Soil Conservation Authority of Victoria:

The Monolith Collection

1962-1988

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Contents

PREFACE

This report is a compilation of work done by Officers of the Soils Conservation Authority (SCA) and subsequent organisations. An explanation is given in the Introduction to this report. The officers responsible for the collection analyses and preparation of the Soil Monolith were James (Jim) Rowan, Ian Leslie and David Cummings.

The report material has been compiled or sourced by a former officer of the SCA; David Cummings. Photographs were taken for this report by a former SCA photographer; Rawdon Strahder.

The material has been edited by current or former officers of Agriculture Victoria, now part of the Department of Jobs, Precincts and Regions (DJPR). The aim being to have this collection of work made available in a published form which not only provides examples of soil types around Victoria but also an insight into the techniques used.

The editing process has been explicitly to update the soil classification expressions that can be understood both in Australia and overseas. This has meant interpretation of historical Australian soil classifications as well as the current classification.

Other additions to the material have been contextualising the profiles (Monoliths) in terms of landscape location and geology in Victoria.

1. INTRODUCTION

What is a soil monolith?

It is a vertical slice of a soil profile which has been removed in one piece and prepared to show the characteristics of the natural soil.

Each soil monolith tells a story through its physical chemical and biological features, and through observation of profile features. They are valuable for reference, for morphologic evaluation, and as teaching aid.

Why prepare a soil monolith?

People interested in soil behaviour and soil management must be concerned with soil in all its dimensions. Viewing the vertical profile of a soil is commonly used to help explain (and predict) soil behaviour.

- Observe the way a soil is “put together”
- Determine soil type
- Provide a view of the physical matrix in which soil processes operate
- Expose the range of materials for further study (laboratory analysis especially)
- Locate the distribution of biological fecundity
- View root exploration routes
- Look for idiosyncrasies (strengths and weaknesses especially)
- Illustrate specialties (such as faunal activity, pores and channels, fossils, etc.)
- Story telling

Field study (i.e. augering and digging soil pits) are valuable but preparing and studying monoliths has an elegance and permanence missed in the field study methods.

What value does a soil monolith have?

- More-or-less portable
- Probably can demonstrate more detail than field viewing
- A lot is learnt of soil characteristics in the act of extracting the prism of soil from which the monolith is prepared1
- A lot is learnt of soil behaviour in preparation
- Maintenance is minimal once prepared
- Visual impact is high
- Unexcelled for profile comparisons
- Is an art-form in its own right
- Loses some contextual links when removed from its site of origin
- The drying rate becomes well known awaiting the right moisture content for “picking down”.2
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The Soil Conservation Authority (SCA) collection

Jim Rowan and Ian Leslie had the vision and the drive to and build this collection. Their first soil monolith (from Macedon) was collected and prepared in 1962. They emulated the work of Cedric Wells of CSIRO Division of Soils in Adelaide, adapting the collection and preparation methods to suit their particular circumstances. The collection was added to steadily over the next 24 years, with most of the work done by Jim and Ian. The last monolith was sampled and prepared in 1986.

The collection has had some traumas over the past 20 years with compromised curation because of regular changes to departmental organization. Some soil monoliths have a little damage and a couple of others have gone missing (see next section).

Information on the individual monoliths (which currently comprise the “Soil Monolith Collection”) is contained in the following pages. First there is a table of all monoliths collected in the period 1962 – 1986, listed in chronological order of collection, which outlines the where, the when and the fate. Then follows details of each of the monoliths, with photograph, site details and laboratory analyses.

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[1] Deep intact cores could be used for the preparation of soil monoliths– avoiding the need for an exposed soil profile face - but they would end up being quite narrow.

[2] “Picking down” needs to be done in tandem with the rate of drying of the soil. It cannot be done in one go, nor by timetable allocation. It is a bit finicky.

2. METHOD

Preparing a soil monolith

- Select un-weathered vertical exposure of moist soil
- Determine dimension of the face of monolith wanted (e.g. 150x600mm, 150x1200mm, or 150x1800mm)
- Have a sampling and transport box (very much like a little coffin) or a metal frame on to which a backing board ca n be bolted available to suit the profile size being sampled (i.e. internal dimensions to match the above 3 alternati ves of 150x600x115mm, 150x1200x115mm, or 150x1800x115mm)
- Scribe the outline of the soil face wanted at the dimension to fit snugly in the box.
- Cut away the soil from this scribed line, slide on the box, going for a snug fit.
- Screw the front panel on box
- Detach the soil prism from the surrounding soil with careful chiselling.
- Trim the back of the soil prism, pack any spaces with soft material and screw on the back box panel.
- Transport to a well-lit workspace
- Without allowing much drying of soil prism remove back panel of box and prepare the soil face to be as planar as is possible.
- Spread glue3 on prepared mounting board, place onto planar soil face, invert, remove front panel of the box, then carefully remove rest of box from around the soil prism.
- When the glue has set, start “picking down” to near the thickness required.
- The ‘art’ of the process comes in here – the careful picking down at the best moisture content (on the drying cycl e) for exposing the inherent soil structure for each of the layers in the profile.
- When happy with the detail, and the look, let the monolith air dry.
- Then seal; using an appropriate glue in appropriate solvent.

And that’s it.

Figures 1 to 5 illustrate a couple of these steps performed by Ian Leslie and Jim Rowan in the 1960’s

[1] Deep intact cores could be used for the preparation of soil monoliths– avoiding the need for an exposed soil profile face - but they would end up being quite narrow.
[2] “Picking down” needs to be done in tandem with the rate of drying of the soil. It cannot be done in one go, nor by timetable allocation. It is a bit finicky.
[3] There is a lot of contention about the “right” glue and the right solvent. The glue and its solvent carrier need to be able to penetrate the soil voids, at a rate controllable by concentration in the carrier. The solvent further needs to be absorbed into the voids with causing damage to the natural structures.

Figure 1. Choosing the site and initial preparation. Jim Rowan upper, Ian Leslie lower.

Figure 2. Preparing a vertical face from which to harvest soil slice.

Figure 3. Preparing to insert the metal monolith holding frame.

Figure 4. Bolting the backing board to the now inserted metal holding frame.

Figure 5. After transporting of the harvested monolith back to the laboratory, "picking down" carried out following some strategic drying.

3. MONOLITH DESCRIPTIONS

There were 33 Monoliths produced over approximately 25 years to represent a range of Victorian soils (see Introduction) on a range of geologies and under different climatic conditions. A number of the originals are missing but those that have been found have been photographed to accompany any existing descriptive information. The locations of the Monoliths are shown on both Figure 1 and Figure 2, with varying degrees of accuracy depending on available information. Table 1 indicates the chronological order of Monolith production while Table 2 provides the geological background to the Monoliths.

Soil classifications are in Chronological order:

Great Soil Group (GSG); Stace et al (1968)

Principle Profile Form (PPF); Northcote (1979)

Australian Soil Classification (ASC); Isbell 2002, 2016)

World Reference Base for Soil Resources (WRB); Food and Agriculture Organisation of the United Nations (FAO), 2015.

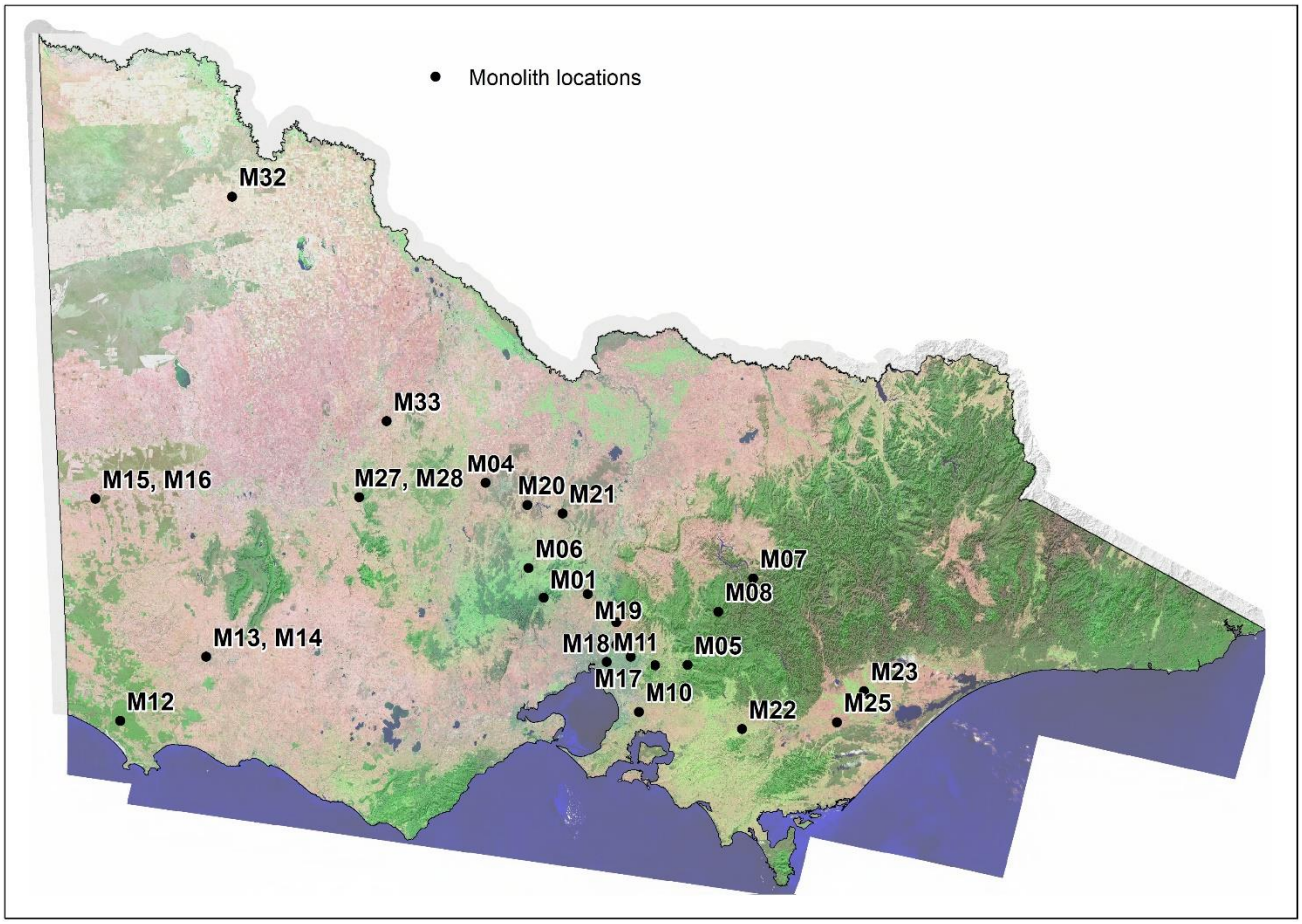


Figure 1. Locations of soil monoliths.

Table 1. The full list of soil monoliths arranged by date of collection.

Number	Location	Collection year	Status/comment
M01	Macedon	1962	
M02	Gladysdale	1963	
M03	Greensborough	1963	
M04	Marong	1963	
M05	Gladysdale	1963	
M06	Kyneton	1963	
M07	Jamieson	1964	
M08	Lake Mountain	1965	
M09	Silvan	1964	
M10	Cranbourne	1964	Missing
M11	Kew	1966	
M12	Cobbobbonee	1968	
M13	Hamilton	1968	
M14	Hamilton	1968	Allocated to PRS Hamilton
M15	Booroopki (gilgai mound)	1968	
M16	Booroopki (gilgai depression)	1968	Missing
M17	Park Orchards	1968	Allocated to Principal Research Officer (PRO)
M18	Yan Yean	1969	
M19	Darrweit Guim	1969	
M20	Eppalock	1969	
M21	Heathcote	1969	
M22	Yarragon	1979	
M23	Maffra	1979	
M24	Briagalong	1979	
M25	Rosedale	1979	
M26	Briagolong	1979	
M27	Winjallock	1985	
M28	Winjalock	1985	Missing
M29	Westgate	1985	Missing
M30	Silvan (erosional)	1986	
M31	Silvan (depositional)	1986	
M32	Kiamal	1986	
M33	Yeungroon East	1988	

Blah Blah Blah

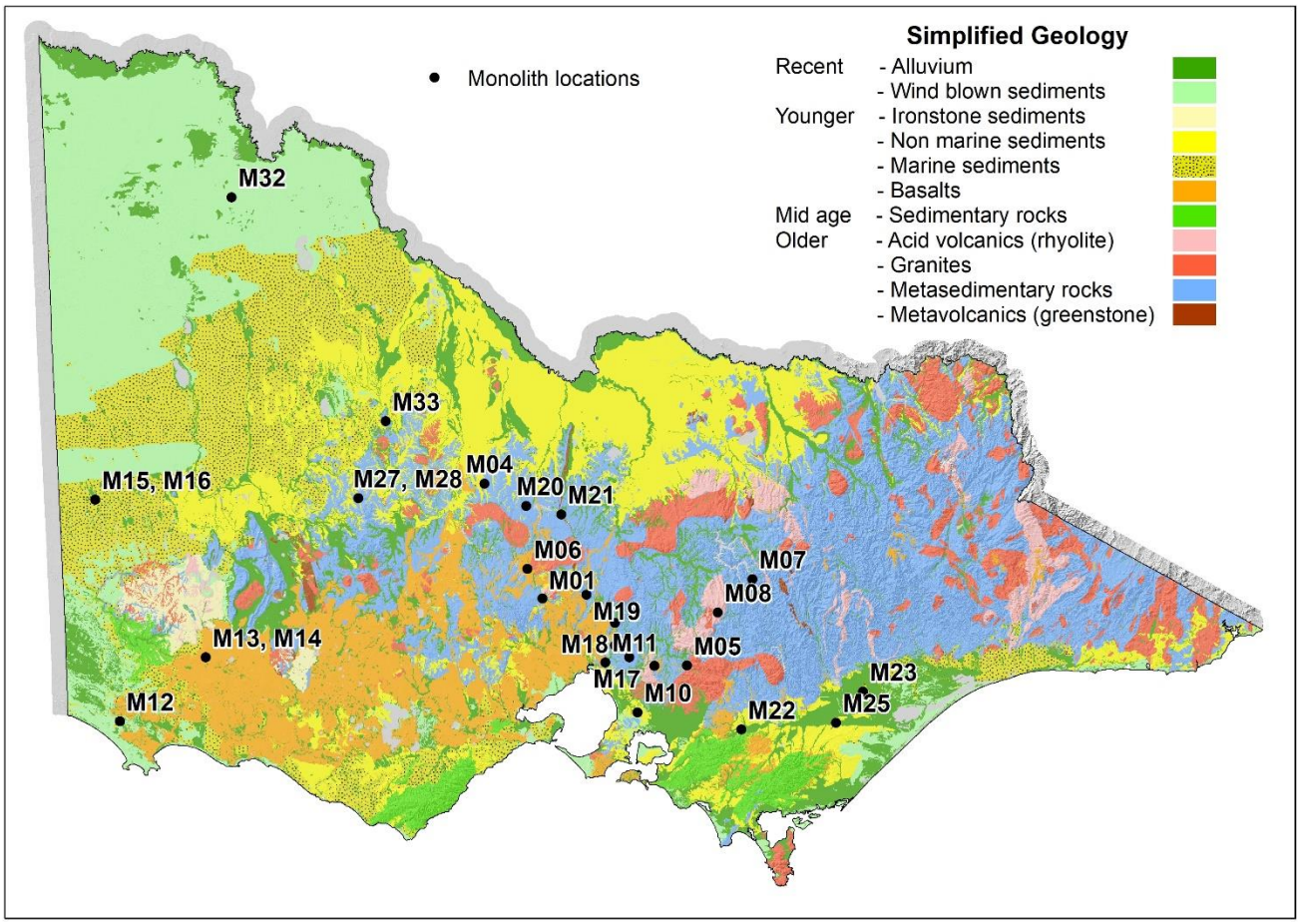


Figure 2. Soil monolith locations and geological materials (Age and Type).

