Soil Distribution:

Map Unit: 130

Classification Code: DaN - HSL - R1S

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
DaN	Water-filled	1-ISL MAA	RIS

Soil Distribution:

The undulating rises around Lake Purrumbete, a maar east of Camperdown, consist of friable, red gradational soils (DaN). The maar itself is water-filled.

Map Unit: 131

Classification Code: FaA - S - PLA

Dominant Soils	Sub-Dominant Soils	Landform Element	Landform Pattern
FaA	DcN, DaN Eck	S D	PLA

Soil Distribution:

The undulating basalt plains in the Warrion-Dreeite area are (DaN)ated by very stony rises with shallow, friable loam soils (FaA). The relatively stone free gently undulating plains between these very slight rises are neutral, black (DcN) and red (DaN) gradational soils, with minor occurrences of friable, mottled-black (AfKt) duplex soils. Layers of volcanic ash are encountered at variable depth in the profile but may occur at 20 cm on crests, and 60 cm on slopes. The flats and depressioHSLtween the rises are alkaline, grey cracking clays (Eck), or occasionally black cracking clays (EaK).

Map Unit: 132

Classification Code: DcN - S - PLA

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
DcN	FaK, DaN	S	PLA

Soil Distribution:

The gently undulating plains in the Alvie area consist of neutral, black gradational soils (DcN) with minor occurrences of alkaline, friable loams (FaK) and neutral, red gradational soils (DaN). Layers of volcanic ash occur in the RLS file, at depths of 30-50 cm.

Map Unit: 133

Classification Code: DcN - HSL - RIS

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
DcN	AgN	HSL	RIS

Soil Distribution:

The unit consists of neutral, friable black gradational soils (DcN) on gently undulating rises in the Mount Noorat area. There are minor occurrences of neutral, LandformBI PatternN) duplex soils.

Map Unit: 134

Classification Code: DcN - HSL - RIS.

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
DcN	FaA,DbA	HSL	RIS

Soil Distribution:

The unit consists of neutral, black gradational soils (DcN) on undulating rises. There are minor occurrences of brown gradational soils (DbA) and shallow, friable loams (FaA), particularly in areas where surface stone is common.

Map Unit: 135

Classification Code: DcN - HSL - LOW

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
DcN	FaK AfKt	HSL V	LOW

Soil Distribution:

The undulating low hills in the Coragulac - Alvie area consist of neutral, black gradational soils (DcN). Layers of volcanic ash are commonly encountered at a depth of about 30-35 cm. Black gradational soils (DcN) and shallow, friable loams (FaK) also occur on the steep hills and rims of the water-filled maars within the unit. Friable, mottled-black (AfKt) duplex soils occur in drainage lines.

Map Unit: 136

Classification Code: DcN, DcA - HSL - LOW

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
DcN,DcA	AiAt	HSL •	LOW

Soil Distribution:

The unit consists of neutral (DcN) and acidic (DcA), black gradational soils, with smaller areas of friable, red duplex soils (AiAt). The major occurrences of this unit are the Wiridgil Hills and Robertson Hill west of Colac.

Map Unit: 137

Classification Code: DcN,DcK - LUN

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
DcN,DcK	-	LUN	-

Soil Distribution:

The unit consists of neutral (DcN) and alkaline(DcK), black gradational soils on gently undulating lunettes in the Swan Marsh area.

Map Unit: 138

Classification Code: DcN,DcK - LUN

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
DcN,DcK	EcK EaK,EcK	LUN SWP	

Soil Distribution:

The unit is a complex one consisting of swamps, lakes and their lunettes in the Lakes Bookar, Colongulac and Milangil areas, and in the Elwood and Leslie Manor Roads area. The soils found on the lunettes are neutral (DcN) or alkaline (DcK) well-structured, black gradational soils with minor occurrences of alkaline, self-mulching grey Maps (EcK). The soils of the swamps are alkaline, black (EaK) or grey (EcK) cracking clays.

Map Unit: 139

Classification Code: DcK - CON

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
DcK		CON	

Soil Distribution:

Mount Gellibrand is a moderately EaK,EcK high cone consisting of alkaline, well-structured black gradational soils (DcK).

Map Unit: 140

Classification Code: ' DbA,DbAd - HSL - R1S

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
DbA,DbAd	-	HSL	RIS

Soil Distribution:

The unit consists of acidic, friable, brown gradational soils (DbA and DbAd) on gently undulating rises in the Timboon West area.

Map Unit: 141

Classification Code: DbA,DbAd - HSL - LOW

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
DbA,DbAd	-	HSL	LOW

Soil Distribution:

The unit consists of acidic, friable, brown gradational soils (DbA and DbAd) on undulating low hills in the Timboon West area.

Map Unit: 142

Classification Code: AiK - CON

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
AiK	-	CON	-

Soil Distribution:

Mount Rebecca and Gow Hill, two gently inclined very low cones between Cressy and Shelford, consist of shallow, alkaline red duplex soils (AiK). The soils are considered as being very good for cropping, but under a situation of high cropping intensity with a subsequent lowering of the organic matter levels, the surface soils are prone to forming a seal. This surface sealing may cause emergency problems.

Map Unit: 143

Classification Code: AaNi,AaKi,AbK1 - S - LAV

Co-dominant Soils	Minor Soils(AaNi,AaKi)	Landform Element	Landform Pattern
AaNi,AaKi,AbK1	-	S	LAV

Soil Distribution:

The unit consists of an association of closely related mottled-yellow duplex soils (AaN1,AaK1 and AbK1) on gently undulating plains west of Inverleigh. Subsurface horizons are either bleached (AaNi and AaKi) or spodic (AbK1).

Map Unit: 144

Classification Code: BaN,BaA.- S - PLA

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
BaN,BaA	BaN _a ,BdA _a	S	PLA

Soil Distribution:

The unit consists of neutral (BaN) and acidic (BaA), mottled-yellow duplex soils on gently undulating plains, predominantly in the Mortlake - Terang area. There are minor occurrences of mottled-yellow (BaNa) and mottled-brown (BdAa) duplex soils with subsurface horizons that are not bleached.

Map Unit: 145

Classification Code: BaA - S - PLA

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
BaA	- EcK	S V	PLA

Soil Distribution:

The gently, undulating plains in the Brucknell - Nirranda East area consist of acidic, mottled-yellow (BaA) duplex soils. Many, near parallel, open depressions of alkaline, grey cracking clays (EcK) occur, which drain towards the Curdie River.

Map Unit: 146

Classification Code: BaN,BdN - HSL - RIS

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
BaN,BdN	BeKh,BaNm	HSL	RIS

Soil Distribution:

The gently undulating rises east of Birregurra consist of neutral, mottled-yellow (BaN) and mottled-brown (BdN) duplex soils. However, the mottled-yellow (BaN) duplex soils are more common adjacent to the Barwon River flats, whereas the mottled-brown (BdN) duplex soils are more frequently found in the south of the unit near the higher, steeper terrain. There are minor occurrences of alkaline, mottled-brown (BeKh) duplex soils and deep sandy banks of mottled-yellow duplex soils with massive subsoils (BaNm).

Map Unit: 147

Classification Code: BaA - HSL - HIL

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
BaA	FbA,IaA,BaAm	HSL	HIL

Soil Distribution:

The unit consists of acidic, mottled-yellow (BaA) duplex soils on rolling hills in the Wombat State Forest, the Parwan Valley and the Kawarren area south of Colac. There are minor occurrences of shallow, massive loams (FbA) and shallow, sandy soils (IaA), and acidic, mottled-yellow duplex soils with massive subsoils (BaAm).

