LONGFORD
SOIL REPORT

Reconnaissance Soil Map Series
of Tasmania

A Revised Edition
by Stacey Spanswick & Peter Zund
Department of Primary Industries, Water and Environment
Tasmania
1999

of Divisional Report 14/57 Longford
By K.D Nicolls
C.S.I.R.O Division of Soils, Adelaide, 1958

Longford Report
and accompanying 1:100 000 Longord
Soil Reconnaissance map

DEPARTMENT *of* PRIMARY INDUSTRIES, WATER *and* ENVIRONMENT
Tasmania

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ACKNOWLEDGEMENTS

This report and accompanying map are revised versions of original work by CSIRO (Nicolls, 1958). We gratefully acknowledge the original work of Nicolls and the CSIRO Division of Soils, Adelaide for supporting this project.

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PREFACE

Correlation of the Reconnaissance Series

Over a 30 year period (1940 - 1967), the CSIRO Division of Soils, Adelaide, undertook a series of reconnaissance soil surveys and some more detailed soil surveys of the agricultural land in Tasmania. However, most of these reports are out of print and of limited availability, the terminology is dated and inconsistencies in map units exist across map sheets. In 1997, the Department of Primary Industries, Water and Environment (DPIWE) and the Natural Heritage Trust, put together a project to correlate and reprint the maps and reports and to extend this information and its value as a tool for sustainable land management, to a variety of potential users.

This report is part of the "Reconnaissance Soil Map of Tasmania" series which were published at a scale of 1 inch to 1 mile, (1:63 360). The reconnaissance series has been expanded to include the soil maps that were not part of the original "Reconnaissance Soil Map of Tasmania" series but mapped at scales of 1inch to 1mile and 1 inch to 2 mile (1:126 000). These maps have been reformatted and reprinted by the DPIWE at a scale of 1:100 000 to be consistent with more recent soil mapping scales (eg South Esk 1:100 000 soil map (southern half), Doyle 1993), the land capability mapping series and the current Tasmanian Land Tenure map series.

It is not the aim of this project to remap the areas covered by the Reconnaissance series or to change the intensity of mapping, but to correlate, standardise and enhance existing information and provide the public and DPIWE staff with more consistent, reliable and accessible soil resource information.

Edits to the Longford Map

The Longford Reconnaissance soil map (Nicolls, 1958) adjoins the Quamby map (Nicolls, 1959) on its western boundary and the South Esk soil map (Doyle, 1993) on its southern boundary (see Appendix 9). The area covered by the Longford map lies predominantly within the Launceston Tertiary Basin (Tamar Graben) with about a quarter of the eastern part within the foothills of the Ben Lomond Plateau (Ben Lomond Horst), (ABS, 1988). Due to their greater agricultural potential, the soils of the Launceston basin have been mapped at a much higher intensity than the soils of the Ben Lomond Horst. The map units within the western two thirds of the Longford sheet are soil associations, ie an association of two or more soil types occurring in a characteristic pattern (Gunn *et al.*, 1988), whereas the map units in the east around the Ben Lomond Horst are mapped mainly on landform and parent material.

As the 1:100 000 South Esk soil map has only recently been published and is in circulation, it has been our aim to correlate the Longford map and the adjoining Quamby map as much as possible to the South Esk soil map.

Due to resource constraints only a limited amount of time could be spent investigating map unit boundaries and soils of the less well defined soil associations.

Where inconsistencies in map unit boundaries between the Longford and South Esk Map sheets were identified changes were made to produce where possible a seamless map.

However because of differences in the type of map unit identified on each map sheet, and the lack of available resources for additional mapping, it has not been possible to introduce the "complex" units identified on the South Esk sheet into the revised Longford map, therefore some artificial boundaries have resulted. Polygons have been added along the Quamby - Longford boundary to increase consistency across the two map sheets and these changes are outlined in Appendix 4. Map unit boundary changes have been done using aerial photos and limited field work and have been recorded in the appendix of the report and in the Spatial Information System (SIS).

Nicolls (1958) mapped some of the polygons in the southern half of the sheet as more than one type of map unit. For example a single map unit may be labelled both "Brumby" and "Brumby with Panshanger". This is really a complex unit. However, because the occurrence of Brumby with Panshanger is only in a third of the polygon, we could not, without significant field work and aerial photography interpretation, split this unit and other units like it. Therefore, we have left these units as is; they are reflected on the paper maps and in a notes column attached to the polygon attribute table. This information has also been stored as a separate point coverage. However, the coordinates used for the label points are only estimations taken from a visual interpretation of their location on the original published map. There are two maps for this report in circulation. The map that accompanies this report has polygons coloured according to the different map units identified. The second map, which is intended solely as a DPIWE in-house publication, has map units coloured according to the Australian Soil Classification for the dominant SPC within each unit. No colour is assigned to a map unit if a SPC has not been identified. As this approach can lead to soil of different agricultural potential having a similar map colour, the second map is not suitable for general use.

Legend

Where possible the dominant soil of each map unit has been classified to soil order using the Australian Soil Classification (Isbell, 1996). Soils have also been classified according to Great Soil Group (Stace *et al*., 1968).