Table 2. Geological Age and Geology Type

Number	Location	Geological Age	Geology Type
M01	Macedon	Devonian	Acid volcanics, colluvium
M02	Gladysdale	Silurian	Sedimentary
M03	Greensborough	Silurian	Sedimentary
M04	Marong	Quaternary	Alluvium, aeolian seds.
M05	Gladysdale	Silurian	Sedimentary
M06	Kyneton	Quaternary	Basalt
M07	Jamieson	Silurian	Sedimentary
M08	Lake Mountain	Devonian	Granodiorite
M09	Silvan	Palaeogene (Tertiary)	Basalt
M10	Cranbourne	Quaternary	Aeolian sediments
M11	Kew	Neogene (Tertiary)	Sediments
M12	Cobbobbonee	Quaternary	Basalt
M13	Hamilton	Quaternary	Basalt
M14	Hamilton	Quaternary	Basalt
M15	Booroopki (gilgai mound)	Quaternary	Basalt
M16	Booroopki (gilgai depression)	Quaternary	Basalt
M17	Park Orchards	Silurian	Sedimentary
M18	Yan Yean	Silurian	Sedimentary
M19	Darrweit Guim	Silurian, Quaternary	Sedimentary
M20	Eppalock	Ordovician	Sedimentary
M21	Heathcote	Ordovician	Sedimentary
M22	Yarragon	Quaternary	Colluvium
M23	Maffra	Quaternary	Sediments
M24	Briagalong	Quaternary	Sediments
M25	Rosedale	Quaternary	Sediments (Alluvium)
M26	Briagolong	Quaternary	Sediments
M27	Winjallock		
M28	Winjalock		
M29	Westgate	Palaeozoic, Quaternary	Metamorphics, Colluvium
M30	Silvan (erosional)	Palaeogene (Tertiary)	Basalt
M31	Silvan (depositional)	Palaeogene (Tertiary)	Basalt
M32	Kiamal	Quaternary	Aeolian sediments
M33	Yeungroon East	Quaternary	Colluvium, aeolian seds.

M01 Macedon soil monolith

Monolith missing

Location

Site description

Soil classification

	Mt Macedon
Map ref	Lancefield (1:50000) 290700E 5864400N Long. 144°36’ lat. 37°22’
Rainfall	860mm
Parent material	Dacite colluvium
Relief	Macedon Range
Site	Relatively gentle slopes
Slope	4°
Aspect	N
Elevation	790m
Native vegetation	Messmate, peppermint and mountain ash
Land use when collected	Forest
Date of collection	11 December 1962
Great soil group	Red structured earth with rough-ped fabric
PPF:Northcote	Gn4.11
ASC;Isbell	Haplic, Mesotrophic, Red Dermosol
WRB	Chromic Umbrisol /Chromic,Lixisol

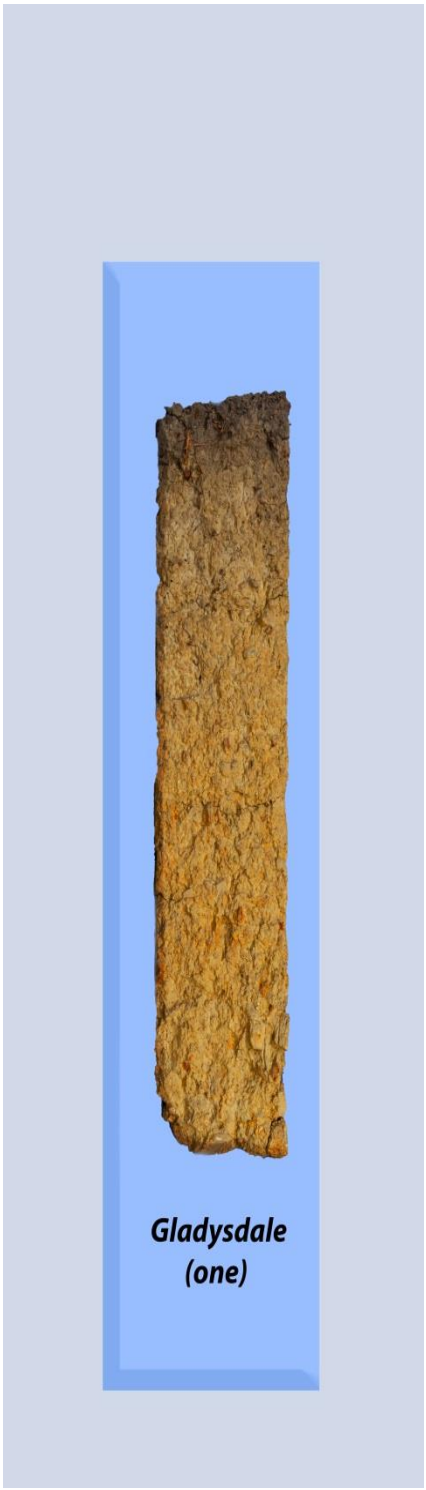
Profile Description

Horizon	Depth (mm)	Colour	Texture	Structure	Roots
A1	0 - 50	5YR3/2	loam	Strong fine crumb	++++
A2	50 - 100	5YR3/2 or 3/3	clay loam	Weak sub-angular blocky	+++
B	100 - 920	5YR4/8	light clay grading into clay	Grading from weak sub-angular blocky to strong sub-angular blocky	++

Analytical data

Horizon☞	A1	A2	B			
mm	0 - 50	50 - 100	100 - 200	200 - 300	300 – 600	600 - 900
Characteristic☞						
%gravel	Trace	Trace	Trace	Trace	5	3
Coarse sand	7	8	7	6	5	5
Fine sand	35	36	35	32	27	24
Silt	27	33	26	20	18	16
clay	18	16	35	46	53	51
pH	5.8	5.9	5.3	5.8	5.8	5.8
EC µS/cm	41	28	23	13	18	23
Organic carbon %	4.9	3.5	2.7			
Ca++me%	6.0	4.0	1.9	1.7	1.1	1.8
Ex. Bases	9.6	6.3	2.7	3.4	3.4	6.8
Ex Acidity (H+)	17.0	16.1	19.4	15.6	13.5	9.8
CEC me%	26.6	22.4	22.1	19.0	16.9	16.6
CEC (Base) saturation %	36	28	12	18	20	41

M02 Gladysdale 1 soil monolith



Location

Site description

Soil classification

Map ref	Warburton 1:250,000 sheet 366-365 Long 145°39' Lat 37°49'
Rainfall	1200 mm
Parent material	Silurian sandstone
Relief	Gentle incline
Site	Site in face of quarry
Slope	?
Aspect	?
Elevation	183m
Native vegetation	Sclerophyll forest
Land use when collected	Quarry
Date of collection	16/1/1963
Great Soil Group	Yellow podzolic
PPF:KH Northcote	Gn 3.74
ASC:RF Isbell	Mottled, Mesotrophic, Brown Dermosol
WRB;FAO	Haplic Acrisol

Profile Description

Horizon	Depth (mm)	Colour	Texture	Structure	Roots
A1	0 - 150	10YR2/2	loam	Strong crumb <5mm	+++
A2	150 - 300	10YR4/2 10YR3/2	clay loam	Weak to moderate sub angular blocky < 25mm	+
B	300 - 450	10YR/4/3 to 10YR5/4	light clay	weak sub angular blocky <40mm	
D	450 - 800	10YR5/4 2.5YR3/6	heavy clay	Moderate angular blocky < 25mm	

Analytical data

Horizon☛	A1	A2	B	D
mm	0 - 150	150 - 300	300 - 450	450 - 800
Characteristic☝				
%gravel	3	3	4	2
Coarse sand	18	18	16	8
Fine sand	29	35	36	23
Silt	23	23	23	16
clay	20	24	22	49
pH	4.8	5.3	5.8	5.9
EC µS/cm	66	29	19	21
Ca++me%	1.6	0.6	1.0	0.8
Ex Bases	3.3	0.9	3.1	6.2
Ex Ac (H+)	6.6	14.2	5.4	15.3
CEC me%	9.8	15.1	8.5	21.5
Base saturation %	33	6	36	29

M03 Greensborough soil monolith

Location	Map ref	Greensborough (Ringwood 7922 1:100 000) North side of road cutting of Eltham road 328000E 5825800N
Site description	Rainfall	600 mm
	Parent material	Silurian mudstones and sandstones
	Relief	Moderately-gently sloped
	Site	Upper east slope
	Native vegetation	Dry sclerophyll forest of red box, narrow leafed peppermint, broad leaf peppermint, long leafed box and yellow box
	Land use when collected	
	Date of collection	22 April 1963
Classification	Great Soil Group	
	PPF:KH Northcote	Dy 3.21
	ASC:RF Isbell	Mottled, Dystrophic, Brown Kurosol
	WRB	Acric Planosol

Profile Description

Horizon	Depth (mm)	Colour	Texture	Structure	Roots
A1	0 - 50	10YR3/2	fine sandy loam	Sub angular blocky	+++
A1 - A2	50 - 100	2.5YR4.5/2	fine sandy loam	Apedal	++
A2	100 - 275	10YR6/4	gritty clay loam	Weak sub angular blocky	+
B	275 - 500	7.5YR4/4	light clay	Angular blocky	
B - C	500 - 650	10YR6/4	clay	Apedal	

Analytical data

Horizon☞	A1	A1 – A2	A2	B	B - C	C
mm	0-50	50 - 100	100 - 275	275 - 500	500 – 650	➢ 650
Characteristic☞						
%gravel	-	-	-	-	-	-
Coarse sand	5	4	4	2	3	
Fine sand	47	50	43	21	25	
Silt	24	24	21	14	11	
clay	20	19	29	59	58	
pH	4.7	4.7	5.1	5.4	5.4	5.5
EC µS/cm	60	75	65	90	240	
Organic C						
Ca++me%	1.5	0.4	0.4	0.4	0.3	
Ex Bases	3.1	1.2	2.0	4.4	8.6	
Ex Ac (H+)	6.1	6.8	4.4	8.2	5.1	
CEC me%	9.2	8.0	6.4	12.6	13.9	
Base saturation %	34	15	31	35	63	

Marong soil monolith (M04)

Monolith missing

Location

Site description

Soil classification

Map ref	Bendigo 1:100000 113-725 Long. 144°04' Lat. 36°41'
Rainfall	450mm
Parent material	Widgella parna
Relief	Depositional riverine plain
Site	plain
Slope	level
Aspect	n/a
Elevation	168m
Native vegetation	Grey box and native grasses
Land use when collected	Calder Highway roadside remnants
Date of collection	20 June 1963
Great Soil Group	red-brown earth
PPF:KH Northcote	Dr 2.23
ASC:RF Isbell	Haplic, Eutrophic, Red Chromosol
WRB;FAO	Abruptic,Chromic Planosol

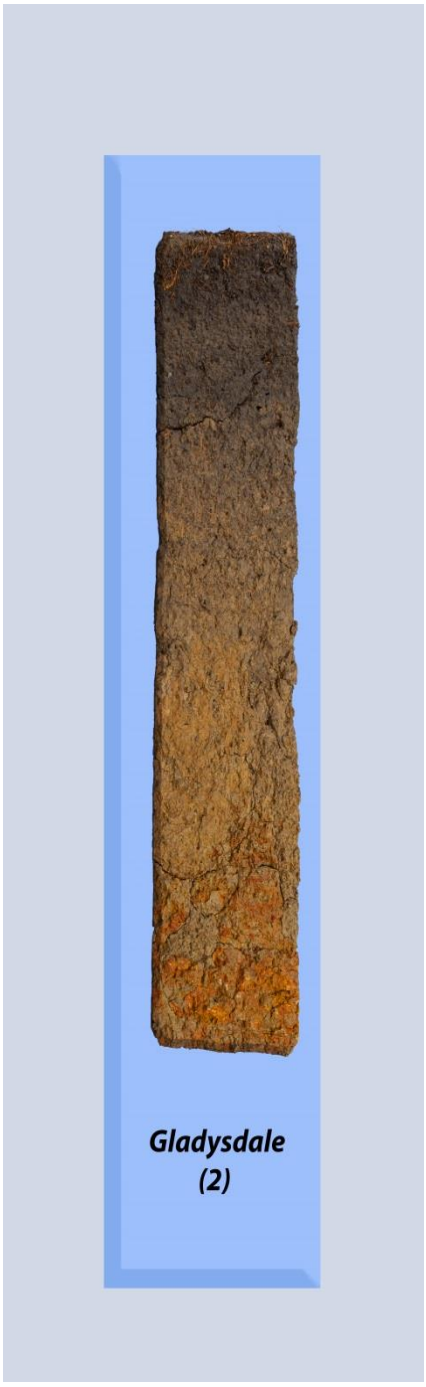
Profile Description

Horizon	Depth (mm)	Colour	Texture	Structure	Roots
A1	0 – 75	7.5YR 3/2	slightly gritty loam	Mod. sub-angular blocky 1.6 – 6 mm	+++
A2	75 - 180	5YR 4/4	gritty sandy loam	apedal	+
B1`	180 - 280	5YR 4/8 2.5YR 4/8	clay	mod. blocky 1.6 – 6 mm	+
B2	280 - 610	5YR 4/4	clay	moderate angular blocky 12.5 mm	
D	610 - 910	10YR 5/3 with clay skin mottles	light clay	weak sub-angular blocky 3 – 15 mm becoming moderate platy 3 – 6 mm	