Map Unit: 148

Classification Code: BaAa - PLA - .PLA

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
BaAa	BaNa	PLA	PLA

Soil Distribution:

The level plains, east of Eilerslie, consist of acidic, mottled-yellow duplex soils with subsurface horizons that are not bleached (BaAa). There are minor occurrences' of closely related neutral (BaNa) duplex soils.

Map Unit: 149

Classification Code: BaKh,BcKh - PLA - PLA

Co-dominant Soils	Sub-Dominant Soils	Landform Element	Landform Pattern
BaKh,BcKh	BcKph	PLA	PLA

Soil Distribution:

The near level plains in the Bookar and Leslie Manor areas, north of Camperdown, consist of an association of closely related alkaline mottled-yellow duplex soils with conspicuous (BaKh) and sporadic bleached (BcKh and BcKph) subsurface horizons. Compared to the other soils of the unit, those in low lying situations have high and potentially harmful salinity levels in both the surface and subsoil.

Map Unit: 150

Classification Code: AaN,AaK,AbK - HSL - LAV

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
AaN,AaK,AbK	AbKs,AbN,AcK	HSL	LAV

Soil Distribution: -

The gently undulating basalt rises which stretch from Winchelsea to Barwon Heads consist of an association of neutral (AaN) and alkaline (AaK and AbK) mottled-yellow duplex soils. Subsurface horizons are conspicuous (AaN and AaK) or sporadic (AbK) bleached. There are minor occurrences of closely related mottled-yellow (AbKs and AbN) duplex soils and alkaline, mottled-brown (AcK) duplex soils.

Map Unit: 151

Classification Code: AbA - HSL - RIS

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
AbA	-	HSL	RIS

Soil Distribution:

These rolling rises which form the rim of a maar in the Ecklin South area consist of acidic, mottled-yellow (AbA) duplex soils.

Map Unit: 152

Classification Code: AbA,DcN - HSL - LOW

Co-dominant Soils	Sub-Dominant Soils	Landform Element	Landform Pattern
AbA,DcN	- AhNd EaK EaK,DcN	HSL C PLA PLA	LOW ALP TER

Soil Distribution:

This complex unit comprises the rolling low hills and valley sides- adjacent to the Merri River, north of Warrnambool, together with its alluvial plains and terraces. The hillslopes facing the river are neutral, well-structured black gradational soils (DcN), while their crests are neutral black (AhNd) duplex soils which are relatively shallow. The soils of the hillslopes away from the creek merge with the soils of the basalt plain and are acidic, mottled-yellow (AbA) duplex soils. The alluvial plains and lower level terraces are alkaline, black self-mulching cracking clays (EaK), while in situations where there are terraces at more than one level, the soils of the higher terraces are neutral, well-structured black gradational soils (DcN).

Map-Unit: 153

Classification Code: AbA,AbN - HSL - LOW

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
AbA,AbN	AiAt	HSL	LOW

Soil Distribution:

The undulating low hills in the Dixie - Staughton Hill area, south of Terang, consist of acidic, mottled-yellow (AbA) duplex soils on mid and lower slopes and neutral, mottled-yellow (AbN) duplex soils on mid and upper slopes. Shallow, mottled-yellow (AbA) duplex soils and patches of redder soils (AiAt) occur on the crater lip and around the maar rim.

Map Unit: 154

Classification Code: EcK - PLA - PLA

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
EcK	-	PLA	PLA

Soil Distribution:

The unit consists of alkaline, grey cracking clays (EcK) on near level plains in the Lake Murdeduke and Bookar areas.

Map Unit: 155

Classification Code: BaA,BcA - S - PLA

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
BaA,BcA	BaAa,BaAm BiAs	S BOU	PLA

Soil Distribution:

The gently undulating plains in the Nullawarre area consist of acidic, mottled-yellow (BaA) duplex soils on the mounds or very slight rises, with acidic, mottled-yellow duplex soils with sporadic bleached subsurface horizons (BcA) occurring on the flats and the shallow depressions or blow-outs between the mounds. These shallow sauce-shaped blow-outs, which range from 20-100 m in diameter, may also contain acidic, black (BiAs) duplex soils. There are minor occurrences of acidic, mottled-yellow duplex soils with unbleached subsurface horizons (BaAa) on crests, and acidic, mottled-yellow duplex soils with massive subsoils (BaAm) on the slopes.

Map Unit: 156

Classification Code: BdA - S - PLA

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
BdA	- EcA	S V	PLA

Soil Distribution:

The unit consists of acidic, mottled-brown (BdA) duplex soils on gently undulating plains south of Terang. The open depressions between the very slight rises consist of acidic, grey cracking clays (EcA). It is difficult to work these soils for cropping before November, due to waterlogging, but peas have been grown successfully on these soils.

Map Unit: 157

Classification Code: BdN,BdA - HSL - RIS

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
BdN,BdA	BgN,BfAp	HSL	RIS

Soil Distribution:

The undulating rises in the Larpent area, south-west of Colac, consist of neutral (BdN) and acidic (BdA), mottled-brown duplex soils, with the acidic subclass BdA being more common in the west of the unit. There are minor occurrences of neutral, mottled-black (BgN) duplex soils and acidic, brown (BfAp) duplex soils in some low-lying situations.

Map Unit: 158

Classification Code: BcA,BaAa - HSL - HIL

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
BcA,BaAa	-	HSL	HIL

Soil Distribution:

The rolling hills in the Scotts Creek area consist of an association of acidic, mottled-yellow duplex soils with bleached (BcA) or unbleached (BaAa) subsurface horizons.

Map Unit: 159

Classification Code: BcAhs - HSL - HIL

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
BcAhs	BaA,BaAm	HSL	HIL

Soil Distribution:

Within the survey area the Otway Ranges consist of steep hills of acidic, mottled-yellow duplex soils (BcAhs). There are also minor occurrences of acidic, mottled-yellow duplex soils with conspicuously bleached subsurface horizons (BaA and BaAm).

Map Unit: 160

Classification Code: BiA,BiAs - PLA - PLA

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
BiA,BiAs	BhA	PLA	PLA

Soil Distribution:

The near level plains in the Carpendeit area consist of acidic, black (BiA and BiAs) duplex soils with minor occurrences of acidic, mottled-black (BhA) duplex soils. Under average seasonal conditions, cropping is prevented due to waterlogging, ie. paddocks untrafficable during essential operational times.

Map Unit: 161

Classification Code: BiKs - PLA - PLA

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
BiKs	-	PLA	PLA

Soil Distribution:

The unit occupies a small area on near level plains south of Lake Gnarpurt and consists of alkaline, black (BiKs) duplex soils.

Map Unit: 162

Classification Code: BkK - HSL - RIS

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
BkK	-	HSL	RIS

Soil Distribution:

The unit consists of alkaline, red (BkK) duplex soils on minor gently undulating rises along creeks in the Foxhow area.

Map Unit: 163

Classification Code: BeA,BeAh - C - PLA

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
BeA,BeAh	-	C	PLA

Soil Distribution:

The gently undulating ridge crests in the Scotts Creek area consist of acidic, mottled-brown (BeA and BeAh) duplex soils.