Edits to the Longford Report

The Longford report has been reformatted to provide more consistent structure across all reports. The soil terminology used within the Longford report has been updated to be consistent with the Australian Soil and Land Survey Field Handbook (McDonald *et al*., 1990), old imperial measurements have been converted to the metric system and sentence structure has been changed where it did not read with clarity. All the changes made to the report are shown in italics.

The map unit names used by the original surveyor have been preserved and underlined in the report, with the correlated map unit name and code appearing above. Map unit names have been changed were possible to be consistent with naming conventions outlined by Gunn *et al.* (1988). For a description of map units refer to Gunn *et al.,* p 33.

Soil Taxonomic Units

The soil taxonomic units used by Nicolls in this survey are soil series and great soil group. These have been replaced by Soil Profile Class (SPC) as this will standardise taxonomic units across the Longford map and be compliant with taxonomic units used within the more recent South Esk soil map and by other states. A SPC is a group or class of soil profiles within a map unit which have similar morphological characteristics, and may have similar chemical properties Gunn *et al.,* (1988). The SPCs were constructed through the use of existing reports, historical soils data in the DPIWE soil database (Talbot *et al.*, 1998) and additional field work A key to soil horizon designations used within the SPCs is provided in Appendix 2. The lines separating horizons within the SPC reports are shown by broken and filled lines. The broken lines show a diffuse or gradual change to the next horizon whereas the filled lines show a clear or abrupt transition.

Laboratory Analysed Data

Analytical information for the soils of the Longford map has been published by Graley (1961). Some analytical data resides within the DPIWE soil database. However, most of the methodology used is now out of date or unknown and these results are not necessarily comparable with modern day analytical data and have therefore not been included in this report. More recent soil analysis was undertaken during the South Esk survey. Where the South Esk SPCs correlate with the SPCs of the Longford map, the analytical data for that SPC has been added to this report. A rating table of chemical values for the analytical data is provided in Appendix 1.

Soil Associations

Outlined below are the map units within the Longford report which have been edited or identified as lacking the data needed to produce SPCs.

Deddington Association - The concept of the Deddington Soil Association has been described by Nicolls (1958) as having similar soils to that found in the Eastfield Association, the main difference being steeper terrain and shallower soils in the Deddington Association. Doyle (1993) described similar country in the South Esk sheet as a Miscellaneous unit of the Eastfield Association. We believe the Deddington Soil Association fails to meet the requirements for a soil association outlined in Gunn *et al.*, (1988), therefore this map unit has been renamed Miscellaneous Soils related to the Eastfield Association (MEa).

Relbia Association - The dominant soils of the Relbia Association have only been briefly defined by Nicolls (1958), although a small scale survey of the Relbia - Western Junction area was published by Loveday in 1952. Due to the lack of described profiles and chemical data we have been unable to define SPCs for the dominant soils of this association within the time limits of this project.

Arnon Association - The Arnon association is poorly defined by Nicolls (1958). There is a need for further work if we are to understand this association better; however this is beyond the scope of this project.

Miscellaneous Soils of the Eastfield Association 2 - On the original map Nicolls identified areas within the Eastfield association, using red stripping where lateritic and krasnozem soils were located. There are three main soil types on dolerite in this unit. They are a Woodstock soil associated with dolerite outcrops (WkDv), a krasnozem which correlates with the Archer (Ar) krasnozems and a Lateritic Krasnozem (ArLv). We have not had time to do any field work in this unit but have referred to Nicolls (1958 & 1959).

Future Work

Due to the high level of information available about the main agricultural soils within this map sheet, the need for future work is minimal. The two map units Arnon and Miscellaneous Soils of the Eastfield Association 2 which are poorly documented and understood are of relatively small extent and of low agricultural potential. However the Relbia Association which comprises about 40 square kilometres is used quiet extensively for agriculture and suffers from severe erosion in some areas, mainly in the form of slumping. A detailed survey by Loveday (1952) provides detailed information of the Relbia - Western Junction area. Further work is needed to understand the relationship between the different soil types outlined by Loveday (1952) and their dominance within the Relbia Association map unit.

Appendices

A series of appendices have been attached providing additional information relevant to this report and the accompanying soil map. Much of this information was either unavailable or not recorded with the original report by Nicolls, (1958).

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Division of Soils

RECONNAISSANCE SOIL MAP OF TASMANIA

SHEET 47 - LONGFORD

by

K.D. Nicolls

1. INTRODUCTION

This report is the seventh of a series under the general title "Reconnaissance Soil Map of Tasmania". *Each of these reports have been mapped at a scale of 1:63 360*. Discussion is limited to a brief explanation of the map, and further information is left to intended future publications. *A list of the Reconnaissance soil maps and their location appears at the back of this report (Appendices 7 and 8).*

There are six detailed surveys within the Longford map; these are outlined in Appendix 5 and a map of their locations within the Longford map is provided in Appendix 6. These earlier maps have been incorporated in the present one, with minor revisions where necessary, and in some cases simplification for conformity with mapping carried out since 1951. The Longford map sheet covers *1155 sq. km.*.