Analytical data

Horizon☞	A1	A2	B1	B2	C
mm	0 - 75	7.5 - 180	180 - 280	280 - 610	610 - 910
Characteristic☞					
%gravel	3	2	1	1	10
Coarse sand	19	16	8	4	8
Fine sand	54	57	36	33	40
Silt	18	16	8	8	24
clay	12	9	44	52	27
pH	6	5.9	7.8	8.4	8.5
EC µS/cm	63	52	340	450	510
Organic carbon %	1.4	0.4	0.4	0.3	0.1
Ca++me%	5.6	2.0	10.0	8.6	8.5
Ex Bases	8.0	2.8	15.0	20.7	15.3
Ex Ac. (H+)	3.3	3.8	0.0	0.0	0.0
CEC me%	11.3	6.6	15.0	20.7	15.3
CEC (Base) saturation %	71	42	100	100	100

M05 Gladysdale B soil monolith



Location

Site description

Soil classification

Map ref	Warburton 367 335 Long 145°39' Lat 37°49'
Rainfall	1220mm
Parent material	Silurian mudstones and sandstones
Relief	Hilly
Site	Mid-slope
Slope	10°
Aspect	north
Elevation	200m
Native vegetation	Dry sclerophyl forest
Land use when collected	
Date of collection	19/8/1963
Great Soil Group	Leptopodsol
PPF:KH Northcote	Gn3.90
ASC:RF Isbell	Acidic-Mottled, Dystrophic, Brown Dermosol Occ. Red Dermosol
WRB;FAO	Leptic Acrisol

Profile Description

Horizon	Depth mm	Colour	Texture	Structure	Roots
A1	0 - 60	10YR3/2	gritty loam	mod. sub angular blocky 4mm	+++
A2 - B	60 - 190	2.5YR5/2	clay loam	weak sub angular blocky 2 – 12mm	+
B	190 - 360	2.5YR5/3 5YR5/3	silty light clay	moderate angular blocky 4 mm	
B	360 - 710	10YR5/6 with reddish yellow mottling	silty clay	moderate angular blocky 3 – 6 mm	
C	719 - 910	10YR6/6	decomposing sandstone	n/a	

Analytical data

Horizon☛	A1	A2 - B	B	B	C
mm	0-60	60-190	190-360	360-710	710-910
Characteristic☛					
%gravel	Trace	3	9	24	40
Coarse sand	3	1	1	3	1
Fine sand	32	28	24	22	20
Silt	38	40	35	29	31
clay	21	27	34	42	43
pH	4.6	4.8	5.1	5.5	5.5
EC µS/cm	61	38	30	26	29
Ca++me%	0.4	0.1	0.2	0.1	0.2
Ex Bases	1.5	1.0	0.9	1.6	2.1
Ex Ac (H+)	15.4	11.3	9.6	8.0	7.7
CEC me%	16.9	12.3	10.5	9.6	9.8
Base saturation %	9	8	9	17	21

M06 Kyneton soil monolith

Location

Site description

Soil classification

	3 km ESE of Kyneton
Map ref	
Rainfall	750mm
Parent material	fine alluvium from basalt
Relief	dissected plateau
Site	lower drainage line near Campaspe River
Slope	2 °
Aspect	South
Elevation	535m
Native vegetation	red gum with native grasses
Land use when collected	grazing
Date of collection	26 November 1963
Great Soil Group	Chernozem
PPF:KH Northcote	Ug 5.15
ASC:RF Isbell	(Haplic, Epipedal) Black Vertosol
WRB;FAO	Haplic Vertisol

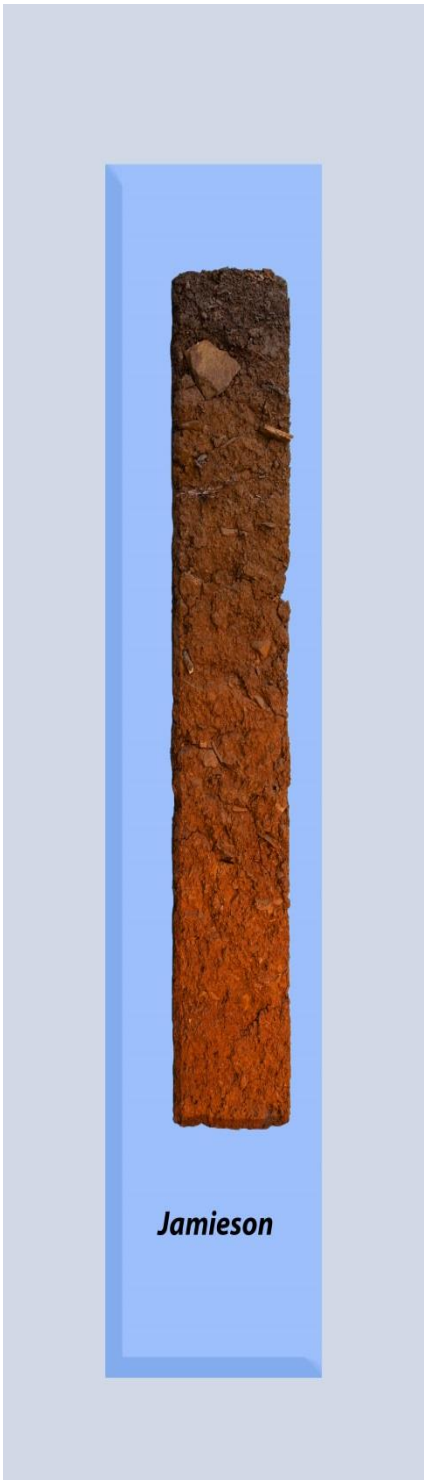
Profile Description

Horizon	Depth (mm)	Colour	Texture	Structure	Roots
A1	0-75	10YR2/1	clay	strong subangular blocky 3-6mm	++++
A-B	75-150	10YR2/1	clay	strong subangular blocky 3-12mm	++
B	150-600	7.5YR2/0 10YR2/1	clay	moderate subangular blocky 6-12mm	+
B-C	600-900		clay	weak angular blocky all sizes	

Analytical data

Horizon☞	A1	A-B	B	B-C
mm	0-75	75-150	150-600	600-900
Characteristic☞				
%gravel				
Coarse sand	5	4	3	2
Fine sand	19	16	17	22
Silt	20	18	15	16
clay	52	59	60	55
pH	6.2	6.5	7.2	8.6
EC µS/cm	110	100	99	190
Organic Carbon %	7.4	5.3	2.7	1.3
Ca++me%	31.6	34.3	31.8	27.6
Ex. Bases	52.1	58.7	59.5	54.0
Ex Ac (H+)	9.9	7.3	4.5	0
CEC me%	62	66	64	54
Base saturation %	84	89	93	100

M07 Jamieson soil monolith (M7)



Location	On Jamieson-Eildon Road. 10 miles from Jamieson River bridge
Map ref	
Site description Rainfall	1235mm
Parent material	Silurian mudstone colluvium
Relief	Steeply dissected
Site	lower slope
Slope	24°
Aspect	South west
Elevation	
Native vegetation	Wet sclerophyll forest
Land use when collected	Forest
Date of collection	04/03/1964
Soil classification Great Soil Group	Brown acid
PPF:KH Northcote	Dr4.11/ Gn4.11
ASC:RF Isbell	Melacic, Dystrophic, Red Dermosol
WRB;FAO	Chromic Acrisol

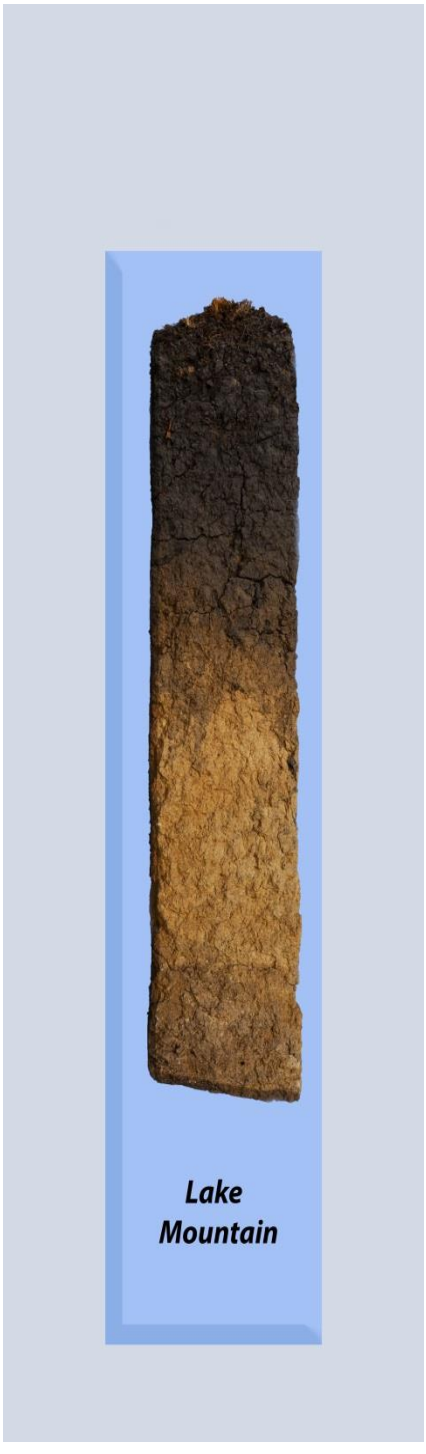
Profile Description

Horizon	Depth (mm)	Colour	Texture	Structure	Roots
A1	0 - 150	10YR2/2	organic clay loam	strong sub angular block 3 mm	+++
B1	150 - 475	7.5YR3/2	light clay	moderate sub angular blocky 2.5mm	++
B21	475 - 900	5YR4/4	light clay	weak sub angular blocky 3 mm	+
B22	900 - 1200	5YR4/6	light clay	weak sub angular blocky	

Analytical data

Horizon☞	A1	B1	B1	B21	B21	B22
mm	0 - 100	200 -300	300 - 450	450- 610	610 - 900	900 - 1200
Characteristic☞						
%gravel	21	11	10	20	20	16
Coarse sand	12	10	12	11	12	10
Fine sand	17	18	16	16	16	18
Silt	39	39	39	37	29	32
clay	26	29	29	33	40	38
pH	4.9	4.6	4.7	4.7	4.6	4.7
EC µS/cm	140	95	69	71	61	61
Organic C %	6.2	3.0	2.5	1.6	0.6	o.5
Ca++me%	4.5	0.4	0.3	0.4	0.3	0.2
Ex, Bases	8.0	1.4	1.0	1.4	1.0	1.0
Ex. Ac (H+)	18.6	21.6	19.6	18.1	11.2	13.8
CEC me%	26.6	23.0	20.6	19.5	12.2	14.8
Base saturation %	30	6	5	7	8	7

M08 Lake Mountain soil monolith (M08)



Location

Site description

Soil classification

	Marysville-Camberville Road
Map ref	
Rainfall	1500mm
Parent material	Devonian granodiorite
Relief	Plateau
Site	Near summit
Slope	
Aspect	
Elevation	
Native vegetation	Grassland
Land use when collected	Grassland being invaded by snow gums, daisies and heath
Date of collection	26/01/1965
Great Soil Group	Alpine humus soil
PPF:KH Northcote	Um 7.11 /Um 6.35 /Gn 2.21
ASC:RF Isbell	Humic, Dystrophic, Yellow Kandosol
WRB;FAO	Mollic, Acric Umbrisol

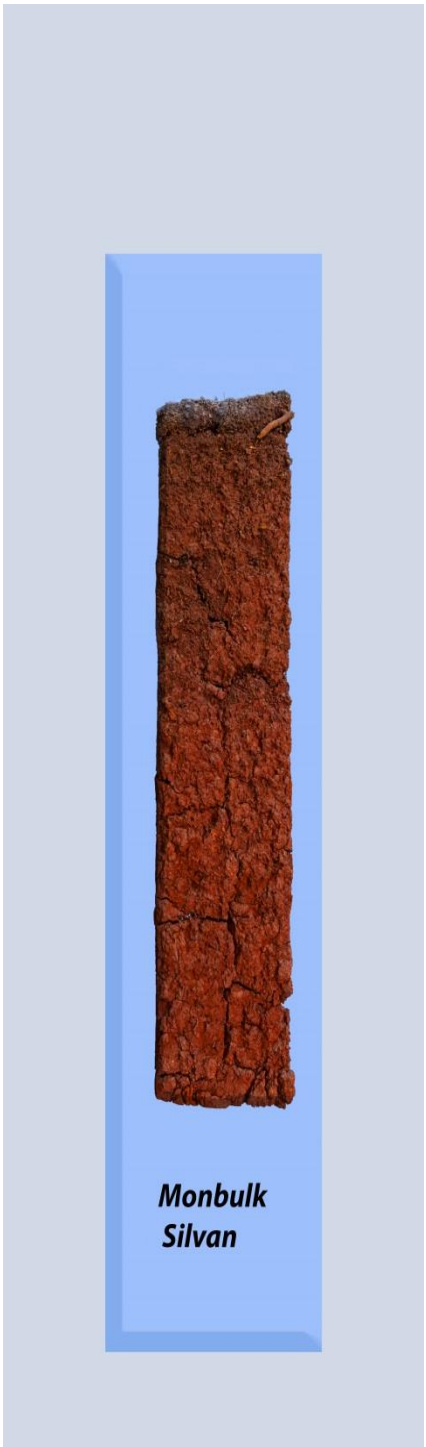
Profile Description

Horizon	Depth (mm)	Colour	Texture	Structure	Roots
A	0 - 350	10YR2.5/1	gritty loam with sand	strong subangular blocky 2.5 mm	++++
B	350 - 725	10YR6/6	gritty light clay	weak subangular blocky 3 – 6 mm	+
C	725 - 900	10YR7/6	gritty clay loam	apedal	

Analytical data

Horizon☞	A			B		C
mm	0-75	75 - 150	150-300	350-610	610-740	740-910
Characteristic☞						
%gravel	1	2	2		1	2
Coarse sand	20	17	19	20	27	30
Fine sand	38	28	38	31	37	36
Silt	22	29	28	24	18	19
clay	9	17	11	22	16	13
pH	4.9	4.7	4.9	4.7	4.7	4.8
EC µS/cm	99	190	86	82	83	54
Organic carbon %	13	10	6.1	0.9	0.3	0.2
Ca++me%	0.5	0.2	0.1	0.2	0.2	0.1
Ex. Bases	2.5	1.4	1.0	0.9	0.6	0.6
Ex. Ac (H+)	33.5	32.6	19.0	12.0	14.1	13.4
CEC me%	36	34	20	12.9	14.7	14.0
Base saturation %	7	4	5	7	4	4

M09 Silvan soil monolith (from 'undisturbed' site)



Location

Site description

Soil classification

	East side of Dandenong ranges
Map ref	3.5km towards Silvan from Monbulk then turn right (and left) 0.5km
Rainfall	1150mm
Parent material	Older basalt
Relief	Hilly
Site	Mid slope
Slope	6 degrees
Aspect	NE
Elevation	230m
Native vegetation	Dry sclerophyll forest
Land use when collected	Forest
Date of collection	19 May 1964
Great Soil Group	Krasnozem.
PPF:KH Northcote	Gn4.11/Dr2.1
ASC:RF Isbell	Haplic, Dystrophic/Mesotrophic, Red Ferrosol
WRB;FAO	Rhodic Lixisol

Profile Description

Horizon	Depth (mm)	Colour	Texture	Structure	Roots
A1	0 – 40	10YR2/2	loam	strong 1.5mm crumb	++++
A-B	40 – 80	5YR3/4	clay	strong 1.5mm subangular blocky.	+++
B	80 - 380	2.5YR3/4	clay	moderate 3mm subangular blocky.	+
B	380 – 900+	2.5YR3/6	clay	weak 6-12mm angular blocky.	