Map Unit: 164

Classification Code: BeAh - HSL - LOW

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
BeAh	BdAh	HSL	LOW

Soil Distribution:

The unit consists of acidic, mottled-brown (BeAh) duplex soils on undulating low hills in the Naroghid area north of Cobden. There are minor occurrences of acidic, mottled-brown duplex soils with conspicuously bleached subsurface horizons (BdAh).

Map Unit: 165

Classification Code: BJK,BcNph - HSL - RIS

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
BJK,BcNph	BaAh	HSL	RIS

Soil Distribution:

These gently undulating rises in the Cobden area consist of an association of alkaline, yellow (BJK) and neutral, mottled-yellow (BcNph) duplex soils. There are minor occurrences of acidic, mottled-yellow (BaAh) duplex soils. The alkaline soils (BJK) normally occur on marl deposits.

Map Unit: 166

Classification Code: BaAm,BaA - S - PLA

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
BaAm,BaA	BbAm,BbA	S	PLA

Soil Distribution:

The unit consists of gently undulating plains of acidic, mottled-yellow or yellow duplex soils with massive (BaAm) and structured (BaA) subsoils. Bleaching in subsurface horizons may be more pronounced in some profiles than others. There are minor occurrences of sandy, mottled-yellow duplex soils with massive (BbAm) and structured (BbA) subsoils.

Map Unit: 167

Classification Code: AcAaBushfield - LAV

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
AcAa,AcAs	AhA,AeA	S	LAV

Soil Distribution:

The gently undulating basalt plains in the Purnim - Bushfield area, east of Warrnambool, consist of acidic, mottled-brown duplex soils (AcAa and AcAs). There are minor occurrences of acidic, brown (AeA) duplex soils, and acidic, black (AhA) duplex soils, particularly in close proximity to the valley walls and slopes adjacent to the Merri River and Drysdale Creek.

Map Unit: 168

Classification Code: AhAd,AhNd - HSL - RIS

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
AhAd,AhNd	- BaA,BaN EaA	HSL L C	RIS

Soil Distribution:

The unit consists of undulating rises around the eastern rim of maars in the Garvoc area. The co-dominant soils of the mid and upper slopes are acidic (AhAd) and neutral (AhNd), black duplex soils. The crests are acidic, black self-mulching clays (EaA), while the soils of the lower slopes are mottled-yellow duplex soils (BaA and BaN) and merge with those of the surrounding plain.

Map Unit: 169

Classification Code: AhNd,AhAd,AcNs - S - LAV

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
AhNd,AhAd,AcNs	Af Aa,AcAt	S	LAV

Soil Distribution:

The gently undulating basalt plains in the Panmure area consist of an association of black (AhNd and AhAd) and mottled-brown (AcNs) duplex soils. There are minor occurrences of mottled-black (AfAa) and friable, mottled-brown (AcAt) duplex soils.

Map Unit: 170

Classification Code: AhNd,AhAd,AcNs - HSL - LAV

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
AhNd,AhAd,AcNs	AhA,AfAa,AcAt FaA	HSL R	LAV

Soil Distribution:

The gently undulating rises in the Garvoc - Wangoom area, east of Warrnambool, consist of neutral, mottled-brown (AcNs) duplex soils on upper slopes and neutral (AhNd) and acidic (AhAd), black duplex soils on the mid and lower slopes. There are minor occurrences of acidic, black (AhA) duplex soils on the flats between the rises, and mottled-black (AfAa) and friable, mottled-brown (AcAt) duplex soils on the slopes. Shallow, friable loams (FaA) occur on the lava ridges which also have many surface stones.

Map Unit: 171

Classification Code: AhNd,AhAd,AcNs - HSL - LAV

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
AhNd,AhAd,AcNs	AcAt	HSL	LAV

Soil Distribution:

The undulating rises in the Panmure area consist of neutral, mottled-brown (AcNs) duplex soils on upper slopes and neutral (AhNd) and acidic (AhAd), black duplex soils on mid and lower slopes. There are minor occurrences of friable, mottled-brown (AcAt) duplex soils.

Map Unit: 172

Classification Code: AhNd,AhAd - HSL - RIS

Co-dominant Sbils	Minor Soils	Landform Element	Landform Pattern
AhNd,AhAd	- Water-filled	HSL. MAA	RIS

Soil Distribution:

The unit consist of black duplex soils (AhNd and AhAd) on the rims of water-filled maws.

Map Unit: 173

Classification Code: AhNd,AhAd - HSL - LOW

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
AhNd,AhAd	- EaK	HSL MAA	LOWSoils

Soil Distribution:

Lake Wangoom consists of a mainly dry maar of black- cracking clays (EaK), surrounded by rolling low hills of neutral (AhNd) and acidic (AhAd), black duplex soils.

Map Unit: 174

Classification Code: HeK - FOR

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
HeK	-	FOR	-

Soil Distribution:

The unit consists of deep, uniform sands (HeK) on rolling foredunes. Map Unit: 175

Classification Code: Bf A - HSL - RIS

Dominant Soils	Sub-Dominant Soils	Landform Element	Landform Pattern
Bf A	BeA BiAs1	HSL C BOU	RIS

Soil Distribution:

The unit consists of undulating rises with numerous steep sided blow-outs or closed depressions in the Allans Forest - Mepunga West area, east of Warrnambool. The hillslopes consist of acidic, brown (Bf A) duplex soils with crests of predominantly acidic, mottled-brown (BeA) duplex soils. Acidic, black (BiAs1) duplex soils are found in the depressions.

Map Unit: 176

Classification Code: AaA,AaAl - HSL - LAY

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
AaA,AaAl	AaAa	HSL	LA V

Soil Distribution:

The rolling rises north-westlight-texturedconsist of acidic, mottled-yellow (AaA) duplex soils in association with light-teXtured (AaAl) surface phases where the basalt has been dissected sufficiently to expose the underlying sediments. There are minor occurrences of acidic, mottled-yellow duplex soils with subsurface horizons that are not bleached (AaAa).

Map Unit: 177

Classification Code: EaAf - F - PLA

Dominant Soils	Sub-Dominant Soils	Landform Element	Landform Pattern
EaAf	EaA.	F	PLA

Soil Distribution:

The unit consists of acidic, black cracking clays (EaAf and EaA) on flats in the Yarpturk area east of Koroit.

Map Unit: 178

Classification Code: EcK - PLA - ALP

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
EcK	EaK	PLA STC	ALP

Soil Distribution:

The unit consists of alkaline, grey cracking clays (EcK) on alluvial plains in the Hawkesdale and Woolsthorpe areas. Periodic surface cracking is only evident in dry years as these soils generally have a high moisture content. The soils along the stream channels are alkaline, black cracking clays (EaK).

Map Unit: 179

Classification Code: AbA, AbAp - HSL - LAV

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
AbA,AbAp	AaAs,AaAps, AhN,AcAs	HSL	LAV

Soil Distribution:

The gently undulating rises between Macarthur and Hawkesdale consist of acidic, mottled-yellow (AbA and AbAp) duplex soils with a sporadic bleached subsurface horizon. There are minor occurrences on upper slopes and crests of mottled-yellow duplex soils with shallow surface soils (AaAs) or which lack a bleached subsurface horizon. Relatively poorer drained mottled-yellow (AaAps) duplex soils may occur on flats and mottled-brown (AcAs) duplex soils are minor soils of the drainage lines between rises. Areas of gilgai microrelief may occur where the soils are neutral, black (AhN) duplex soils. A few surface stones usually occur on rises with gilgai microrelief.