2. PHYSICAL ENVIRONMENT

2.1 Geology & Geomorphology

The Longford map sheet is representative of an important physiographic unit in Tasmania, the Launceston Tertiary Basin. The Basin is a large trough, some *128km* long and in places *40km* wide, between the highlands of the Ben Lomond Plateau to the north-east and the Central Plateau to the south-west. Its floor, at a general elevation of *140m to 210m* above sea level, consists of a succession of nearly flat terraces at distinct levels, with gently undulating country between. As a whole it slopes very gently north-westwards. Down the centre of the Basin runs a discontinuous line of hills, reaching elevations of *270m* above the basin floor and dividing it into two portions.

This topography is the result of the extensive block faulting which broke up Tasmania during the lower to middle Tertiary Period *(see Appendix 3)* leaving the Launceston Basin as a sunken block with the plateaux on either side *approximately one thousand metres* above it. The central line of hills referred to above, is a minor ridge on the sunken block. Lake sediments, which accumulated to a considerable depth in the trough, constitute the greater part of the basin floor. These are readily prone to erosion and have been largely removed from the sections north of the city of Launceston. To the south of Launceston, however, they are protected by bars of dolerite and basalt, through or around which the rivers must pass. Several large streams rising in wet mountainous catchments cross the basin and join the South Esk River. Differential rates of cutting by the South Esk through the main dolerite bar, (the Cataract Gorge with its head at Hadspen), have been responsible for the development of the succession of river terraces in the soft sediments of the basin floor upstream, and subsequently erosion of the upper terraces to give the undulating country between the flat remnants.

The Longford map sheet includes a representative portion of the foothills of the Ben Lomond Plateau in the north east, and extends to within a *few kilometres* of the Western Tiers *in the south west*, the long fault scarp dividing the Launceston Basin from the Central Plateau. The central dividing chain of hills is represented by Mt Arnon in the north and by Hummocky Hills in the south, and the sheet includes extensive portions of the terraced basin floor on either side of, and between, these hills.

Of the rocks older than the faulting, Jurassic dolerite (*Appendix 3*) is by far the most widespread in this area, accounting for most of the elevated country of the Ben Lomond foothills, Mt Arnon and Hummocky Hills. Triassic sandstones *(Appendix 3)* are prominent in the Ben Lomond foothills around Blessington. The Permian mudstones (*Appendix 3)* are exposed less extensively near Mt Arnon and in the foothills east of Evandale. Elsewhere in the Longford map sheet Triassic and Permian rocks are restricted to small outcrops. Of the rocks younger than the faulting, the Tertiary lake sediments *are the most extensive*. Tertiary basalts are prominent in the north of the area, blocking the valley of the South Esk River at Evandale, and there are isolated remnants of another flow in the south near Epping. *Younger* alluvial deposits occur in the river valleys, together with deposits (mostly sandy) resorted by wind and blown eastwards over the valley floors and sides. Windblown sands also form lunettes around lagoons on the higher levels of the basin floor.

2.2 Climate

Most of the area falls within the rain shadow of the Western Tiers. The *700mm* isohyet follows the western boundary of the Longford sheet, and skirts the elevated country in the north eastern corner of the sheet where rainfalls rise to about *1000mm*. The lowest rainfall, around *510mm*, was recorded in the south eastern corner of the sheet. Rainfalls are usually inadequate for plant growth in summer, while in winter the soils are often excessively wet due to poor drainage. Mean annual temperature is around *10.6° C*. Frosts may occur at any time and average one every two days in midwinter.

2.3 Land Use

The favourable topography, comparatively favourable climate, good water supplies, and proximity to the city of Launceston combine to support a well established and stable agriculture despite the low to moderate fertility of the soils. A large proportion of the western half of the map sheet *has in the past been intensively cultivated,* but much of this is now used for sheep grazing on improved pastures. The eastern half of the sheet is more sparsely settled and is used mainly for more extensive grazing of sheep on natural or partially improved pastures. The hilly country of the north east is suitable only for rough grazing.

3. SOIL LANDSCAPES

3.1 The Soil Map

The soil association, used as the mapping unit for this sheet, is defined as a characteristic pattern of soils not necessarily genetically related to each other but always occurring together in a distinctive landscape. In this area, the soil associations are based very largely on geomorphic subdivisions, so that the pattern of soils, as depicted by the map, is largely a reflection of geomorphology. *The five diagrams in Figure 1 below are idealised sections illustrating the topographical relationships between associations. Fifteen soil associations are defined.*