Analytical data

Horizon☞	A1	A-B	B	B	B	B	B
mm	0-40	40-80	80-150	150-300	300-380	380-600	600-900
Characteristic☞							
Gravel %	23	10	6	0	0	0	0
Coarse sand %	10	8	4	2	2	2	1
Fine sand %	39	26	19	17	15	15	14
Silt %	27	35	30	25	21	22	18
Clay %	14	29	46	54	63	62	68
pH	7.6	7.3	6.3	5.7	5.7	5.7	5.6
EC µS/cm	320	180	90	64	41	38	41
Organic Carbon %	7.9	4.3	2.9	1.9	1.1	0.9	0.6
Ca++me%	29.6	16.1	8.3	3.2	2.2	2.9	2.3
Ex. Bases	34.8	20.0	11.2	5.6	5.9	5.2	4.6
Ex Ac (H+)	0	0	9.1	7.2	8.2	7.8	10.3
CEC me%	34.8	20.0	20.3	12.8	14.1	13.0	14.9
Base saturation%	100	100	55	44	42	40	31

Cranbourne soil monolith (M10)

Monolith missing

Location

Site description

Soil description

Map ref	Cranbourne Military Map 037333 In sand pit 45m from Thompsons Road (south side) 351800 578300
Rainfall	850mm
Parent material	Pliocene/Pliestocene sands. Coastal dunjes
Relief	Undulating
Site	Crest
Slope	o
Aspect	n/a
Elevation	52m
Native vegetation	Shrub based woodland
Land use when collected	Sand pit
Date of collection	29 September 1964
Great Soil Group	Podsol
PPF:KH N orthcote	Uc 4.22 / 4.32
ASC:RF Isbell	Aeric Podsol
WRB;FAO	Ortsteinic, Albic Podzol

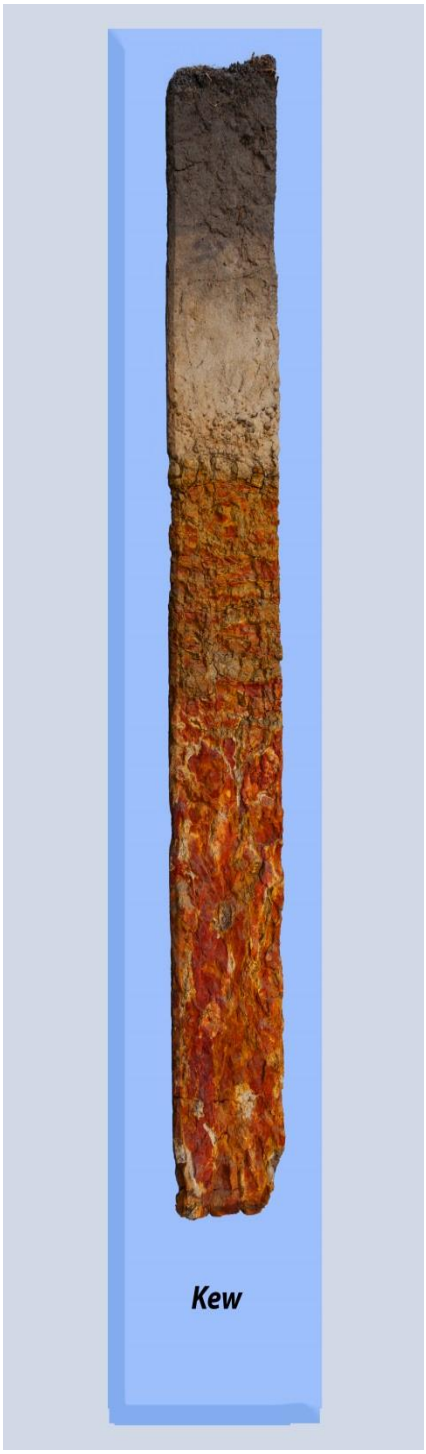
Profile Description

Horizon	Depth (mm)	Colour	Texture	Structure	Roots
A1	0 - 400	5YR 4/1 with mottles	Sand	Weak sub-angular blocky to 75m m . Apedal below	+++
A2	400 -= 1400	2.5YR 5/2	Sand	Apedal	+
B	1400 - 1625	10/YR 4/3	Sand	Apedal	+
BFe	1625 -1800	10YR 4/4	Sand	Apedal	+

Analytical data

Horizon☞	A1	A2	B	BFe
mm	0 - 400	400 - 1400	1400 - 1625	1625 - 1800
Characteristic☞				
Gravel %	0	0	0	0
Coarse sand	67	64	62	52
Fine sand	30	34	31	44
Silt	1	1	1	1
Clay	2	1	5	2
pH	5.2	4.5	4.8	5.4
EC µS/cm	71	53	56	64
Organic C %	0.5	0.1	0.4	0.2
Ca++me%	1.3	0.2	0.7	0.4
CEC me%	2.5	<1	3.3	0.7
CEC saturation %	n/a	n/a	n/a	n/a

M11 Kew soil monolith



Location

Site description

Soil classification

	Near corner of Cotham and Burke Roads
Grid ref	329160E 5813430S
Rainfall	700mm
Parent material	Tertiary sediments
Relief	Gently undulating
Site	upper slope
Slope	1°
Aspect	east
Elevation	
Native vegetation	
Land use when collected	Building site
Date of collection	22/03/1966
Great Soil Group	Podzolic
PPF:KH Northcote	Dy3.41
ASC:RF Isbell	Bleached-Mottled, Eutrophic, Brown Chromosol
WRB;FAO	Albic, Lixic Planosol

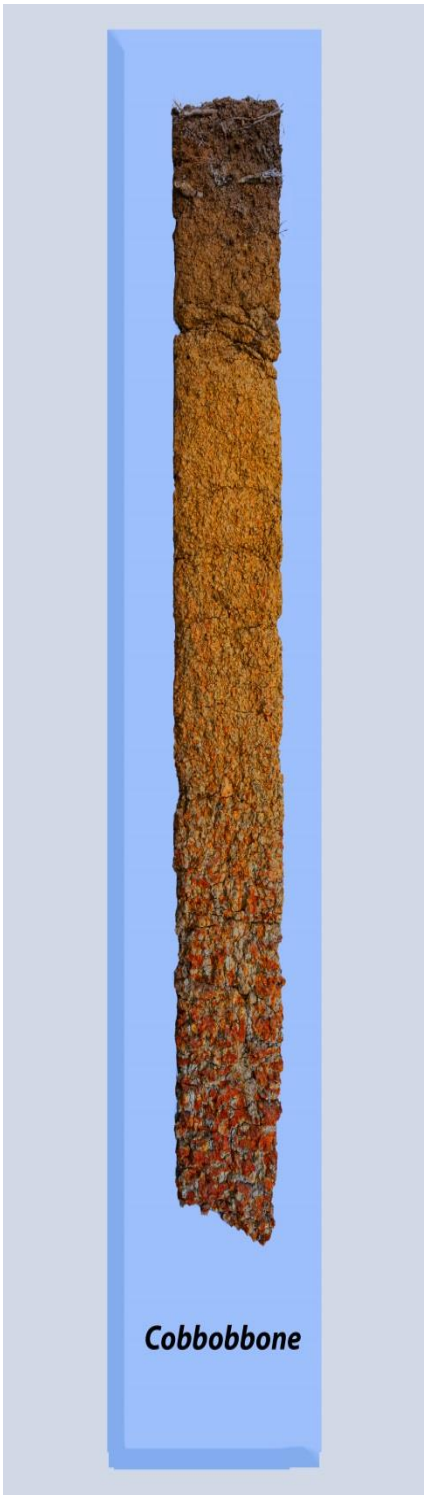
Profile Description

Horizon	Depth (mm)	Colour	Texture	Structure	Roots
A1	0 - 250	10YR3/2 – 10YR4/2	sandy loam	fine sub angular blocky	
A2	250 - 650	5Y6/3	loamy sand	apedal	
B	650 - 900	2.5Y4/2 with some 7.5YR5/6	clay	strong angular blocky	
D	900 - 1500	2.5YR4/8 with 10YR6/8	clayey sand	apedal	

Analytical data

Horizon☞	A1	A2	B	D
mm	80 - 150	300 - 460	760 - 910	940 - 1220
Characteristic☞				
%gravel	1	3	0	0
Coarse sand	52	53	18	53
Fine sand	32	32	9	21
Silt	6	6	3	0
clay	7	4	57	25
pH	5.5	5.5	6.0	5.6
EC µS/cm	72	26	83	61
Organic carbon %	1.2	0.2	0.3	0.1
Ca++me%	2.7	0.7	2.5	0.7
Ex. Bases	3.7	1.1	10.3	3.4
Ex. Ac (H+)	3.1	1.3	3.3	1.5
CEC me%	6.8	2.4	13.6	4.9
Base saturation %	54	45	76	70

M12 Cobbobbonee soil monolith



Location

Site description

Soil description

Map ref	38°0" south 141°21'east 531300E 5782700S
Rainfall	900mm
Parent material	Basalt
Relief	Flat-undulating plain
Site	Flat
Slope	v low
Aspect	n/a
Elevation	116m
Native vegetation	forest messmate
Land use when collected	forest
Date of collection	2 /10/1968
Great Soil Group	Brown Podzolic (Type A! p338)
PPF:KH Northcote	Yellow duplex Dy3.61
ASC:RF Isbell	Mottled, ?, Brown Kurosol
WRB;FAO	Acric Planosol / Abruptic Acrisol
	Collected for the ISS 9th Congress

Profile Description

Horizon	Depth (mm)	Colour	Texture	Structure	Roots
A	0 - 100	10YR3/2	Organic loam	Fine crumb to subangular blocky	Many
	100 - 200	10YR3/4-4/4	gravelly clay loam	Fine crumb to subangular blocky	Many
A2	200 - 300	7.5YR-10YR4/4	gravelly clay loam	Medium angular blocky	Many
B1	300 - 900	10YR5/6, 7.5YR4/6	gravelly medium cla y	Wek blocky	
B2	900 - 1400	10YR5/6, 10YR6/3, 5YR4/8	gravelly medium cla y	Weak blocky	(Very) Few
	1400 - 1600	5YR4/8, 7.5YR5/6 ,10YR6/2	Gravelly heavy clay	Weak angular blocky	Very few

Analytical data

Horizon☞	**A11**	**A12**	**A2**	**B1**	**B2**	**B3**
mm	0-100	100-200	200-300	300 - 900	900 - 1400	1400 -1600
Characteristic☞						
Gravel %	21	32	29	30	20	20
Coarse sand	14	14	10	5	5	7
Fine sand	39	37	34	18	12	15
Silt	26	20	17	10	7	6
clay	15	25	37	65	75	69
pHw	**6.0**	**5.2**	**5.0**	**4.8**	**5.3**	**4.7**
EC µS/cm	140	86	71	63	115	76
Organic C %	3.2	1.9	1.3	0.5		
Initial Information missing; see Stace p338; profile 34A for chemistry below						
pHw	**5.5**	**5.1**	**5.2**	**5.5**	**5.7**	**5.5**
Ca++me%	8.2	0.9	1.2	1.5	1.7	1.5
Ex. Bases	12.7	3.0	4.4	7.4	9.3	8.2
Ex Ac. me%	7.3	6.4	6.1	4.8	2.3	1.8
CEC me%	21	9.4	10.5	12.2	11.6	10
Base saturation %	60.5	31.9	41.9	60.7	71.6	82.0

M13 Hamilton soil monolith

Location

Site description

Soil classification

Map ref	Hamilton 504-334 Long. 142°05' Lat 37°50'
Rainfall	710mm
Parent material	Basalt
Relief	Undulating
Site	Knoll
Slope	
Aspect	
Elevation	215m
Native vegetation	Dry sclerophyll
Land use when collected	
Date of collection	3/10/1968
Great Soil Group	Red-Brown Earth
PPF:KH Northcote	Red duplex; Dr2.42
ASC:RF Isbell	Haplic, Eutrophic, Red Chromosol
WRB;FAO	Abruptic, Chromic Lixisol

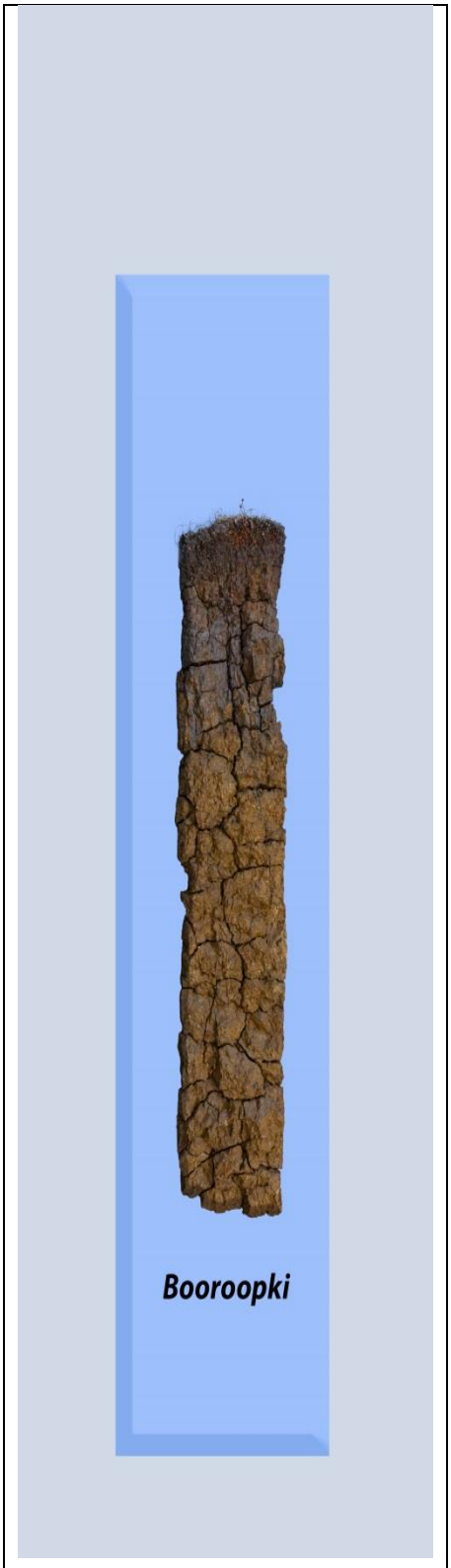
Profile Description

Horizon	Depth (mm)	Colour	Texture	Structure	Roots
A11	0 - 100	5YR3/2	gravelly loam	strong crumb	+++
A12	100 - 350	5YR4/3	gravelly loam	weak sub angular blocky 6mm	++
B	330 - 1100	5YR4/8 5YR5/4	clay	strong angular blocky 3mm	+
D clay	1100 +-	7YR5/6 10YR6/8 10YR5/2	clay	strong angular blocky 18mm	
D basalt	1100 +	10R3/6 10R4/6	-	apedal	