Map Unit: 180

Classification Code: AbA,AbAp HSL LAV

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
AbA,AbAp	AcA,AcAa, AfA,AfAa	HSL	LAV

Soil Distribution:

The undulating rises in the Milltown area, north of Heywood, consist of acidic, mottled-yellow (AbA and AbAp) duplex soils with a sporadic bleached subsurface horizon. There are minor, occurrences of mottled-brown (AcA and AcAa) and mottled-black (Af A and AfAa) duplex soils, which may gilga microreliefached subsurface horizons, particularly on the broad level crests where areas of gilgaimicrorelief are common.

Map Unit: 181

Classification Code: AbA - CON

Dominant Soils	Minor Soils	Landform Element.	Landform Pattern
AbA	AdA,FaA EaK	CON CRA	

Soil Distribution:

This very gently inclined, very low cone south of Woolsthorpe consists of acidic, mottled-yellow (AbA) duplex soils. There are minor occurrences of mottled-brown (AdA) duplex soils and shallow, friable loams (FaA) particularly around the crater rim. Black, cracking clays (EaK.) occur in the crater itself.

Map Unit: 182

Classification Code: AbA - CON

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
AbA	AdA,FaA	CON	-

Soil Distribution:

This gently inclined low cone to the west of Winslow, near Woolsthorpe, consists of acidic, mottled-yellow (AbA) duplex soils. There are minor occurrences of mottled-brown (AdA) duplex soils and shallow, friable loams (FaA).

Map Unit: 183

Classification Code: AbNI,AbAI,AbA - HSL - LAV

Co-dominant Soils	Minor Soils	Landform. Element	Landform Pattern
AbNI,AbAI,AbA	AdA,AeAI EcK	HSL F	LAV

Soil Distribution:

The undulating rises to the west of Macarthur consist of neutral (AbN1) and acidic (AbAI and AbA), mottled-yellow duplex soils with sporadic bleached subsurface horizons. There are minor occurrences of mottled-brown (AdA) and brown (AcAI) duplex soils on the slopes and soils on the crests may be very shallow. Alkaline, grey cracking clays (EcK) occur on the flats.

Map Unit: 184

Classification Code: AbN1,AbA1,AbA - HSL - LOW

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
Abn1,AbA1,AbA	- AdA,BaAm	HSL	LOW

Soil Distribution:

Bald Hill, west of Macarthur, consists of neutral (AbN1) and acidic (AbA1 and AbA), mottled-yellow duplex soils with sporadic bleached subsurface horizons. There are minor occurrences of mottled-brown (AdA) duplex soils and sandy, mottled-yellow (BaAm) duplex soils are commonly found in the western portion of the unit.

Map Unit: 185

Classification Code: AbAp,AaAs - HSL - HIL

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
AbAp,AaAs	DaA, DaAd	HSL	HIL

Soil Distribution:

The very steep hills of Mount Clay consist of acidic, mottled-yellow (Abn1,AbA1,AbA) duplex soils with minor occurrences of friable, red gradational soils (DaA and DaAd), particularly on lower slopes.

Map Unit: 186

Classification Code: FaA,DcN - CON

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
FaA,DcN	AbA	CON	-

Soil Distribution:

Mount Eccles, a moderately inclined low cone west of Macarthur, consists of shallow, friable loams (FaA) and friable, black gradational soils (DcN) with minor occurrences of acidic, mottled-yellow (AbA) duplex soils on the lower slopes.

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Map Unit: 187

Classification Code: FaK - HSL - RIS

Dominant Soils	Sub-Dominant Soils	Landform Element	Landform Pattern
FaK	FaA,FaN	HSL	RIS

Soil Distribution:

The gently undulating rises in the Port Fairy - Rosebrook area consist of shallow, black, friable loamy soils (FaK, FaN and FaA) on limestone. The pH trend of these shallow profiles depends on the amount of hard carbonate nodules present. The rises furthest from the coast are the highest and steepest, and are generally lighter textured, e.g. loam, fine sandy. The rises of lower relief, closer to the coast, generally have textures of light clay loam or clay loam.

Map Unit: 188

Classification Code: BaA,BaAa - S - PLA

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
BaA,BaAa		S	PLA

Soil Distribution:

The gently undulating plains, south of Mount Clay, consist of an association of acidic, mottled-yellow duplex soils with bleached (BaA) and unbleached (BaAa) subsurface horizons.

Map Unit: 189

Classification Code: BaA,BaAa - HSL - RIS

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
BaA,BaAa		HSL	RIS

Soil Distribution:

The gently undulating rises, north of Mount Eckersley, consist of acidic, mottled-yellow duplex soils with bleached (BaA) and unbleached (BaAa) subsurface horizons.

Map Unit: 190

Classification Code: BaA,BaAa - HSL - RIS

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
BaA,BaAa		HSL	RIS

Soil Distribution:

The unit consists of acidic, mottled-yellow duplex soils with .bleached (BaA) and unbleached (BaAa) subsurface horizons on undulating rises north of Mount Eckersley.

Map Unit: 191

Classification Code: BaA,BaN, BaAa - PLA - SAN

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
BaA,BaN,BaAa	BbA,BbN,BbAm BjN,BcK,BcNp HbA,HcA EcK,EaK	PLA D	SAN

Soil Distribution:

The unit is a complex one consisting of gently undulating to level plains with numerous small depressions in the Heywood - Bessiebelle - St. Helens area. In the eastern, or more undulating, portion of the unit the very slight rises with broad level crests consist of acidic (BaA and BaAa) and neutral (BaN), mottled-yellow duplex soils with minor occurrences of sandy, mottled-yellow (BbA, BbN and BbAm) duplex soils which may be dominant locally. There are also minor occurrences of sand hills or dunes consisting of deep, uniform sands (HbA). The numerous small depressions are alkaline, grey (Eck) or black (EaK) cracking clays. There are minor depressions of acidic, black cracking clays (EaA) and some may have shallow depths to the substrate material. Mottled-yellow duplex soils with sporadic bleached subsurface horizons (BcK and BcNp) may also occur on level areas. In the western portion of the unit, which is near level, poorly drained, yellow (BjN) duplex soils are more common and there are occurrences of sand sheets where the soils are deep, uniform sands that contain a pan (HcA). Alkaline, grey cracking clays (Eck) also occur in the swamps and depressions in this portion of the unit.

Map Unit: 192

Classification Code: BaAa,BaNa,BjN,BjK PLA - PLA

Co-dominant Soils	Minor Soils	Landform Element	Landform PaHomerton
BaAa,BaNa,BjN,BjK	Eck,EaK	PLA	PLA

Soil Distribution:

The near level plains in the Heywood to Hortietton, and Tyrendarra areas consist of an association of acidic (BaAa) and neutral (BaNa), mottled-yellow duplex Soils and neutral (BjN) and alkaline (BjK), yellow duplex otherwise with the latter occupying the lower portions of the plain. The very slight deCo-dominant the other wise level terrain consist of alkaline, grey (Eck) or black (EaK) cracking clays.