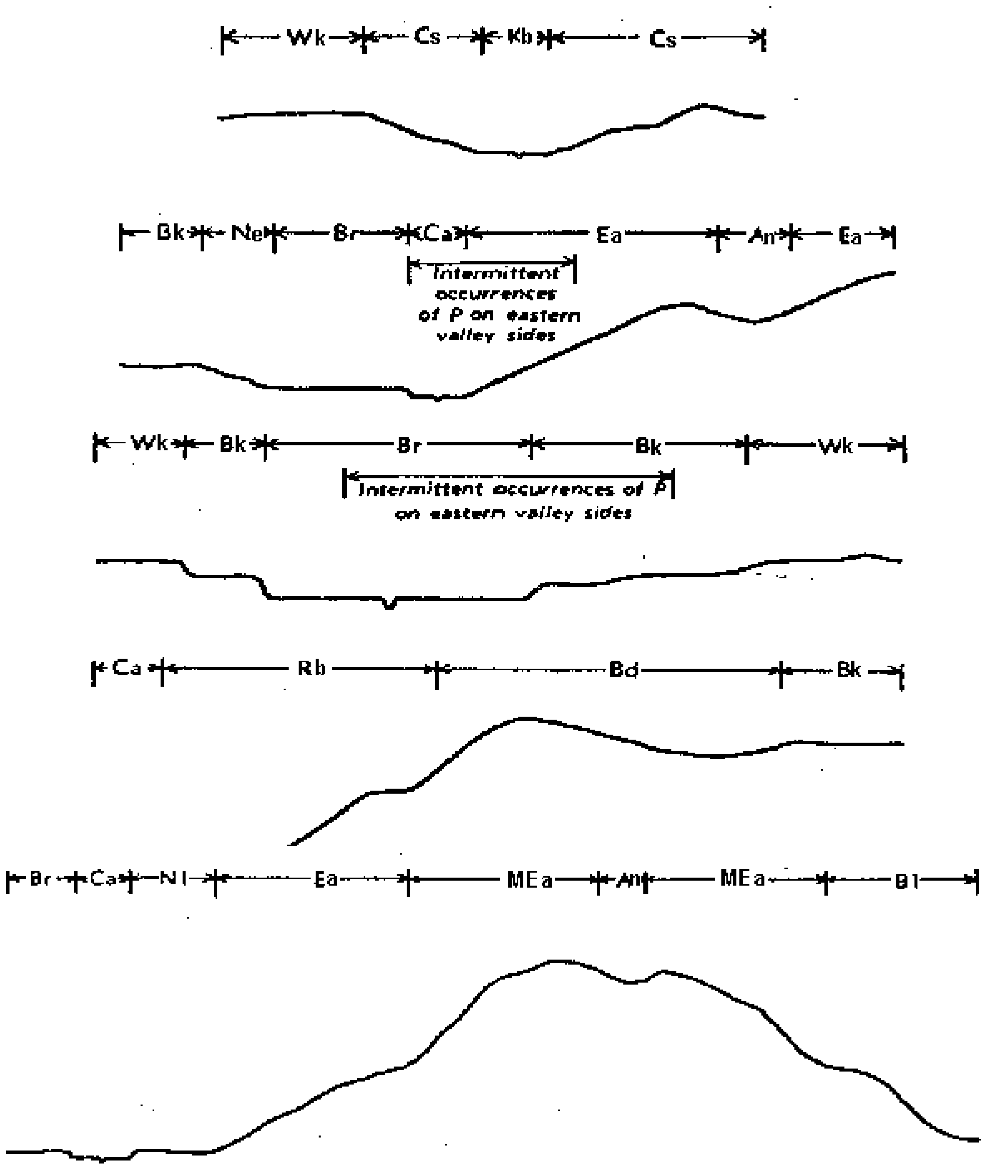


Figure 1 Position of soil associations in the landscape. This figure was taken off the original map sheet by Nicolls (1958), and a legend for the codes appears on the next page.

Code	Map Unit Name
An	Arnon Association
Bd	Breadalbane Association
Bk	Brickendon Association
Bl	Blessington Association
Br	Brumby Association
Ca	Canola Association
Cs	Cressy Association
Ea	Eastfield Association
Kb	Kinburn Association
MEa	Miscellaneous soils related to the Eastfield Association
Ne	Newham Association
Rb	Relbia Association
Wk	Woodstock Association

Table 1 Legend of codes used in figure 1.

* Note (P) in figure 1 refers to Panshanger soils (Ps)

4. SOIL MAP UNITS AND SPCS

4.1 Soils on Dolerite

4.1.1 Eastfield Association (Ea)

E - Eastfield Association *(160 sq. km)*
The distinction between the two associations of soils of the dolerite hills, the Eastfield and the *MEa* soils, rests mainly on ruggedness of terrain and on general elevation and only to a less extent upon soil differences. The Eastfield country rarely exceeds *300m* above sea level and is generally less steep and stony than the *soils of the MEa* though some steep slopes and rock outcrops are mapped with it. The greater accessibility of the Eastfield Association has led to more agricultural development of it than the *MEa*. Mostly the Eastfield Association (and all the *MEa*) are on hills above the level of the Woodstock Association but in places, mainly on slopes beside watercourses, the dolerite has been exposed by erosion of formerly-overlying lake sediments. The Eastfield Association tends to run in long strips trending north west, following fault structures in the dolerite and older rocks.