Analytical data

Horizon☞	A1	A	B	D (basalt layer)	D (clay layer)
mm	0-100	100-330	330-1100	1100+	1100+
Characteristic☞					
%gravel	51	55	20	80	5
Coarse sand	19	17	7	17	2
Fine sand	34	34	18	39	17
Silt	26	23	14	22	10
clay	17	26	61	23	68
pH	4.9	5.2	5.8	5.5	5.6
EC µS/cm	200	75	115	160	190
Organic C %	6.0	1.0	0.9	negligible	
Ca++me%	8.7	4.6	6.9	1.2	2.5
CEC me%	25.5	11.0	20	9	16
Base saturation %					

M15 Booroopki (gilgai mound) soil monolith (M15)



Location

Site description

Soil classification

	Booroopki
Map ref	Approx 520600E 5929500S
Rainfall	575mm
Parent material	Basalt
Relief	Plains (gilgai mound)
Site	
Slope	
Aspect	
Elevation	
Native vegetation	Tussock grassland
Land use when collected	
Date of collection	28/11/1968
Great Soil Group	Yellow brown sodic clay
PPF:KH Northcote	Ug 6.6
ASC:RF Isbell	Endohypersodic, Epipedal, Brown Vertosol
WRB;FAO	Sodic Vertisol

Profile Description

Horizon	Depth (mm)	Colour	Texture	Structure	Roots
A	0-80	10YR4/3	gravelly clay	strong sub angular blocky 2-4 mm	++++
B	80-300	mottled 10YR5/8 & 7.5YR5/8 & 10YR4/1	heavy clay	Moderate sub angular blocky 12-25mm	++
B	300-400 400-1000	2.5Y5/4	heavy clay	Weak coarse angular blocky with notable slickenslides in otherwise earthy matrix	+

Analytical data

Horizon☞	A		B			
mm	0-80	80-200	200-300	300-400	400-500	500-1000
Characteristic☞						
%gravel	54	7	2	8	18	8
Coarse sand	12	4	2	2	2	2
Fine sand	38	18	14	13	14	14
Silt	18	10	8	7	6	7
clay	31	69	77	76	74	76
pH	5.2	5.7	7.2	7.7	7.9	8.0
EC µS/cm	85	86	180	380	430	840
Organic carbon %	2.7	1.1	0.51	0.37	0.31	0.22
Ca++me%	5.8	10.5	16.6	35.7	30.5	28.0
Ex. Bases	11.7	25.5	32.0	33.1	32.4	31.0
Ex. Ac (H+)	4.3	3.5	0	0	0	0
CEC me%	16.0	29.0	32.0	33.1	32.4	31.0
Base saturation %	73	88	100	100	100	100

Booroopki (gilgai depression) soil monolith (M16)

Location

Site description

Soil classification

	Booroopki
Map ref	
Rainfall	575mm
Parent material	Basalt
Relief	Plains (gilgai depression)
Site	
Slope	
Aspect	
Elevation	
Native vegetation	Tussock grassland
Land use when collected	
Date of collection	28 October1968
Great Soil Group	Solonetz
PPF:KH N orthcote	Grey brown sodic duplex Dy3.22
ASC:RF Isbell	Eutrophic, Mesonatric, Brown Sodosol
WRB;FAO	Abruptic, Stagnic Solonetz

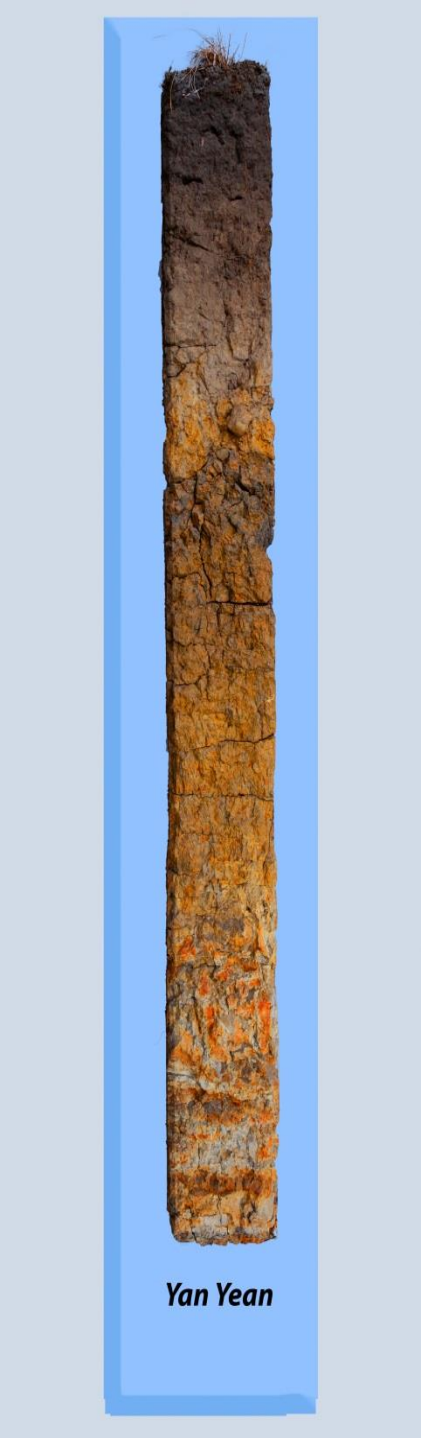
Profile Description

Horizon	Depth (mm)	Colour	Texture	Structure	Roots
A1	0 - 90	10YR 4/2	Clay loam	Mod sub-angular blocky 3mm	+++
A2	90 - 240	10YR 5/3	Fine sandy cla y loam	Apedal	++
A2	240 - 600	10YR 5/3 with m ottles and chann els	Light clay	Apedal	+
B	600 - 1000	10YR 5/2 with 7. 5YR6/6	Heavy clay	weak angular blocky 25mm	+

Analytical data

Horizon☞	A1	A2	A2	B
mm	0 - 100	100 - 200	200 - 500	500 - 1000
Characteristic☞				
%gravel	14	18	17	6
Coarse sand	6	4	7	3
Fine sand	45	40	39	20
Silt	25	29	22	10
clay	24	29	35	69
pH	4.8	4.8	5.3	6.9
EC µS/cm	110	50	71	473
Organic carbon %	2.2	0.94	0.63	0.42
Ca++me%	3.8	2.2	3.9	8.3
Ex.Bases	7,1	5.8	9.8	25.6
Ex.Ac (H+)	3,6	3.1	2.6	1.1
CEC me%	10.7	8.9	12.4	26.7
Base saturation %	66	65	79	96

M18 Yan Yean soil monolith



Location

Site description

Soil classification

	¼ mile east of Paynes Dam
Map ref	On Yan Yean 1: 63,360 map 325000 5847400
Rainfall	670 mm
Parent material	Silurian sandstone
Relief	Undulating ridges
Site	Lower slope
Slope	10°
Aspect	South
Elevation	
Native vegetation	Dry sclerophyll forest/woodland
Land use when collected	
Date of collection	24 April 1969
Great Soil Group	Solodic
PPF:KH Northcote	Dy3.12- Dy3.32
ASC:RF Isbell	Bleached-Sodic, Eutrophic, Brown Chromosol
WRB:FAO	Lixic,(Albic), Eutric Planosol

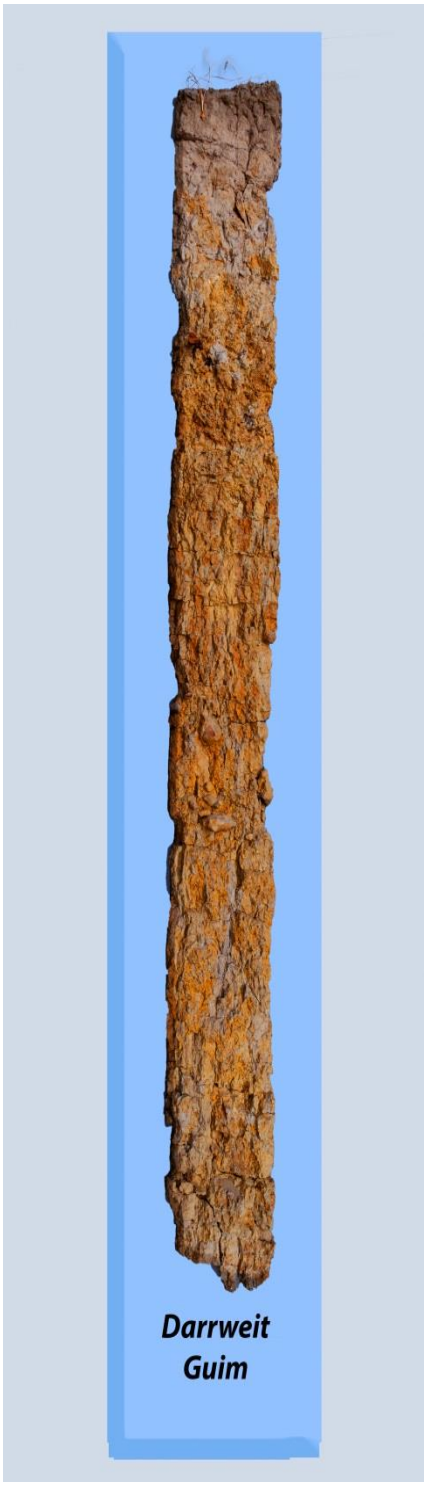
Profile Description

Horizon	Depth (mm)	Colour	Texture	Structure	Roots
A1	0-160	10YR3/2	loam	strong sub angular blocky 2mm	++++
A	160-600	10YR 4/2-6/3 with some mot tling in lower parts	clay loam	weak sub angular blocky grading into apedal	++
B	600-1230	10YR5/6 – 5/4 with mottling	clay	coarse angular blocky 10 – 60 mm	
C	1230-1800	mottled	n/a	n/a	

Analytical data

Horizon☞	A1	A	B	C
mm	0-160	160-600	600-1230	1230-1800
Characteristic☞				
%gravel	2	1	1	
Coarse sand	2	2	1	
Fine sand	64	66	30	
Silt	13	13	3	
clay	16	19	63	
pH	4.4	5.3	6.6	7.4
EC µS/cm	42	63	353	220
Organic carbon %	2.5	0.5	0.7	
Ca++me%	3.8	1.0	1.8	1.4
Ex. Bases	5.9	3.4	18.3	12.6
Ex. Ac (H+)	5.8	1.6	1.8	0
CEC me%	11.7	4.0	20.1	12.6
Base saturation %	50	61	90	100

M19 Darraweit Guim soil monolith



Location

Site description

Soil classification

Map ref	Lancefield 1:63360 Reference: 9355848
Rainfall	650 mm
Parent material	Silurian sandstone, alluvial deposits
Relief	Gentle slopes
Site	Lower slope
Slope	3°
Aspect	North
Elevation	300m
Native vegetation	Dry sclerophyll forest
Land use when collected	Grassland
Date of collection	8/10/1969
Great Soil Group	Alluvial soil
PPF:KH Northcote	Dy3.41
ASC:RF Isbell	Bleached-Mottled, Eutrophic, Brown Chromosol
WRB:FAO	Albic,Lixic Planosol

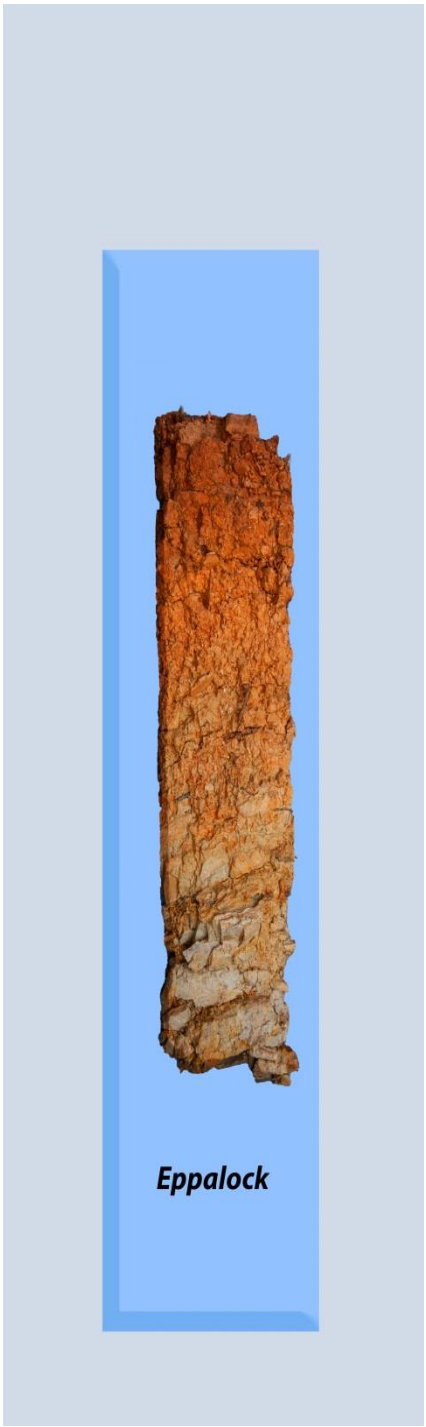
Profile Description

Horizon	Depth (mm)	Colour	Texture	Structure	Roots
A1	0 - 100	10YR4/3	Fine sandy loam	apedal	++
A21	100 - 200	10YR6/2	Fine sandy loam	apedal	+
A22	200 - 300	10YR6/3	Fine sandy loam	apedal	+
B	300 - 600	10YR5/4 10YR6/4	clay	moderate angular blocky 5 – 30 mm	
B - C	600 - 1200	10YR6/6 10YR4/2	clay loam	weak columnar 50mm	
D	1400 - 1800	10YR5/3	heavy clay	moderate columnar 50mm with coarse angular blocky	