Map Unit: 193

Classification Code: AaA,AaAa - HSL - LAV

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
AaA,AaAa	AdA,AiAt EcK AiAd,AcAs	HSL D	LAV

Soil Distribution:

The undulating rises to the north of Portland consist of acidic, mottled-yellow duplex soils with bleached (AaA) and unbleached (AaAa) subsurface horizons. The colour of the topsoil in the latter is usually reddish brown or brown. There are minor occurrences of acidic, mottled-brown (AdA) and friable, red (AiAt) duplex soils. Alkaline, grey cracking clays (EcK) occur in the swamps and depressions while red (AiAd) duplex soils occur on the crests of banks surrounding these depressions. Mottled-brown (AcAs) duplex soils are typical of the soils found on slopes leading down to the depressions. -

Map Unit: 194

Classification Code: AaA,AaAs - CON

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
AaA,AaAs		CON	

Soil Distribution:

The gently inclined low cone east of Macarthur consists of acidic, mottled-yellow (AaA and AaAs) duplex soils.

Map Unit: 195

Classification Code: AaAs - HSL - LOW

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
	DaA, DaAd AiNt	HSL	LOW

Soil Distribution:

The rolling low hills in the Mount Clay area consist of acidic, mottled-yellow (AaAs) duplex soils with brown coloured topsoils. There are minor occurrences of friable, red gradational (DaA and DaAd) and duplex (AiNt) soils particularly on the steeper slopes around the border of the unit.

Map Unit: 196

Classification Code: BjA - PLA - PLA

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
BjA		PLA	PLA

Soil Distribution:

The near level plains, north of Woolsthorpe, consist of acidic, yellow (BjA) duplex soils.

Map Unit: 197

Classification Code: IbK - DUN - DUN

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
IbK	- HbN	DUN F	DUN

Soil Distribution:

The undul(LbK).limestone dunes between Port Fairy and Portland consist of red-brown sands (IbK). The depth of the sola varies but tends to be shallow on upper slopes and crests where some limestone outcrops may occur. The soils of the interdune flats are deep, uniform sands with a conspicuously bleached subsurface horizon (HbN).

Map Unit: 198

Classification Code: IbK - DUN - DUN

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
IbK	- HbN	DUN	DUN

Soil Distribution:

The rolling limestone dunes near Tyrendarra consist of red-brown sands (IbK). The depth of the sola varies but tends to be shallow on upper slopes and crests. There are minor occurrences of deep, uniform sands with a conspicuously bleached subsurface horizon (HbN) on the flats.

Map Unit: 199

Classification Code: HeK - FOR - DUN

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
HeK		FOR	

Soil Distribution:

The rolling foredunes in the Discovery Bay area, west of Portland, consist of deep, uniform sands (HeK) with many shell fragments.

Map Unit: 200

Classification Code: HbA - HSL - RIS

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
HbA	BaA	HSI.	

Soil Distribution:

The unit consists of deep, uniform sands (HbA), on undulating rises east of Bessiebelle. There are minor occurrences of acidic, mottled-yellow (BaA) duplex sHSLs.

Map Unit: 201

Classification Code: HcA - S - PLA

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
	HaA	S DUN	PLA

Soil Distribution:

The gently undulating plains, west of Portland, consist of deep, uniform sands with a conspicuously bleached subsurface horizon which overlies a cemented or compacted pan (HcA). The dunes which occur on the plain are deep uniform sands that lack pedologic development apart from some surface accumulation of organic matter (HaA).

Map Unit: 202

Classification Code: DaA - HSL - LOW

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
	EaA	HSL D	LOW

Soil Distribution:

The rolling low hills of Sugarloaf Hill and Sheoak Rise, north of Heywood, consist of acidic; friable red gradational soils (DaA). There are minor occurrences of acidic, black self-mulching clays (EaA) in local depressions.

Map Unit: 203

Classification Code: DaK - H

Dominant Soils	Sub-Dominant Soils	Landform Element	Landform Pattern
	BbA		H

Soil Distribution:

The gently inclined very low limestone hillock, north of Tyrendarra, consists of an association of friable, red gradational (DaK) and sDcNy, mottled-yellow (BbA) duplex soils.

Map Unit: 204

Classification Code: DeN - HSL - LOW

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
	AaA EaNf	HSL L	LOW

Soil Distribution:

The rolling low hills of Mount Eckersley, north of Heywood, consist of neutral, friable black gradational soils (DeN). There are minor occurrences of acidic, mottled-yellow (AaA) duplex soils, particularly on crests, and shallow, black self-mulching clays (EaNf) on lower slopes.

Map Unit: 205

Classification Code: DeN,DeK - HSL - RIS

Co-dominant Soils	Sub-Dominant Soils	Landform Element	Landform -Pattern
DeN,DeK	DdN	HSL	RIS

Soil Distribution:

The undulating rises around Tower Hill, in the Koroit area, consist of neutral (DeN) and alkaline (DeK), well-structured, black gradational soils, which contain layers of volcanic ash from approximately 50cm. Neutral, friable brown gradational soils (DdN) occur on the steeper slopes, particularly around the edge of the unit and those leading up to the maar rim.

Map Unit: 206

Classification Code: BbA DUN - SAN

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
BbA	DaK	DUN	SAN.

Soil Distribution:

The unit consists of sandy, mottled-yellow (BbA) duplex soils on undulating dunes. In the unit RLSthe west of Heywood, alkaline, red gradational soils (DaK) occur on limestone or marl.

Map Unit: 207

Classification Code: BbAm,BbA - HSL - LOW

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
BbAm,BbA	B1A	HSL	LOW

Soil Distribution:

The undulating low hills, west of Mount Clay, consist of sandy, mottled-yellow duplex soils with massive (BbAm) and structured (BbA) subsoils. There are minor occurrences of sandy, red (B1A) duplex soils, particularly around the margins of the unit.

Map Unit: 208

Classification Code: BbAm,BbA - L - LOW

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
BbAm,BbA		L	LOW

Soil Distribution:

The lower, northern slopes of Bald Hill, west of Macarthur, consist of acBIAc, sandy, mottled-yellow duplex soils with massive (BbAm) and structured (BbA) subsoils.

Map Unit: 209

Classification Code: BaK - HSL - RIS

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
	BaKs	HSL	RIS

Soil Distribution:

The undulating rises in the Leopold area, on the Bellarine Peninsula, consist of alkaline, mottled-yellow (BaK) duplex soils. Alkaline, mottled-yellow duplex soils with shallow surface horizons (BaKs) may occur on crests, and also a few surface stones may be found on upper slopes and crests.

Map Unit: 210

Classification Code: BaK - HSL - LOW

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
	BaKs	HSL	LOW

Soil Distribution:

The undulating low hills in the Moriac and Maude areas consist of alkaline, mottled-yellow (BaK) duplex soils. There are minor occurrences of closely related shallow surface soils (BaKs) on crests.

Map Unit: 211

Classification Code: BaKh,BcKh - S - PLA

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
BaKh,BcKh		S	

Soil Distribution:

The unit consists of alkaline, mottled-yellow duplex soils with conspicuous (BaKh) and sporadic (BcKh) bleached subsurface horizons on gently undulating plains in the Moolap area, east of Geelong.

Map Unit: 212

Classification Code: BaA,BeA - HSL - LOW

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
BaA,BeA	BkK	HSL	

Soil Distribution:

The rolling low hills in the Bellbrae area, west of Torquay, are variable in terms of soils, but consist predominantly of acidic mottled-yellow (BaA) and mottled-brown (BeA) duplex soils with alkaline, red (BkK) duplex soils occurring on some hillslopes.