The dominant soils are those of the Eastfield series (Eastfield SPC), in which there is a grey-brown loam or fine sandy loam surface, a light grey fine sand to sandy loam subsurface, often with much fine rounded ferruginous gravel, and a sharp change at about *30cm* to a grey-brown, dark yellow-grey, or slightly mottled tough clay, hard when dry and plastic when wet. Partially weathered dolerite fragments and loose stones are common throughout the profile.

There are variants in which the bleached subsurface horizon may be considerably thicker, or may be absent altogether. Deeper and more organic fine sandy profiles and sometimes black clays, occupy drainage lines and hollows.

Brown soils on dolerite *correlating with the Bloomfield soils identified on the South Esk map (Doyle 1993 & Appendix 9)* common elsewhere in Tasmania, are scattered through areas of the Eastfield Association and are usually shallow and adjacent to large rock outcrops. They have a grey-brown to brown loam or fine sandy loam surface over a very stony brown to reddish brown clay. All grades between the Eastfield series and the brown soils may be found in the Eastfield Association.

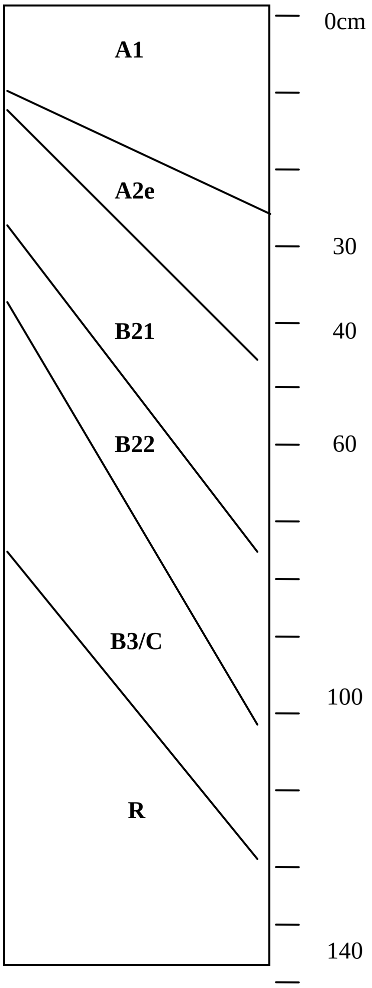
Included with this association, but distinguished on the map by *the code EaLv*, are lateritic and Krasnozem soils of the Eastfield Association. These are: a) profiles closely resembling the Woodstock series but containing boulders of weathered dolerite *(Woodstock Dolerite phase);* b) soils associated with massive outcrops of laterite *(Archer Lateritic variant, ArLv, see Appendix 9);* and c) deep, friable red-brown clays over very weathered dolerite *(Archer soil, Ar see Appendix 9).*

Land Use

Most of the Eastfield Association has undergone partial clearing of its eucalypt woodland and is used for rough grazing on native grasses. Some carries sown pasture, mainly on lower slopes, and there is a potential for extension of this. However, over much of the area surface stone, rock outcrop and sometimes steep slopes limit the use of agricultural implements.

Eastfield Soil Profile Class

Name	**Eastfield SPC (Ea)**
Concept	**Brown, mottled, texture contrast soils with dolerite fragments throughout, loamy topsoils, sandy sub-surface, with ironstone, and clayey subsoils developed on dolerite hills**.
Aust. Soil Classification	Brown Chromosols and Brown Sodosols
Great Soil Group	Grey-Brown Podzolics
Principal Profile Form	Db, Dd
Mapping Units	Ea, Ea-Ar, Ea-Ps, Ea-Wk
Geology	Jurassic Dolerite
Landform	Moderate to steeply undulating hills
Permeability	Slowly permeable
Drainage	Imperfectly drained
Land Capability	Class 5 or 6



A1: Black (10YR 2/1, 3/1, 3/2); sandy loam to loam massive or weak structure, 2-10mm, subangular blocky structure, very weak to weak (moist) consistence, very few, 2-6mm, ferruginous concretions, very few, 2-6mm, ferruginous concretions, variable amounts of dolerite stones and boulders; pH 5.5 - 7.0; clear to gradual change to

A2e: Conspicuously leached (10YR 4/2, 5/1, 5/2, 6/2 (moist)); fine sand to fine sandy loam or silty sandy loam; single grain or massive structure; very weak to weak (moist) consistence; common to abundant, <2-6mm, ferruginous concretions, variable amounts of dolerite gravels, stones or boulders; pH 6.0 - 7.0; sharp to abrupt change to

B21: Mottled; brown (10YR 3/4, 4/3, 4/4, 4/6, 5/4); medium to heavy clay; moderate, 50-200mm angular blocky or columnar structure, firm to very firm (moist) consistence; few slickensides; clay skins common; cracks present; very few to few, 2-6mm, ferruginous nodules; variable amounts of dolerite fragments, stones or boulders; pH 6.5 - 7.0; abrupt to clear change to

B22: Mottled brown or red (2.5Y 4/4, 4/6, 10YR ¾, 4/3, 4/4, 4/6, 5/4, 7.5YR 4/4, 4/6, 5YR 3/3); heavy clay; moderate, 50-100mm, angular blocky structure; firm to strong (moist) consistence; very few to few, 2-6mm, ferruginous nodules; variable amounts of dolerite stones and boulders; slickensides and clay skins common; pH 6.5 - 7.5; sharp to clear change to