Analytical data

Horizon☛	A1	A21	A22	B	B - C	D
mm	0-100	100-200	200-300	300-600	600-1200	1200-1800
Characteristic☞						
%gravel					6	16
Coarse sand	5	2	2	2	2	2
Fine sand	56	55	56	36	42	34
Silt	27	27	24	15	14	12
clay	10	13	17	44	40	52
pH	4.9	5.2	5.3	5.7	6.2	6.2
EC µS/cm	35	35	55	270	760	1150
Organic C %	0.7	0.2	0.1	0.2		
Ca++me%	1.0	0.6	0.5	0.8	0.7	0.9
Ex. Bases	1.3	1.6	2.2	9.9	12.0	12.9
Ex. Ac (H+)	2.7	1.8	1.4	2.5	0.4	1.1
CEC me%	4.0	3.4	3.6	12.4	12.1	14.0
Base saturation %	33	47	60	80	97	92

M20 Eppalock soil monolith



Location

Site description

Soil classification

	Eppalock
Map ref	7724:
Rainfall	550 mm
Parent material	Ordovician sandstone/mudstone
Relief	Rolling hills
Site	Crest
Slope	
Aspect	
Elevation	
Native vegetation	Grey box woodland
Land use when collected	
Date of collection	2/10/1968
Great Soil Group	Structured earth
PPF:KH Northcote	Gn3.31
ASC:RF Isbell	Sodic, Magnesic, Brown Dermosol
WRB;FAO	Leptic,Luvisol

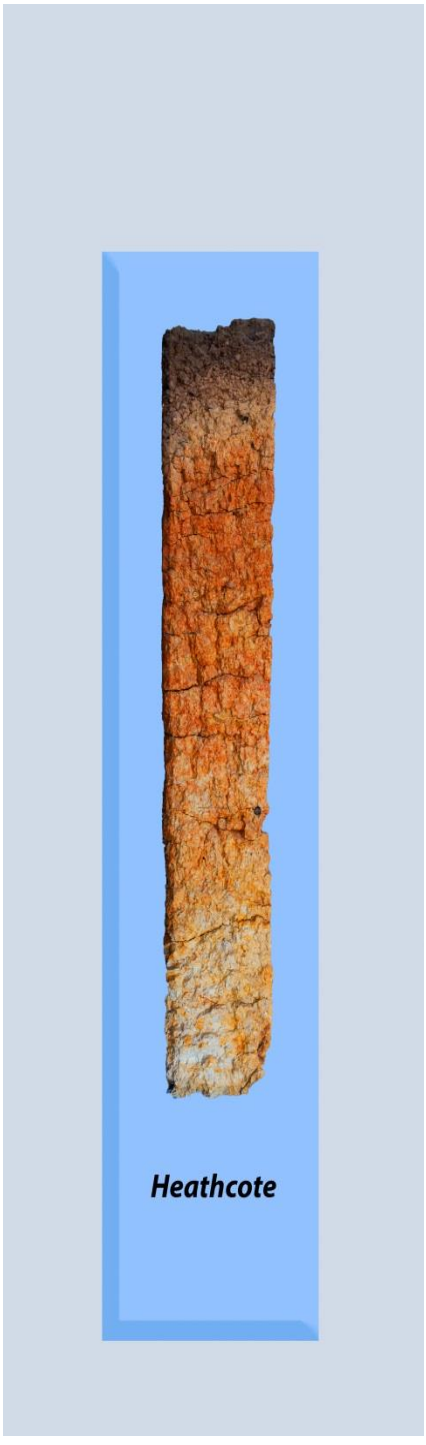
Profile Description

Horizon	Depth (mm)	Colour	Texture	Structure	Roots
A1	0 - 100		gravelly loam		
A2	100 - 170		gravelly clay loam		
B	170 - 400		heavy clay	Information missing	
B - C	400 - 800		clay		
C	800 - 1100		rock		

Analytical data

Horizon	A1	A2	B	B - C	C
mm	0-100	100-170	170-400	400-800	800-1100
Characteristic					
%gravel					
Coarse sand	16	7	1	1	
Fine sand	47	50	21	21	
Silt	19	21	14	20	
clay	18	20	64	58	
pH	4.6	4.9	5.3	5.8	7.2
EC µS/cm	84	110	380	670	640
Organic Carbon%	3.7	1.2	0.6		
Ca++me%	1.0	0.3	0.6	0.5	
Ex. Bases	4.1	3.0	8.7	10.7	
Ex. Ac (H+)	8.1	3.3	4.7	1.3	
CEC me%	12.2	6.3	13.4	12.0	
Base saturation %	34	47	65	89	

M21 Heathcote soil monolith



Location

Site description

Soil classification

	Heathcote
Map ref	
Rainfall	680 mm
Parent material	Ordovician slate and sandstone
Relief	Undulating
Site	Ridge; upper slopes
Slope	
Aspect	
Elevation	
Native vegetation	Open forest, Box-Ironbark
Land use when collected	
Date of collection	26/7/79
Great Soil Group	Solodic
PPF:KH Northcote	Reddish yellow gradational: Gn3.14
ASC:RF Isbell	Bleached-Mottled, Magnesic, Red Dermosol
WRB; FAO	Leptic, Chromic Luvisol

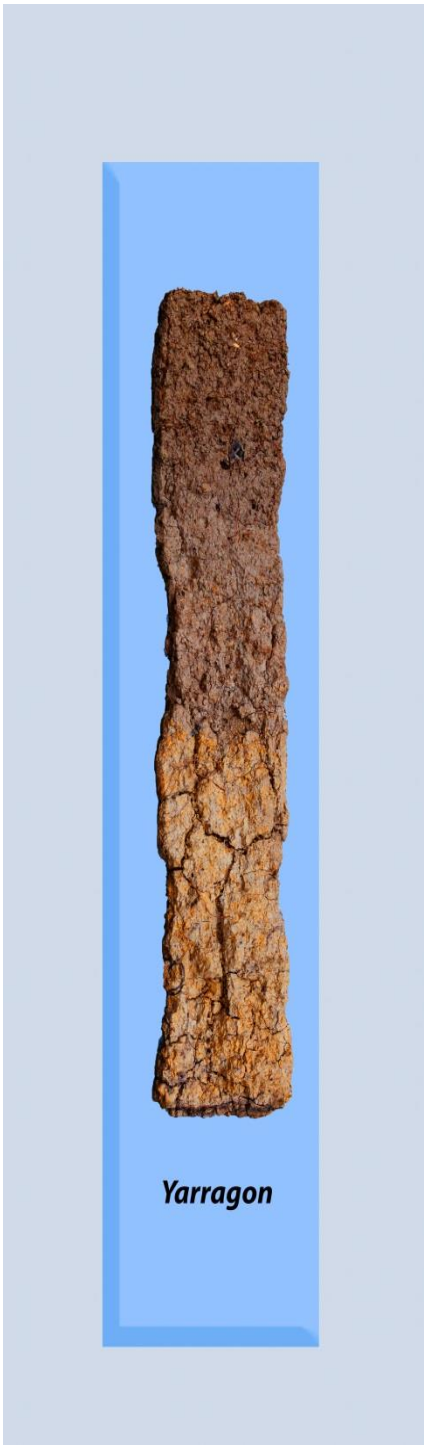
Profile Description

Horizon	Depth (mm)	Colour	Texture	Structure	Roots
A1	0 - 150		gravelly clay loam	n/a	
B	150 - 450		gravelly clay	n/a	
C	450 +		rock	n/a	

Analytical data

Horizon☛	A1	A - B	B	B - C	C	C
mm	0 - 100	100 - 200	200 - 300	400 - 500	600 - 700	900 - 1000
Characteristic☝						
%gravel	9	27	38	42	77	91
Coarse sand	17	15	10	5		
Fine sand	33	27	28	18		
Silt	27	25	32	32		
clay	20	30	30	45		
pH	4.8	5.0	5.3	5.9	6.2	6.7
EC µS/cm	26	24	22	29	37	33
Organic C %	2.0	1.1				
Ca++me%	1.3	0.09	0.06	0.05		
Ex. Bases	3.4	2.5	4.2	9.5		
Ex. Ac (H+)	6.7	6.9	4.5	1.8		
CEC me%	10.1	9.4	8.7	11.3		
Base saturation %	34	27	48	84		

M22 Yarragon soil monolith



Location

Site description

Soil classification

	1 km SE of Yarragon
Map ref	Moe 812; 41800E 57669600S
Rainfall	
Parent material	Pleistocene-Holocene fine-textured colluvium
Relief	Colluvial apron
Site	
Slope	1%
Aspect	
Elevation	100 m
Native vegetation	
Land use when collected	Introduced grasses with scattered E. ovata and Acacia melanoxoylon
Date of collection	
Great Soil Group	Wiesenboden
PPF:KH Northcote	Gn4.51
ASC:RF Isbell	Eutrophic, Grey Dermosol/ Hydrosol
WRB;FAO	Stagnosol,

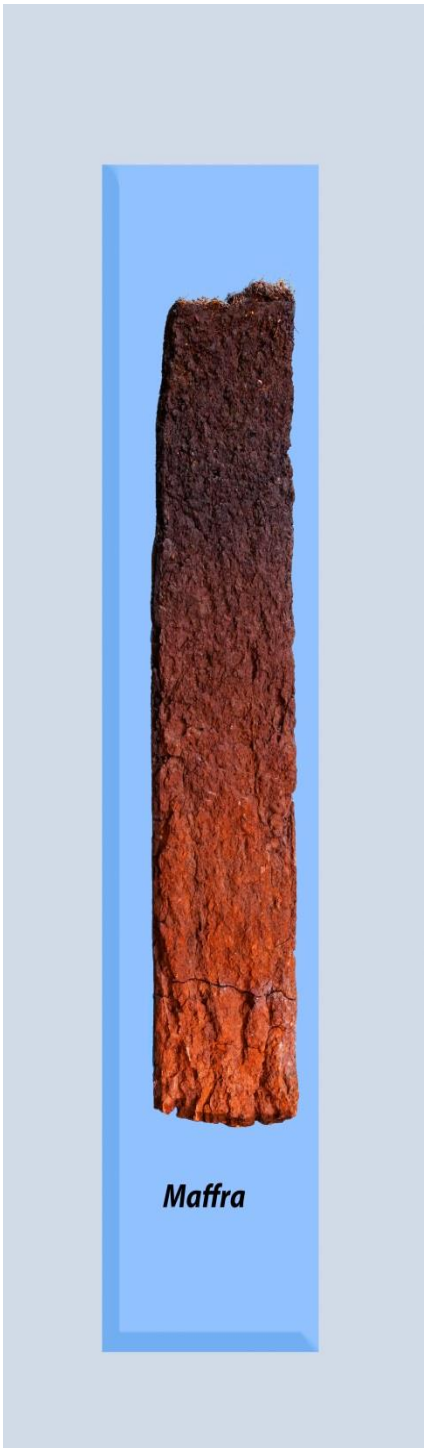
Profile Description

Horizon	Depth (mm)	Colour	Texture	Structure	Roots
A11	0-80	10YR3/2	clay loam	subangular blocky 5mm	+++
A12	80-300	10YR4/2	light clay	subangular blocky 8mm	+++
B21	300-780	10YR4/2	medium clay	angular blocky 20mm	=
B22	780-1440	10YR5/3 with mottles	heavy clay	angular blocky 30mm	
C	1440-1800	10YR6/3 with mottles	clay	apedal	

Analytical data

Horizon☞	A11	A12	B21	B22	C
mm	0-80	80-300	300-780	780-1440	1440-1800
Characteristic☞					
%gravel	14	2	2	2	14
Coarse sand	15	3	5	3	7
Fine sand	32	38	31	29	48
Silt	22	30	26	23	223
Clay	26	30	37	45	24
pH	5.5	5.7	5.8	5.6	5.4
EC µS/cm	92	50	39	50	100
Organic carbon %	3.2	1.8			
Ca++me%	5.0	4.6	5.6	9.2	8.8
Ex Ac (H+)	12.8	12.8	12.0	14.8	9.6
CEC me%	22.8	21.7	23.8	36.4	29.3
Base saturation %	43.9	41.0	49.6	59.2	67.2

M23 Maffra soil monolith



Location

Site description

Soil classification

	Maffra
Map ref	
Rainfall	572mm
Parent material	Cainozoic clays
Relief	Plain
Site	Fluviatile
Slope	Flat
Aspect	n/a
Elevation	
Native vegetation	Open red gum forest
Land use when collected	
Date of collection	18/7/1979
Great Soil Group	
PPF:KH Northcote	Uniform Uf6.11
ASC:RF Isbell	Haplic, Eutrophic, Red Dermosol
WRB;FAO	Rhodic/Chromic Luvisol

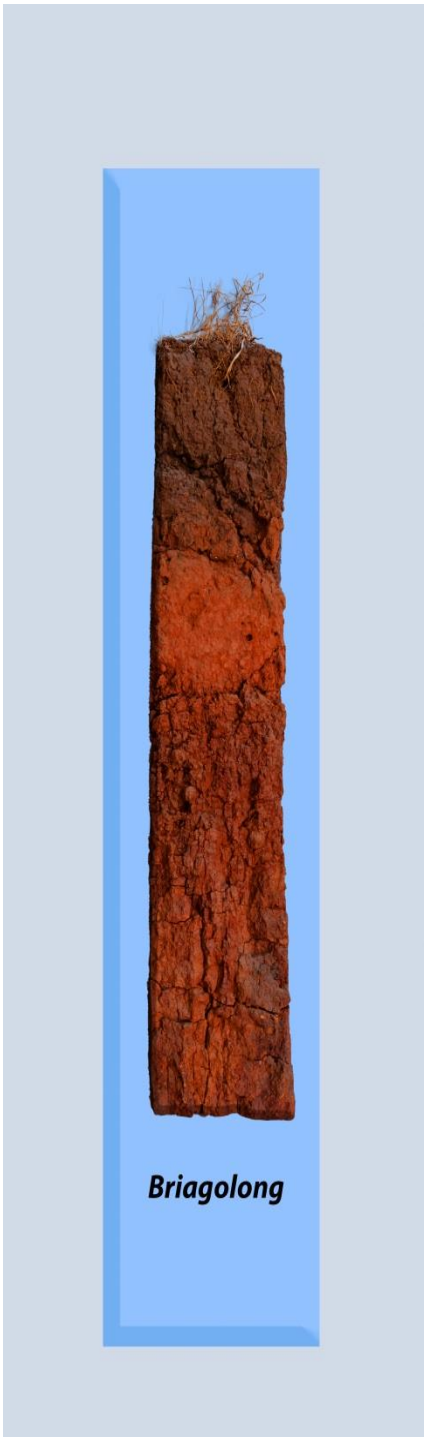
Profile Description

Horizon	Depth (mm)	Colour	Texture	Structure	Roots
A1	0 - 200		light clay		
B1	200 - 350		medium clay		
C1	350 - 900		sandy clay	Information missing	
C2	900 - 1500		light sandy clay		
C3	1500 - 1800		sandy loam		