Map Unit: 213

Classification Code: BbA - PLA PLA

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
	BbAc	PLA	PLA

Soil Distribution:

The unit consists of sandy, mottled-yellow (BbA) duplex soils on near level plains south of Teasdale. There are minor occurrences of sandy, yellow (BbAc) duplex soils.

Map Unit: 214

Classification Code: BbA - PLA - PLT

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
	BaA,HbA,HcA	PLA	PLT

Soil Distribution:

The unit consists of sandy, mottled-yellow (BbA) duplex soils on the gently undulating plateau to the north and west of Torquay. Associated soils include acidic, mottled-yellow (BaA) duplex soils with hardsetting surface characteristics developed to varying degrees and deep, uniform sands. In the deep sands the subsoils are coherent (HbA) but not cemented or compacted enough to form a pan. However, there are minor occurrences where 'coffee rock' pans occur (HcA) but they are not continuous over large areas.

Map Unit: 215

Classification Code: BbA - HSL - LOW

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
BbA	BLnlet	HSL C	LOW

Soil. Distribution:

The steep low hills in the Anglesea - Airey's Inlet area consist of sandy, mottled-yellow (BbA) duplex soils. Shallow, mottled-yellow (BaAs) duplex soils occur on upper slopes and ridge crests.

Map Unit: 216.

Classification Code: BbAm - HSL - ESC

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
BbArn	BbA	HSI.	ESC

Soil Distribution:

The soils of the escarpment on the northern edge of the plateau of Map Unit 214 consist of acidic, sandy mottled-yellow duplex soils with massive (BbAm) and structured (BbAmbA) sHSLs.

Map Unit: 217

Classification Code: BbA,BbAc,BbAcM - HSL - HIL

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern.
BbA,BbAC,BbAcM	BaA,HcA,BcAhc.	HSL	HIL

Soil Distribution:

The very steep hills north-west of Anglesea consist of sandy, mottled-yellow (BbA) duplex soils, and sandy, yellow duplex soils with structured (BbAc) and massive (BbAc) subsoils. There are minor occurrences of acidic, mottled-yellow (BaA) duplex soils with hardsetting surface characteristics developed to varying degrees, deep uniform sands with a 'coffee rock' pan. (HcA) and acidic, yellow duplex soils with a partially bleached subsurface horizon (BcAhc).

Map Unit: 218

Classification Code: BbKc,BbKca - S - PLA

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
BbKc,BbKca	BIK,BIKa	S	PLA

Soil Distribution:

The undulating plains around Barwon Heads consist of alkaline, sandy BIKlow duplex soils with bleached (BbKc) and unbleached (BbKca) subsurface horizons. There are minor occurrences of alkaline, sandy red BbA,BbAc,BbAcM where the subsurface horizon may be bleached (B1K) or unbleached (BMW). Thin carbonate pans may occur iBIK,BIKa soils.

Map Unit: 219

Classification Code: BcKh,BiKs HSL - HIL

Co-dominant Soils	Minor Soils.	Landform Element	Landform Pattern
BcKh,BiKs	BdKh,BdN,BaN	HSL.	

Soil Distribution:

The rolling hillslopes of the Barrabool Hills, west of Geelong, consist of alkaline, mottled-yellow (BcKh) and black (BiKs) duplex soils. There are minor occurrences of alkaline, mottled-brown (BdKh) duplex soils and neutral, mottled-brown (BdN) and mottled-yellow (BaN) duplex soils on hillcrests.

Map Unit: 220

Classification Code: BhKs - PLA - PLA

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
BhKs	BeKh	PLA	

Soil Distribution:

The near level plains in the Lara area consist of alkaline, mottled-black (BhKs) duplex soils. There are minor occurrences of alkaline, mottled-brown (BeKh) duplex soils.

Map Unit: 221

Classification Code: BiKs - PLA - ALP

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
BiKs		PLA	ALP

Soil Distribution:

The alluvial plain of the Waurm Ponds Creek, in the Grovedale area, consists of alkaline, black (BiKs) duplex soils.

Map Unit: 222

Classification Code: BkK - PLA - PLA

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
BkK	BkAd	PLA	PLA

Soil Distribution:

The unit consists of alkaline, red (BkK) duplex soils on near level plains in the Little River and Anakie areas. There are minor occurrences of acidic, red (BkAd) duplex soils.

Map Unit: 223

Classification Code: Eck,EcKf - PLA - LAV

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
Eck,EcKf	-	PLA	LAV

Soil Distribution:

The near level basalt plains between Bannockburn and LeMap Unit consist of relatively deep (Eck) and shallow (EcKf), grey cracking clays.

Map-Unit: 224

Classification Code: EaNf,EaKf - S - LAV

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
EaNf,EaKf		S	LAV

Soil Distribution:

These gently undulating basalt plains in the Bannockburn area consist of an association of neutral (EaNf) and alkaline (EaKf), shallow black self-mulching clays. The neutral soils tend to be the shallower of the two and lack carbonate segregations in the profile. The very slight rises have many surface stones.

Map Unit: 225

Classification Code: EaNf - CON

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
		CON	

Soil Distribution:

Mount Pollock is a moderately inclined low cone consisting of neutral, shallow, black cracking clays (EaNf). The hillslopes have abundant surface stone.

Map Unit: 226

Classification Code: EaK,EaKf - R

Co-dominant	Minor Soils	Landform Element	Landform Pattern
EaK,EaKf		R	

Soil Distribution:

The unit consists of alkaline, black self-mulching days (EaK and EaKf) on an undulating ridge along the eastern shore of Lake Modewarre.

Map Unit: 227

Classification Code: AaN,AaK - HSL - LAV

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
AaN,AaK	AgKs,EaKf	HSL	LAN/

Soil Distribution:

The unit consists of neutral (AaN) and alkaline (AaK), mottled-yellow duplex soils on undulating rises near Moriac. There are minor occurrences of alkaline, mottled-black (AgKs) duplex soils and alkaline, shallow, black cracking clays (EaKf) particularly on the upper slopes.

Map Unit: 228

Classification Code: AaK - HSL - LAV

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
AaK	AeN.	HSL	LAY

Soil Distribution:

The undulating basalt rises in the Mount Duneed area consist of alkaline, mottled-yellow (AaK) duplex soils. There are minor occurrences of neutral, brown (AeN) duplex soils.

Map Unit: 229

Classification Code: AhK,AhKp - HSL - LAV

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
AhK,AhKp	DbN,AbK,AdK AiK,AdK,AbKps EcK	HSL PLA	LAV

Soil Distribution:

The unit consists of undulating rises with broad areas of near level plains extending from Anakie to Geelong. The co-dominant soils of the rises, which have variable amounts of surface stone, are alkaline, mottled-black (AhK and AhKp) duplex soils. There are minor occurrences of neutral, friable brown gradational soils (*DbN*), particularly on the rises with many surface stones, and alkaline mottled-brown (AdK) and mottled-yellow (AbK) duplex soils. On the level plains the co-dominant soils are also alkaline, mottled-black (AhK and AhKp) duplex soils, with minor occurrences of alkaline, red (AiK), mottled-brown (AdK) and mottled-yellow (AbKps) duplex soils. Alkaline, grey cracking clays (EcK) occur in depressions on the plain and shallow, black cracking clays (EaKf) occur on the escarpment bordering Map Unit 86.