B3/C: Occasionally mottled; brown (2.5Y 5/4, 5/3, 4/3, 4/4); light to medium clay; strong (moist) consistence; occasionally calcareous soft segregations present; variable amounts of dolerite stones or boulders; slickensides common; pH 7.0-7.5

R: Jurassic dolerite

Morphological Sites: LRRBD L6, 34, 93, 126
Analysed Sites: CSIRO H24, H163; LRRBD L12, 43
Relate d soil names: Eastfield Series, Eastfield Sand, Type I, Eastfield SPC
Previously described by: Nicolls (1958), Doyle, (1993), Stephens et al (1942)

Soil Profile Class "Property" Grid Reference (AMG)	Profile Number	Horizon	Sample Depth (cm)	pH water (1:5)	EC (d/sm)	Total P (mg/kg)	Avail. P (mg/kg)	Avail. K (mg/kg)	Org. Carb. (%)	Total N (%)	C/N Ratio	Ca	Mg	Na	K	Total Bases	CEC	BASE SAT (%)	ESP (%)	Ca/Mg Ratio
												(milli-equivalents / 100 grams of soil)								
Eastfield	SP 12	A1	0 - 8	5.4	0.14	166	15	348	2.00	0.194	10	3.19	1.53	0.33	0.88	5.9	10	61	3.4	2.08
"Kelvin Grove"	SP 12	A2	8 - 18	6.4	0.04	115	2	193	0.80	0.096	8	2.69	1.78	0.48	0.40	5.4	9	57	5.1	1.51
540600E	SP 12	B21tg	18 - 60	8.1	0.11	70	0	491	0.70	0.093	8	9.64	18.65	4.57	1.38	34.2	42	82	11.0	0.52
5376300N	SP 12	B22t	60 - 70	8.9	0.15	122	0	441	0.70	0.075	9	10.09	20.63	5.91	1.25	37.9	44	86	13.4	0.49
	SP 12	Ctk	70 - 80	9.3	0.45	132	0	324	0.40	0.039	10	17.15	17.25	5.36	0.85	40.7	34	119	15.7	0.99
Eastfield	SP 43	A1	0 - 16	5.8	0.08	386	7	62	4.10	0.310	13	11.21	4.08	0.21	0.18	15.7	20	77	1.0	2.75
"Leverington"	SP 43	A2	16 - 23	6.3	0.03	143	0	44	1.30	0.123	11	7.15	3.90	0.16	0.14	11.4	16	71	1.0	1.83
520800E	SP 43	B21t	23 - 47	6.8	0.04	124	0	123	0.70	0.100	7	15.04	15.16	0.53	0.40	31.1	38	81	1.4	0.99
5375300N	SP 43	B22t	47 - 65	7.4	0.04	109	0	123	0.60	0.070	9	14.17	15.53	0.78	0.38	30.9	41	76	1.9	0.91
	SP 43	B3	65 - 80	8.2	0.05	79	0	142	0.10	0.020	5	15.37	16.69	1.23	0.36	33.7	42	81	2.9	0.92

Soil Profile Class "Property" Grid Reference (AMG)	Profile Number	Horizon	Sample Depth (cm)	Gravel (of total) >2000 (µm) (%)	Sand Coarse >250 (µm) (%)	Sand Fine <250 (µm) (%)	Silt (%)	Clay (%)	Clay Mineralogy (Approximate weight %)		
									Smectite	Kaolinite	Illite
Eastfield	SP 12	A1	0 - 8	0	14	50	18	18		80	20
"Kelvin Grove"	SP 12	A2	8 - 18	0	18	48	16	18	25	65	10
540600E	SP 12	B21t	18 - 60	0	4	17	11	68	80	20	
5376300N	SP 12	B22t	60 - 70	6	13	17	12	59	85	15	
	SP 12	B3	70 - 80	4	28	16	9	47			
Eastfield	SP 43	A1	0 - 16	0	4	54	29	14			
"Leverington"	SP 43	A2	16 - 23	0	6	52	26	17			
520800E	SP 43	B21t	23 - 47	0	2	30	13	56			
5375300N	SP 43	B22t	47 - 65	1	2	27	15	56			
	SP 43	B3	65 - 80	1	2	41	10	47			

Table 2: Analytical data for Eastfield, taken from Doyle (1993)

4.1.2 Un-named Miscellaneous Soils Related to Eastfield (MEa) Association

D - Deddington Association *(200 sq. km)*
This, the most extensive of the 15 soil associations, occupying most of the foothill country of the Ben Lomond Plateau within the Longford sheet. West of the South Esk River it is represented in this sheet only by the top of Hummocky Hills. *As discussed earlier, Deddington Association soils are not really a separate association - more a separate soil landscape. The basis of distinction between the MEa and the Eastfield Associations is that the entire MEa unit occurs above 300m in steeper and stonier country.*

Differences between soils of the *MEa* and Eastfield Associations are only of degree. Profiles conforming with the Eastfield *SPC* are found in the *MEa mapping unit* but shallower profiles with less development of the bleached subsurface horizons are more common. Such profiles contain small to moderate amounts of the rounded ferruginous gravel. Many profiles show little or no development of the bleached subsurface. Texture of the surface horizons of all these soils is usually loam rather than fine sandy loam.