Analytical data

Horizon☞	A1	A1	B1	C1	C2	C3
mm	0 - 100	100-200	200-350	350-900	900-1500	1500-1800
Characteristic☞						
%gravel	4	0	0	0	0	0
Coarse sand	4		4	3	1	
Fine sand	31		36	45	44	
Silt	27		30	27	32	
clay	31		30	23	24	
pH	5.7	5.8	6.2	6.8	7.3	7.5
EC µS/cm	53	37	30	23	30	40
Organic Carbon %	4.8	3.2	1.8			
Ca++me%	8.7		10.1	6.8	5.3	
Ex. Bases	12.7		13,8	10.0	9.6	
Ex. Ac (H+)	14.9		9.2	4.1	3.2	
CEC me%	27.6		23.0	14.1	12.8	
Base saturation %	46		60	71	75	

M24 Briagalong A soil monolith



Location

Site description

Soil classification

	Briagalong
Map ref	8322: Approx. 508300E 5811600S
Rainfall	640mm
Parent material	Quaternary sediments
Relief	
Site	
Slope	
Aspect	
Elevation	
Native vegetation	
Land use when collected	
Date of collection	19/07/1979
Great Soil Group	Red brown earth
PPF:KH Northcote	Dr3.21
ASC:RF Isbell	Mottled, Eutrophic, Red Chromosol
WRB;FAO	Rhodic/Chromic Abruptic Luvisol

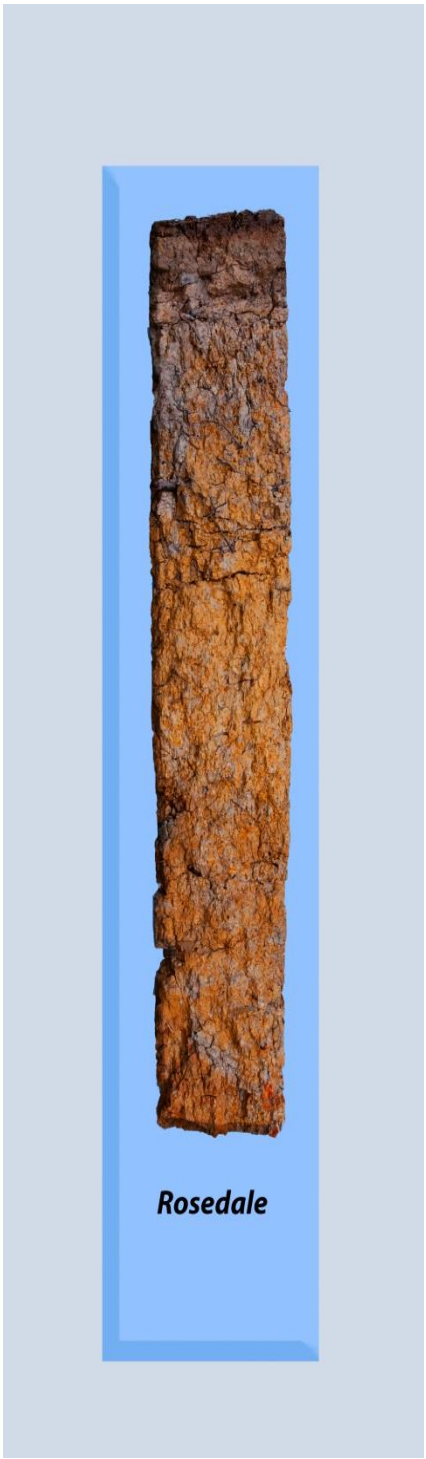
Profile Description

Horizon	Depth mm	Colour	Texture	Structure	Roots
A	0 - 100				
	120 - 200				
B1	300-420				
	620 - 800			Information missing	
C	900 - 1200				

Analytical data

Horizon☞	A		B1		C
mm	0-100	120-200	300-420	620-800	900-1200
Characteristic☞					
Gravel %	0	0	0	0	0
Coarse sand	5	4	4	1	6
Fine sand	46	47	40	26	45
Silt	25	28	30	54	27
Clay	20	21	25	41	23
pH	5.1	5.6	6.2	6.3	6.5
EC µS/cm	50	27	22	35	34
Organic C %					
Ca++me%	1.9	2.8	2.7	4.7	2.9
Ex. Bases	3.8	4.7	5.0	9.5	6.6
Ex. Ac (H+)	9.3	5.0	2.9	6.6	3.8
CEC me%	13.1	9.7	7.9	16.1	10.4
Base saturation %	29	48	63	59	63

M25 Rosedale soil monolith



Location

Site description

Soil classification

	Rosedale
Map ref	
Rainfall	680mm
Parent material	Quaternary alluvium
Relief	
Site	
Slope	
Aspect	
Elevation	
Native vegetation	
Land use when collected	
Date of collection	26 July 1979
Great Soil Group	Solodic
PPF:KH Northcote	Dy3.23
ASC:RF Isbell	Eutrophic, Mottled-Subnatric Brown Sodosol
WRB; FAO	Abruptic Solonetz

Profile Description

Horizon	Depth (mm)	Colour	Texture	Structure	Roots
A1	0-200		Silty loam		
A2	200-450		Silty clay loam	Information missing	
B2	450-1000		Medium clay		
BC	1000-1800		Medium clay		

Analytical data

Horizon☞	A1	A2	B2	BC
mm	0-200	200-450	450-1000	1000-1800
Characteristic☞				
Gravel %	0	0	0	0
Coarse sand	1	1	<1	1
Fine sand	33	33	11	13
Silt	27	36	25	35
Clay	33	29	62	50
pH	5.7	6.0	6.6	8.1
EC µS/cm	50	40	260	437
Organic Carbon %	2.2	1.0		
Ca++me%	2.6	1.2	3.1	3.3
Ex. Bases	5.7	4.0	14.7	15.6
Ex. Ac (H+)	10.7	7.2	6.0	1.7
CEC me%	16.4	11.2	20.7	17.3
Base saturation %	35	36	71	90

M26 Briagalong B soil monolith

Location

Site description

Soil classification

	Briagalong
Map ref	8322: Approx. 508300E 5811600S
Rainfall	640mm
Parent material	Quaternary sediments
Relief	
Site	
Slope	
Aspect	
Elevation	
Native vegetation	
Land use when collected	
Date of collection	19/07/1979
Great Soil Group	Soloth
PPF:KH Northcote	Dy3.21/Dr5.12
ASC:RF Isbell	Mottled-Sodic, Magnesic, Red Kurosol
WRB;FAO	Rhodic/Chromic, Abruptic Alisol

Profile Description

Horizon	Depth mm	Colour	Texture	Structure	Roots
A1	0 - 30		Sandy loam	Information missing	
A2	30 - 150		Loamy sand		
B21	150- 400		Medium clay		
B22	400--1200		Heavy clay		
C	> 1200		Sandy clay		

Analytical data

Horizon☞	A1	A2	A2	B21	B21	B22	B22	B22
mm	0-30	30 -100	100 - 150	150 - 200	200 - 400	400-600	600-900	900-1200
Characteristic☞								
Gravel %	1	2	3	3	1	1	1	1
Coarse sand	19		29	20			23	8
Fine sand	33		39	26			27	35
Silt	13		18	12			6	11
Clay	15		12	40			42	44
pH	5.9	5.0	5.3	5.3	5.2	4.8	4.7	4.6
EC µS/cm	210	52	38	65	87	250	270	420
Organic C %	11.6	0.99	0.54	0.53	0.62			
Ca++me%	11.0		0.3	0.2			0.1	0.1
Ex. Bases	16.8		1.6	6.7			8.1	10.8
Ex. Ac (H+)	14.2		6.4	12.5			9.7	9.3
CEC me%	31.0		8.0	19.2			17.8	20.1
Base saturation %	54		20	35			46	53

M27 Winjallock soil monolith

Location

Site description

Soil classification

	Winjallock
Map ref	
Rainfall	
Parent material	
Relief	
Site	
Slope	
Aspect	**Information missing**
Elevation	
Native vegetation	
Land use when collected	
Date of collection	
Great Soil Group	
PPF:KH Northcote	Dy2.22/ Gn3.95
ASC:RF Isbell	Sodosol, Dermosol
WRB: FAO	Planosol / Lixisol

Profile Description

Horizon	Depth (mm)	Colour	Texture	Structure	Roots
	0 - 100		Fine sandy loam		
	100 – 200		Fine sandy clay loam	Information missing	
	200 - 300		Fine sandy clay loam		
	300 - 500		Medium clay		
	500 - 700		Medium clay		
	700 - 900		Sandy clay		

Analytical data

Horizon☞						
mm	0 - 100	100 - 200	200 - 300	300 - 500	500 - 700	700 - 900
Characteristic☞						
%gravel	11	6	4	7	14	8
Coarse sand	20	17	11	13	13	13
Fine sand	45	44	44	41	38	36
Silt	21	23	22	21	19	20
clay	11	14	22	26	25	32
pH	5.9	5.9	5.9	6.2	6.8	7.0
EC µS/cm	82	93	139	204	270	380
Organic carbon %	1.4	0.5	0.3			
Ca++me%	0.2	0.1	<0.1	<0.1	<0.1	<0.1
Ex. Bases	2.3	2.5	3.3	5.4	7.4	10.2
Ex. Ac (H+)	7.7	4.3	4.2	4.5	2.5	2.1
CEC me%	10.0	6.8	7.5	9.9	9.9	12.3
Base saturation %	23	37	44	55	75	83

M29 Westgate soil monolith

Location	Westgate, Armstrong
	1:100000 7423. 664200E 5980200N
Site description	
Rainfall	600mm
Parent material	slope wash deposit overlying metamorphosed slates and sandstones
Relief	N-S metamorphic aureole
Site	Upper slope of spur to S of aureole crest
Slope	6%
Aspect	North
Elevation	340m
Native vegetation	Low open forest
Land use when collected	Farming with erosion
Date of collection	29 October 1985
Soil classification	
Great Soil Group	Non-calcic Brown
PPF:KH Northcote	Um 1.43
ASC:RF Isbell	Mottled, Mesotrophic, Brown Dermosol
WRB: FAO	Lixisol/Alisol

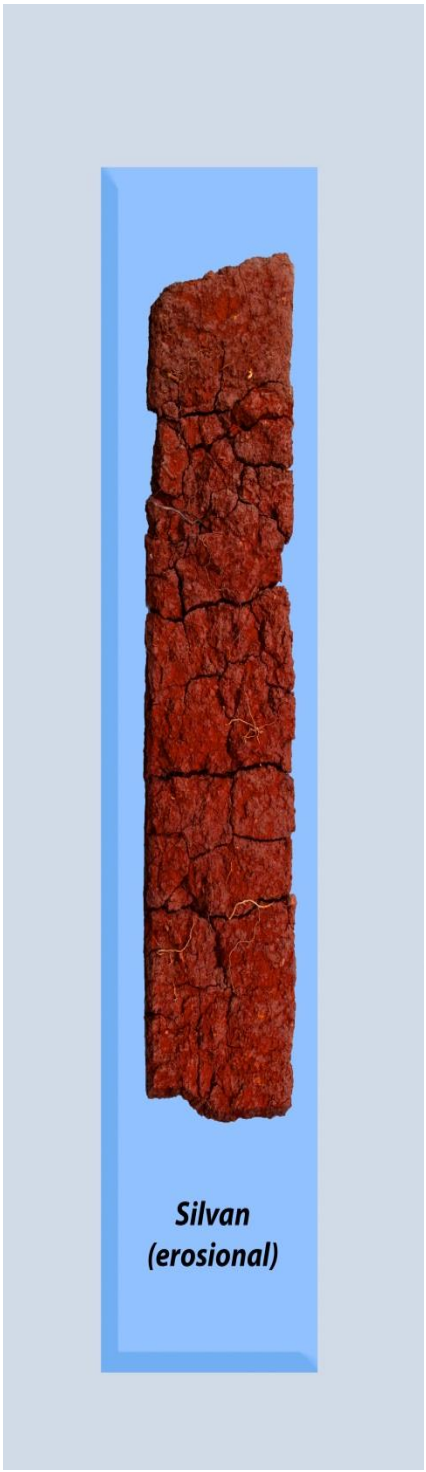
Profile Description

Horizon	Depth (mm)	Colour	Texture	Structure	Roots
A	0 - 25	10YR 4/3	Gravelly clay loam	Moderate 4 mm sub-angular blocky	++
C	25 - 190	10YR 4/3	Gravelly clay loam	Weak angular blocky	+
2B2b	190 - 400	7.5YR 5/4	Gravelly light clay	Weak angular blocky	+
3Cnb	400 - 680	7.5YR6/4 2.5YR6/6 5Y2/1	Soft slates and sandstones		
3Cb	680 - 1200	Yellow red a nd grey	hard slates and sandstones		

Analytical data

Horizon☞						
mm	0 - 100	100 - 200	200 - 300	300 - 400	400 - 500	500 - 900
Characteristic☞						
Gravel %	23	34	35	55	48	58
Coarse sand	17	15	15	16	14	16
Fine sand	41	42	39	32	31	33
Silt	21	23	24	26	28	30
clay	20	20	23	26	26	22
pH	5.2	5.5	5.6	5.7	5.7	6.0
EC µS/cm	93	30	30	34	36	34
Organic carbon %	3.1	1.2	0.6			
Ca++me%	1.2	2.1	2.3	2.4	3.0	2.6
Ex. Bases	2.9	3.1	3.3	3.4	4.3	4.5
Ex. Ac (H+)	13.1	8.0	6.4	6.4	5.6	3.6
CEC me%	16.0	11.1	9.7	9.8	9.9	8.1
Base saturation %	18	28	34	35	43	56

M30 Silvan soil monolith (from eroded site)



Location

Site description

Classification

	Silvan
Map ref	Ringwood 7922 361500E 5809200N
Rainfall	1000mm
Parent material	Paleogene (Older) basalt
Relief	hilly
Site	upper slope
Slope	6 degrees
Aspect	NE
Elevation	180m
Native vegetation	
Land use when collected	Bare fallow (horticulture)
Date of collection	4 June 1986
Great Soil Group	Krasnozem
PPF:KH Northcote	Uf6.21
ASC:RF Isbell	Acidic, Mesotrophic, Red Ferrosol
WRB: FAO	Rhodic/Chromic Lixisol, Nitisol