Map Unit: 230

Classification Code: AiK - S - LAV

Dominant Soils	Minor Soils	Landform. Element	Landform Pattern
AiK	EcK	S	LAV

Soil Distribution:

The unit consists of small areas of gently undulating plains near Lara and Bacchus Marsh. The dominant soils are alkaline, red (AiK) duplex soils with alkaline, grey cracking clays (Eck) occurring on the lower slopes and flats.

Map Unit: 231

Classification Code: AiK - HSL - LAV

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
	AaK,AhKp Eck	HSL D	LAV

Soil Distribution:

The unit consists of undulating rises extending from Bacchus Marsh to Lara. These broad rises consist of alkaline, red (AiK) duplex soils and have many surface stones. There are minor occurrences of alkaline, mottled-yellow (AaK) and black (AhKp) duplex soils and alkaline, grey cracking clays (Eck) occur in the low lying areas and depressions between the rises.

Map Unit: 232

Classification Code: DcK - HSL - LOW

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
DcK		HSL	LOW

Soil Distribution:

The unit consists of alkaline, friable black gradational soils (DcK) on undulating low hills in the Waurn Ponds area. The unit is considered as being good cropping country.

Map Unit: 233 Classification Code: DaA

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
DaA		CON	

Soil Distribution:

Hopwoods, Black and O'Donnell Hill are steep low cones in the Gordon-Millbrook area consisting of acidic, red gradational soils (DaA).

Map Unit: 234

Classification Code: DcN - HSL - LOW

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
DcN	FaA	HSL	LOW

Soil Distribution:

The undulating low hills in the Myrning area consist of neutral, friable black gradational soils (DcN). Shallow, friable loams (FaA) may occur, particularly on hillcrests.

Map Unit: 235

Classification Code: DcN - HSL - LOW

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
	FaA	I-ISL	LOW

Soil Distribution:

The Pentland Hills, steep low hills north-west of Bacchus Marsh, consist of neutral, black gradational soils (DcN). Shallow, friable loams (FaA) may occur, particularly on hillcrests.

Map Unit: 236

Classification Code: EaK - PHSLLP

Dominant Soils	Sub-Dominant Soils	Landform Element	Landform Pattern
EaK	- GaK	PLA BKP	ALP

Soil Distribution:

The alluvial plains of the Parwan Creek consist of alkaline, black cracking clays (EaK). The backplain, at some distance from the stream channel, consists of deep, poorly structured brown loams (GaK).

Map Unit: 237

Classification Code: BaA - HSL - HLL

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
BaA	FbA	HSL	HIL

Soil Distribution:

The unit consists of acidic, mottled-yellow (BaA) duplex soils on steep hills west of Bacchus Marsh. There are minor occurrences of shallow, massive loamy soils (FbA).

Map Unit: 238

Classification Code: BaN - S - PLA

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
BaN	BaK	S	PLA

Soil Distribution:

The unit consists of neutral, mottled-yellow (BaN) duplex soils on gently undulating plains west of Meredith. There are minor occurrences of alkaline mottled-yellow (BaK) duplex soils.

Map Unit: 239

Classification Code: BaN - HSL - RIS

Dominant Soils	Sub-dominant Soils	Landform Element	Landform Pattern
	BaK	HSL	RIS

Soil Distribution:

The unit consists of an association of neutral (BaN) and alkaline (BaK), mottled-yellow duplex soils on undulating rises in the Meredith area.

Map Unit: 240

Classification Code: BaK - FOO - RIS

Dominant	Minor Soils	Landform Element	Landform Pattern
	BcK	FOO	RIS

Soil Distribution:

The undulating footslopes in the Brisbane Ranges area consist of alkaline, mottled-yellow (BaK) duplex soils. There may be areas with a few surface stones and alkaline, mottled-yellow duplex soils with sporadic bleached subsurface horizons (BcK) may also occur.

Map Unit: 241

Classification Code: BaAh - HSL - LOW

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
		HSL	LOW

Soil Distribution:

The rolling low hills around Greendale consist of the heavy surface phases of the acidic, mottled-yellow (BaAh) duplex soils.

Map Unit: 242

Classification Code: BaNh,BaAh - HSL - RIS

Co-dominant	Minor Soils	Landform Element	Landform Pattern
BaNh,BaAh	BcNh	HSL	RIS

Soil Distribution:

The unit consists of neutral (BaNh) and acidic (BaAh), mottled-yellow duplex soils on gently undulating rises north of Meredith. There are minor occurrences of neutral, mottled-yellow duplex soils with sporadic bleached subsurface horizons (BcNh).

Map Unit: 243

Classification Code: BaNh - S - PLA

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
BaNh	BaAh	S	PLA

Soil Distribution:

The unit consists of neutral, mottled-yellow (BaNh) duplex soils on gently undulating plains near Gordon, west of Ballan. There are minor occurrences of acidic, mottled-yellow (BaAh) duplex soils.

Map Unit: 244

Classification Code: BaA,BaAm - HSL - HIL

Co-dominant Soils	Sub-Dominant Soils	Landform Element	Landform Pattern
BaA,BaAm	BbA,BbAm	HSL	HIL

Soil Distribution:

The rolling hills of the Brisbane Ranges National Park consist of an association of acidic, mottled-yellow duplex soils with structured (BaA) or massive (BaAm) subsoils. The condition of the surface soils may also be loose when dry (BbA and BbAm).

Map Unit: 245

Classification Code: BaK,BaKm - S - PLA

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
BaK,BaKm		S	

Soil Distribution:

The unit consists of alkaline, mottled-yellow duplex soils with structured (BaK) and massive (BaKm) subsoils on gently undulating plains east of Anakie.

Map Unit: 246

Classification Code: BbAm - HSL - RIS

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
BbAm	BbA,BaN	HSL	

Soil Distribution:

The undulating rises in the Sheoaks - Steiglitz area consist of sandy, mottled-yellow duplex soils with massive subsoils (BbAm). Sandy, mottled-yellow duplex soils with structured subsoils (BbA) may occur, and there are minor occurrences of neutral, mottled-yellow (BaN) duplex soils.

Map Unit: 247

Classification Code: BcAh - SWP

Dominant Soils	Sub-Dominant Soils	Landform Element	Landform Pattern
BcAh	EcK	SWP	

Soil Distribution:

The unit consists of acidic, mottled-yellow (BcAh) duplex soils, with areas of alkaline, grey cracking clays (EcK) in a depression near Lal Lal.

Map Unit: 248

Classification Code: BdK - S - PLA

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
BdK		S	PLA

Soil DistributionHLL

The unit consists of alkaline, mottled-brown (BdK) duLandformls on gently undulating plains near Anakie.

Map Unit: 249

Classification Code: BkA - HSL - HIL

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
BkA	BaA	HSL	HIL

Soil Distribution:

The steep hills west of Bacchus Marsh consist of acidic, red (BkA) duplex soils, with minor areas of acidic, mottled-yellow (BaA) duplex soils.

Map Unit: 250

Classification Code: BkK,BkKd - S - PLA

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
BkK,BkKd	BdKs	S	PLA

Soil Distribution:

The unit consists of alkaline, red (BkK and BkKd) duplex soils on gently undulating plains south of Bacchus Marsh. There are minor areas of alkaline, mottled-brown (BdKs) duplex soils.