The shallow *Bloomfield soils (Bo)* noted in the Eastfield Association occur to about the same extent in the *MEa Mapping Unit. (Refer to the Eastfield Association for the Eastfield SPC and Appendix 9 for the Bloomfield SPC.)*

Land Use

Because of steep terrain, surface stoniness, and frequent rock outcrop agricultural usage of the *MEa* Association is almost confined to rough grazing in more or less open woodland. Some milling of timber and cutting of fence posts is done in heavier forest country near Blessington. Further agricultural development seems limited by costs of clearing and of topdressing. In regard to the latter, spreading of fertiliser from aircraft may become important.

4.2 Soils on Basalt

4.2.1 Breadalbane Association (Bd)

Bd - Breadalbane Association (*30 sq. km.*)
Basalt, the parent material of the Breadalbane soils, occurs discontinuously in three localities within the Longford sheet. The largest, near Evandale, forms a small plateau with gentle slopes on top but with sides sloping steeply along the valleys of Rose Rivulet and its tributaries. The basalt is undercut by these streams, with resultant slumping around the steep valley sides. Thus the association includes topography varying from gentle to very steep.

Two series of soils, the Breadalbane and the Evandale, are co-dominant in this association. The Breadalbane *SPC*, from which the association takes its name, consists of shallow stony brown profiles, common in the better drained situations such as round the crests of ridges and knolls. They have grey-brown to brown friable clay loam surface textures overlying a brown to reddish brown clay, passing at about *40cm* to boulders of basalt with clay in between the cracks. Basalt “floaters” are scattered on the surface and through the profile. Occasionally there may be small amounts of lime in the subsoil. On lower slopes with poor drainage, soils are often of the Evandale *SPC*, in which a dark grey clay at the surface passes to a plastic, dark yellowish grey clay with mottling, and to friable decomposing basalt below about *95cm*. “ Floaters” of basalt are present in these soils but much less commonly than in the Breadalbane *SPC*.

Minor soils of the association include those soils transitional between the *Evandale and Breadalbane SPC*, a deep, black “self mulching” clay with lime in the subsoil, on lower slopes affected by drainage waters from the decomposing basalt above, *described as Type A by Loveday et al. (1952*), and Krasnozem soils, indicated on the map by the *code BdKb*.

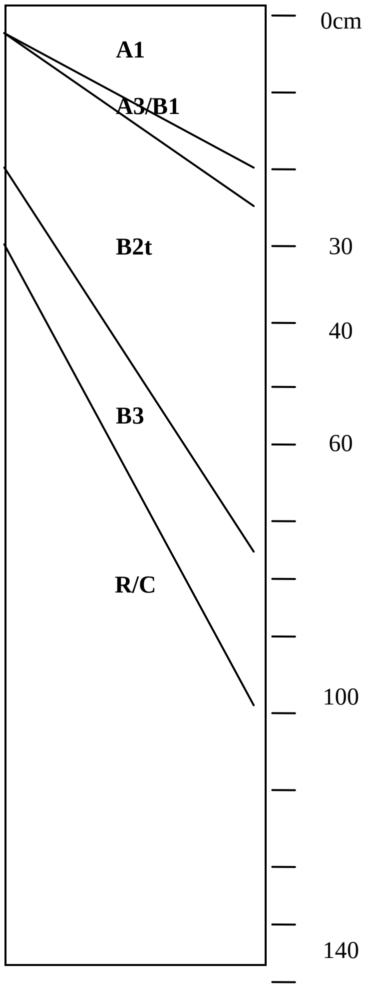
The Krasnozems occur in two localities in the Longford sheet, the larger being at Viney’s Sugarloaf. They are deep friable red-brown clays with the apparent texture of loam or clay loam at the surface, containing pieces of soft weathered basalt, and distinguishable only by their parent material from kranozems of the Eastfield Association which also occur near Viney’s Sugarloaf.

Land Use

Virtually the whole area of the association is under more or less intensive agricultural use. Most has been cultivated, including some steep slopes. Surface stoniness has been a problem, particularly with soils of the Breadalbane *SPC*.