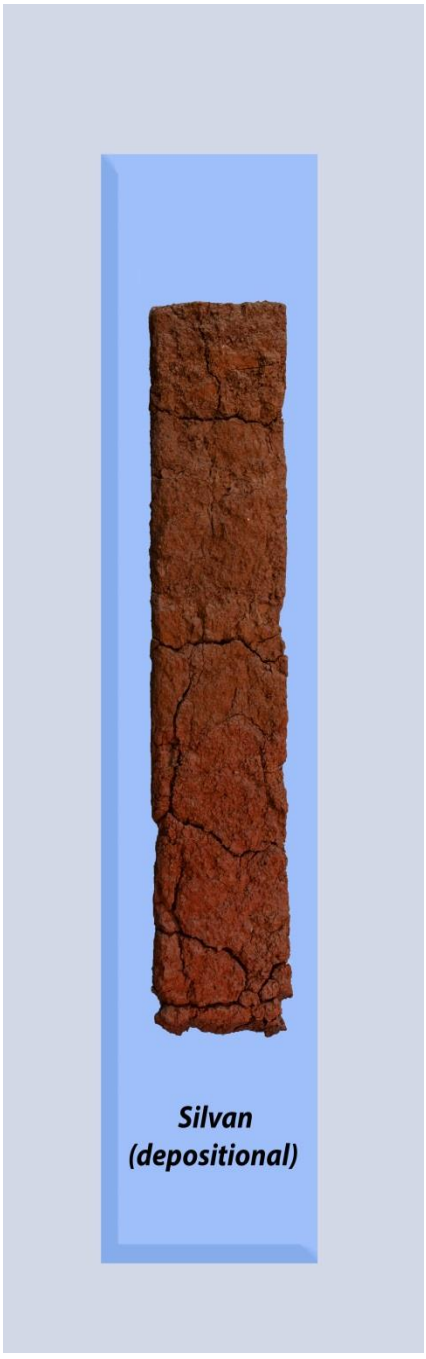
Profile Description

Horizon	Depth (mm)	Colour	Texture	Structure	Roots
Ap	0 – 160	10R3/6	clay	strong fine 2mm angular blocky.	++
B21	160 – 700	10R4/6	clay	moderate fine 2mm subangular blocky. dull clay skins	+
B22	700 - 1000	10R4/6	clay	strong fine 4mm angular blocky. mo derate shiny clay skins	+

Analytical data

Horizon☞	Ap		B21		B22	
mm	0-100	100-160	200-300	300-400	500-600	800-900
Characteristic☞						
%gravel	0	0	0	0	0	0
Coarse sand	1	1	2	2		
Fine sand	22	22	20	18		
Silt	26	24	18	12		
clay	50	53	63	68		
pH	6.3	5.9	5.0	5.3	5.4	5.3
EC µS/cm	40	61	89	108	124	155
Organic carbon %						
Ca++me%	6.7	6.6	5.1	5.7	4.9	1.6
Ex. Bases	8.9	8.2	5.7	6.6	6.7	5.9
Ex. Ac (H+)	17.2	19.7	16.5	19.3	17.8	18.7
CEC me%	26.1	25.3	22.0	25.4	24.0	24.6
Base saturation %	34	32	25	24	26	24

M31 Silvan soil monolith (from site with deposition of eroded materials)



Location	Silvan
Map ref	Ringwood 7922 361500E 5809200S
Site description	
Rainfall	1000 mm
Parent material	Paleogene (Older) basalt
Relief	hilly
Site	lower slope
Slope	6 degrees
Aspect	NE
Elevation	160m
Classification	
Great Soil Group	Krasnozem
PPF:KH Northcote	Uf6.21
ASC:RF Isbell	Acidic, Mesotrophic, Red Ferrosol
WRB:FAO	Rhodic/Chromic Lixisol, Nitisol

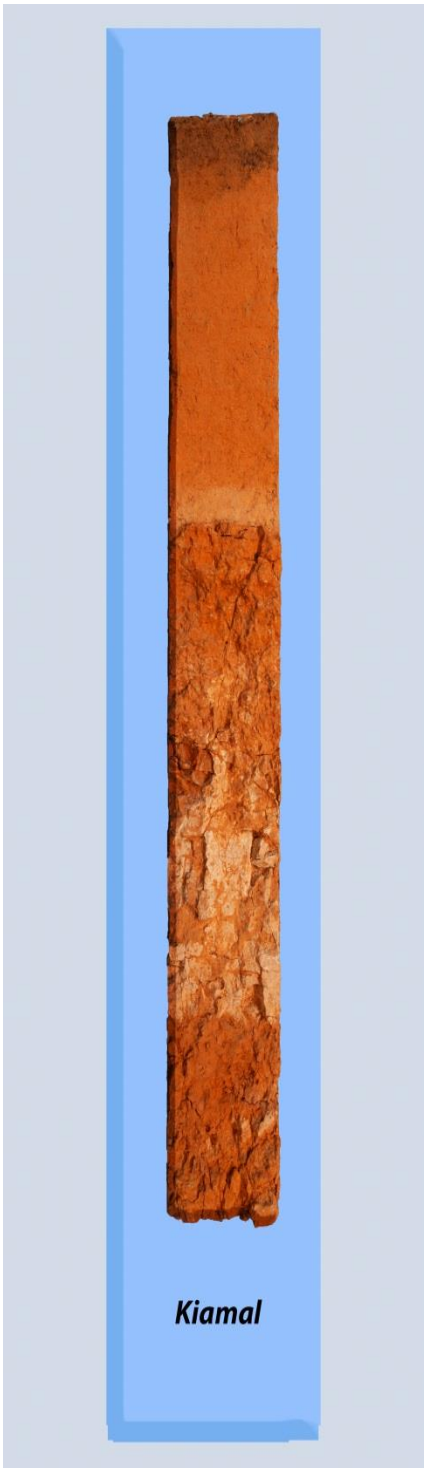
Profile Description

Horizon	Depth (mm)	Colour	Texture	Structure	Roots
				Information missing	

Analytical data

Horizon☞					
mm	0-100	100 - 200	200 - 300	300 - 550	600 - 900
Characteristic☞					
%gravel	<1	1	0	0	0
Coarse sand	0	0	2	2	
Fine sand	33	31	30	33	
Silt	33	35	38	30	
clay	23	23	22	27	
pH	5.6	5.4	5.3	4.8	4.6
EC µS/cm	54	95	93	124	127
Organic carbon %					
Ca++ me%	3.8	4.1	4.5	2.2	2.2
Ex. Bases	6.1	6.4	6.3	3.9	3.2
Ex. Ac (H+)	26.2	20.4	21.2	23.7	17.9
CEC me%	32.3	26.8	27.5	27.6	21.1
Base saturation %	19	24	23	14	15

M32 Kiamal soil monolith



Location

Site description

Soil classification

	Railway cutting
Map ref	1:100000 Topo sheet 7327 – 619800E 6123200N
Rainfall	310mm
Parent material	Woorinen formation
Relief	Widely spaced e-w dunes on plains and ridges
Site	Upper slope of e-w dune
Slope	4°
Aspect	South
Elevation	55m
Native vegetation	Low mallee scrub
Land use when collected	Railway reserve
Date of collection	31/10/1986
Great Soil Group	Calcareous Red Earth
PPF:KH Northcote	~~Red Duplex (Dr4.23)~~ Gc1.21
ASC:RF Isbell	Endohypersodic, Regolithic, Calcic Calcarosol
WRB;FAO	Calcisol

Profile Description

Horizon	Depth (mm)	Colour	Texture	Structure	Roots
A1	0 - 685	7.5YR6/8	sand	Weak sub angular blocky 5mm	++
A2	685 - 1020	7.5YR7/6	sand	Weak angular blocky	+
B1	1020 - 1200	7.5YR5/8 with 2.5Y7/4	sandy loam	Weak angular blocky	
B2	1210 - 1790	7.5YR5/8	sandy clay loam	weak angular blocky	
C	1790 +	5YR6/6	sandy loam	weak angular blocky	

Analytical data

Horizon☞	A1	A2	B1	B2	C
Depth (mm)	100 - 200	635 - 685	1100 - 1200	1400 - 1500	1700 - 1790
Characteristic☞					
%gravel	0	0	0	0	0
Coarse sand	33	32	37	35	36
Fine sand	62	46	44	51	51
Silt	1	2	3	1	3
clay	4	22	18	15	13
pH	9.1	9.4	9.7	9.7	9.8
EC µS/cm	80	50	1440	1130	880
Organic carbon %	0.2				
Ca++me%	3.1	1.1	2.0	1.6	1.2
Ex. Bases	4.1	2.3	12.1	11.1	7.7
Ex. Ac (H+)	0.0	0.0	0.0	0.0	0.0
CEC me%	4.1	2.3	12.1	11.1	7.7
Base saturation %	100	100	100	100	100

M33 Yeungroon East soil monolith

Location

Site description

Soil classification

Map ref	Charlton 1:100000 (7525) 716800E 5974700N
Rainfall	410mm
Parent material	Mainly Inidgelli parna. Also colluvium from weathered metamorphosed Cambro-Ordovician
Relief	W Victorian uplands
Site	Saddle on N-S ridge. Midslope of a NE spur
Slope	5%
Aspect	NW
Elevation	170m
Native vegetation	Woodland originally
Land use when collected	Stubble and weeds
Date of collection	20 January 1987
Great Soil Group	Red-brown earth
PPF:KH Northcote	Dr 2.23
ASC:RF Isbell	Calcic, Mesonatric, Red Sodosol
WRB;FAO	Solonetz / Luvic Calcisol / Luvisol
	+

Profile Description

Horizon	Depth (mm)	Colour	Texture	Structure	Roots
Ap1	0 - 80	5YR4/8	Clay loam with co arse sand	Apedal	
A2	80 - 160	2.5YR6/6 mottles	Clay loam with co arse sand	Mod. 50 mm columnar	
B1	160 - 250	Mottled 2.5YR3/6 2.5YR4/8	Clay	Mod. 25 mm sub-angular block y with clay skins	
B2	250 - 540	2.5YR4/6 OM stains 5YR3/3	Clay	Mod. 25 mm sub angular block y with clay skins	
B2ca	540 - 770	2.5YR4/8 lime 5YR7/6	Clay	Mod. 25 mm sub-angular block y with clay skins	
D	770 - 992	2.5YR4/6 lime 5YR7/6	Clay	Strong 15 mm angular blocky	

Analytical data

Horizon☞	Ap1	A2	B1	B2	B2ca	D
mm	0-80	80-160	160-250	250-500	600-700	900-922
Characteristic☞						
Gravel %	3.8	10.6	0.6	0	4.2	10.9
Coarse sand	19	18	6	5	7	5
Fine sand	51	52	19	15	22	27
Silt	13	14	5	3	8	16
clay	16	16	68	76	61	53
pH	6.2	7.1	8.4	9.0	9.5	9.5
EC µS/cm	130	50	160	365	650	790
Organic carbon %	1.1	0.5	0.4			
Ca++me%	3.4	3.0	7.5	7.2	5.0	4.2
Ex. Bases	7.0	6.0	25,5	31.4	27,2	24,0
Ex. Ac (H+)	6.8	3.5	4.8	2.5	0	0
CEC me%	13.8	9.5	30.3	33.8	27.2	24
Base saturation %	51	63	84	93	100	100

METHODS OF LABORATORY ANALYSIS

All results are expressed in terms of oven-dry soil passing a 2-mm sieve, except gravel which is reported as a percentage of the air-dry field sample

Particle size analysis

Plummet balance method of Hutton (1956)[4] with sand separation by hand decantation. The I.S.S.S. size fractions were separated: i.e., coarse sand 2-0.2mm; fine sand 0.2-0.02 mm; silt 0.02-0.002mm; and clay <0.002mm

Electrical conductivity (EC)

A 1:5 soil:water suspension was shaken for 1 hour and, after temperature equilibration, conductivity was measured with a dip cell and direct-reading meter. Results are recorded in µS/cm (MicroSiemens per centimetre)

Soil reaction (pH)

Measured by glass electrode and digital pH metre on the above suspension

Organic carbon

Measured using the wet-combustion technique of Walkley and black as described by Piper (1942)[5]. No recovery factor was applied, but the factor of 1.3

C:N was used to calculate carbon:nitrogen ratios

Exchangeable cations

Pre 1980 these were determined by the method of Hutton and Bond (unpublished data).

Synopsis I: soil leached with molar ammonium chloride solution (pH = 7.0) to displace exchangeable cations. Potassium and sodium in the leechate determined by flame emission techniques. Calcium and magnesium determined by EDTA titration. Absorbed ammonium ion was leached from the soil with sodium sulphte solution, and cationic exchange capacity was determined from the excess of ammonium ion over chloride ion in the leachate

Post 1980 the extraction method of Tucker (1974)[6], also described in Loveday (1974)[7], was used.

Synopsis II: soluble ion removal by 10% ethanediol in ethanol. Cation displacement by ammonium chloride in ethanol:water (2:1) at pH 8.5. Cation determination by atomic absorbtion. Cation exchange capacity by measurement of ammonium ion displaced from the treated soil by potassium nitrate-calcium

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Appendix ? Monolith Locations: Grid References (* Approx.)

Monolith	Map sheet 1:100,000	Easting	Northing
1	7823 Woodend	287200	5861700
2	8022 Healesville	381300	5813300
3	7922 Ringwood	328000	5825800
4	7724 Bendigo	237800	5935600
5	8022 Healesville	380400	5813500
6	7823 Woodend	277300	5872200
7*	8123 Mansfield	417500	5868500
8	na		
9	7922 Ringwood	362300	5812000
10*	Cranbourne Military	X03700 351800	Xx33300 578300
11	7922 Ringwood	329160	5813430
12	7121 Nelson	531300	5782700
13	7323 Hamilton	595900	5811800
14	7323 Hamilton	595900	5811800
15	7124 Goroke	520600	5929500
16	7124 Goroke	520600	5929500
17	7922 Ringwood	na	na
18	7922 Ringwood	325000	5847400
19	7823 Woodend		
20	7724 Bendigo		
21	7824 Heathcote	na	na
22	8121 Moe	418000	5769600
23	8222 Maffra	na	na
24	8322 Stratford	508300	5811600
25	8221 Traralgon	na	na
26			
27	na	na	na
28			
29	7423 Ararat	664200	5880200
30	7922 Ringwood	361500	5809200
31	7922 Ringwood	361500	5809200
32	7327 Ouyen	619800	6123200
33	7525 Charlton	716800	5974700