Map Unit: 251

Classification Code: BkK - HSL - RIS

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
BkK	BdKs	HSL	RIS

Soil Distribution:

The undulating rises in the Coimadai area north of Bacchus Marsh consist of alkaline, red (BkK) duplex soils. There are minor occurrences of alkaline, mottled-brown (BdKs) duplex soils.

Map Unit: 252

Classification Code: AaA,AaN - HSL - LAV

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
AaA,AaN	Af A,AfN	HSL	

Soil Distribution:

The unit consists of acidic (AaA) and neutral (AaN), mottled-yellow duplex soils on undulating rises north-west of Ballan. There are minor occurrences of mottled-black duplex soils (AfA and AfN).

Map Unit: 253

Classification Code: AcK,AeKd - S - LAV

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
AcK,AeKd	FaA,EbKf	S	

Soil Distribution:

The unit consists of alkaline, mottled-brown (AcK) and brown (AeKd) duplex soils on gently undulating plains on the southern edge of the Parwan Creek Valley. Shallow, friable loams (FaA) occur in the areas with many surface stones and there are minor occurrences of shallow, alkaline brown cracking clays (EbKf).

Map Unit: 254

Classification Code: AgA,AgN - S - LAV

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
AgA,AgN	AaA,AcA,EcNf AbNps	S	

Soil Distribution:

The unit consists of acidic (AgA) and neutral (AgN), mottled-black duplex soils on gently undulating basalt plains in the Myrning and Morrisons area. There are minor areas of acidic, mottled-yellow (AaA) and mottled-brown (AcA) duplex soils, and neutral, shallow grey clays (EcNf) with a few surface stones. The unit has some extensive areas of gilgai microrelief where the soils are acidic, mottled black (AgA) or neutral, mottled-yellow (AbNps) duplex soils.

Map Unit: 255

Classification Code: AgA,AgN - HSL - LAV

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
AgA,AgN	AfN,AbAp,AhNd	HSL	

Soil Distribution:

The gently undulating basalt rises in the Myrning and Mount Doran areas consist of acidic (AgA) and neutral (AgN), mottled-black duplex soils. There are minor areas of neutral, mottled-black duplex soils with a conspicuous bleached subsurface horizon (AfN) and acidic, mottled-yellow (AbAp) duplex soils. Areas of gilgai microrelief occur where the soils of the mounds and depressions are acidic, mottled-black (AgA) duplex soils. Neutral, black (AhNd) duplex soils may occur on gilgai mounds.

Map Unit: 256

Classification Code: AiNt, DaN - CON

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
AiNt, DaN		CON L	

Soil Distribution:

These gently inclined very low cones, south of Ballan consist of shallow, friable red duplex (AiNt) and gradational (DaN) soils. The gentle lower slopes contain patches of shallow, black self-mulching clays (EaNf).

Map Unit: 257

Classification Code: AiNt, DaN - CON

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
AiNt, DaN	EaNf	CON L	

Soil Distribution:

The gently inclined low cone north of Elaine consists of shallow, friable red duplex (AiNt) and gradational (DaN) - soils. The relatively gentle lower slopes contain patches of shallow, black self-mulching clays (EaNf).

Map Unit: 258

Classification Code: AiNt, DaN - CON

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
AiNt, DaN	- EaNf	CON L	

Soil Distribution:

The unit consists of steep low cones of shallow, friable red duplex (AiNt) and gradational (DaN) soils on the relatively steeper middle and upper slopes. The gentler lower slopes contain patches of shallow, black self-mulching clay. (EaNf). The cones include Bald Hill, Mount Steiglitz, Mount Blackwood, Mount Bullengarook, Mount Egerton, Mount Gorong and Mount Darriwill which occur predominantly in the Ballan region.

Map Unit: 259

Classification Code: AiNt, DaN - CON

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
AiNt, DaN	- EaNf	CON L	

Soil Distribution:

Mount Anakie is a steep high cone consisting of shallow, friable red duplex (AiNt) and gradational (DaN) soils on the relatively steeper middle and upper slopes. The gentler lower slopes contain patches of shallow, black self-mulching clays (EaNf).

Map Unit: 260

Classification Code: AiK - PLA - LAV

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
	AiN EaK	PLA D	LAV

Soil Distribution:

The near level basalt plains in the Balliang East area consist of alkaline, red (AiK) duplex soils, with relatively shallow profiles having a neutral soil reaction trend (MN). Alkaline, black self-mulching clay (EaK) depressions, up to 20m in diameter, are scattered throughout the unit.

Map Unit: 261

Classification Code: AiK HSL - LAV

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
AiK	-	I-1SL	LAV

Soil Distribution:

The unit consists of alkaline, red (AiK) duplex soils on gently undulating rises south of Bacchi-ISLRsh.

Map Unit: 262

Classification Code: AiK - HSL - LAV

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
	FaA AeK	HSL D	LAV

Soil Distribution:

The rolling basalt rises near Parwan, south of Bacchus Marsh consists of alkaline, red (AiK) duplex soils, with shallow, friable loams (FaA) occurring on rises with many surface stones. The saucer-shaped depressions between the rises consist of alkaline, brown (AeK) duplex soils.

Map Unit: 263

Classification Code: AiK - CON

Dominant	Minor- Soils	Landform Element	Landform Pattern
		CON	

Soil Distribution:

Bald and Spring Hills, moderately inclined low cones north of Balliang East, consist of alkaline, red (AiK) duplex soils with a few surface stones.

Map Unit: 264

Classification Code: CaA,CaAI,CaAlm - HSL,TOR - LOW

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern(CaA,CaAI
CaA,CaAI,CaAlm	HdA,HbA	HSL,TOR	LOW

Soil Distribution:

The unit consists of acidic, mottled-yellow (CaA,CaAI and CaAlm) duplex soils on rolling low hills in the Mount Rothwell and Anakie Junction areas. Very rocky slopes and tors are a common feature of this unit and deep, uniform sand soils (HdA andHLLA) occur in the vicinity of the rock outcrops.

Map Unit: 265

Classification Code: CaA,CaAI,CaAlm - HSL - HIL

Co-dominant Soils	Minor Soils	Landform Element	Landform Pattern
CaA,CaAI,CaAlm	HdA,HbA	HSL	HIL

Soil Distribution:

The Yo(CaA,CaAIre very steep hills consisting almost entirely of rock outcrops. The soils that are likely to occur in this rockland are deep, uniforCaA,CaA1,CaAlmbA) on upper slopes and acidic, mottled-yellow (CaA,CaAI and CaAlm) duplex soils predCaA,CaA1,CaAlmhe lower slopHLL

Map Unit: 266

Classification Code: BaAm,BaA - HSL - RIS

Co-dominant	Minor Soils	Landform Element	Landform Pattern
BaAm,BaA	BbAm,BbA	HSL	RIS

Soil Distribution:

The unit consists of acidic, mottled-yellow duplex soils with massive (BaAm) and structured (BaA) subsoils on gently undulating rises east of Simpson. Sandy, mottled-yellow duplex soils with massive (BbAm) and structured (BbA) subsoils may also occur.

Map Unit: 267

Classification Code: HaA - FOR

Dominant Soils	Minor Soils	Landform Element	Landform Pattern
		FOR	

Soil Distribution:

The rolling foredunesRLStween Torquay and Barwon heads consist of deep, uniform sands (HaA).