Breadalbane Soil Profile Class

Name	**Breadalbane SPC (Bd)**
Concept	**Shallow, stony, well drained soil with a loamy brown topsoil overlying a brown clayey subsoil developed on basalt**
Aust. Soil Classification	Eutrophic Brown Dermosol
Great Soil Group	Non-calcic brown soils, Brown earth, Euchrozem
Principal Profile Form	Gn or Db
Mapping Units	Bd, Bd - Ps
Geology	Tertiary Basalt, occasionally Jurassic Dolerite
Landform	Crests or upper part of gently or moderately undulating low hills
Drainage	Moderately well to well drained
Land Capability	Class 4 or 5



A1: Brown, black or grey (7.5YR 4/2, 3/3, 3/2, 3/1, 10YR 3/3,3/2,3/1,2/2, 2/1); heavy loam to clay loam; moderate to strong 5-10mm subangular blocky parting to 2-5mm subangular blocky or granular structure; very weak to weak (moist) consistence ; 2-20% basaltic gravels; pH 5.5 - 6.0; clear to gradual smooth change to

A3/B1: Brown or black (7.5YR 3/4, 3/3, 3/2, 3/1, 2/3, 2/2, 2/1, 10YR 3/3, 3/2, 3/1, 2/2,2/1) ; clay loam to medium clay; moderate to strong 5-10mm subangular blocky parting to 2-5mm subangular blocky or granular structure; very weak to weak (moist) consistence ; 10-50% basaltic gravels; pH 5.5 - 6.5 ; diffuse change to

B2t: Occasionally mottled; red or brown (2.5YR 3/2, 5YR 3/2, 3/3,3/4, 4/3, 4/4, 5/3, 5/4, 7.5YR 4/3,4/4,5/3,5/4 10YR 4/3,5/3,5/4,5/6); medium to heavy clay; moderate to strong 20-100mm angular blocky parting to 5-10mm angular blocky structure; firm to very firm (moist) consistence ; 2-90% basaltic gravels; clay cutans common and slickensides occasionally present; pH 6.5 - 7.0; gradual to diffuse change to

B3: Brown or red (10YR 5/4, 5/6, 5/8 7.5YR 3/3, 3/4 5YR 3/3, 3/4); medium to heavy clay; moderate 20-100mm blocky structure; firm (moist) consistence ; slickensides occasionally present; 2-20% basaltic gravels; pH 7.0-7.5; sharp change to

R/C: Weathered basalt bedrock, clay in between boulders and occasionally small amounts of lime segregations present

Morphological Sites: LRRBD 8, 9, 11, 95, 101, 122
Analysed Sites: CSIRO H27, 52, 87; LRRBD 15, 29, 111
Related soil names: Breadalbane clay loam, Breadalbane series, Breadalbane SPC
Previously described by: Loveday & Dimmock (1952), Dimmock & Loveday (1953), Nicolls (1958), Doyle (1993)

Soil Profile Class "Property" Grid Reference (AMG)	Profile Number	Horizon	Sample Depth (cm)	pH water (1:5)	EC (d/sm)	Total P (mg/kg)	Avail. P (mg/kg)	Avail. K (mg/kg)	Org. Carb. (%)	Total N (%)	C/N Ratio	Ca	Mg	Na	K	Total Bases	CEC	BASE SAT (%)	ESP (%)	Ca/Mg Ratio
												(milli-equivalents / 100 grams of soil)								
Breadalbane	SP 15	A1	0 - 16	5.8	0.10	208	7	225	3.40	0.296	11	8.78	3.22	0.30	0.70	13.0	19	68	1.6	2.73
"Woorak"	SP 15	B2t	16 - 28	6.7	0.06	137	0	178	1.80	0.168	11	19.72	11.88	0.59	0.59	32.8	43	76	1.4	1.66
531400E																				
5375900N																				
Breadalbane	SP 29	A1	0 - 25	6.1	0.09	115	1	116	1.30	0.154	8	8.42	5.48	0.62	0.42	14.9	18	84	3.5	1.54
"Vaucluse"	SP 29	B21t	25 - 55	7.2	0.10	88	0	123	0.70	0.096	7	16.77	14.06	2.00	0.55	33.4	39	85	5.1	1.19
537300E	SP 29	B22t	55 - 75	8.2	0.46	110	0	95	0.50	0.069	7	19.07	17.87	4.17	0.49	42.0	37	114	11.3	1.07
5373900N	SP 29	BC	75 - 90	8.6	0.89	57	0	102	0.30	0.037	8	23.66	19.86	5.92	0.51	50.7	41	123	14.3	1.19
Breadalbane	SP 111	A1	0 - 11	5.8	0.06	212	15	739	3.37	0.302	11	8.14	3.99	0.36	1.73	14.2	19	73	1.9	2.04
"Stockwell"	SP 111	A3	11 - 20	6.6	0.08	156	4	817	2.00	0.165	12	20.22	14.06	0.62	2.33	37.2	44	85	1.4	1.44
528850E	SP 111	B2t	20 - 45	7.7	0.08	131	3	540	1.37	0.100	14	22.69	16.97	0.75	1.50	41.9	49	86	1.5	1.34
5368750N																				
Breadalbane	H 52	A1	0 - 5	6.1		150			3.27	0.318	10	12.70	14.90	1.66	1.25	28.9	44	66	3.8	0.85
CSIRO	H 52	B21	6 - 23	6.7					1.75	0.203	9	18.00	23.50	3.20	1.03	42.5	58	74	5.6	0.77
Campbell Town	H 52	B22	23 - 38	7.9		100			1.58	0.183	9	18.40	32.20	5.00	1.00	51.6	62	83	8.1	0.57
537355E	H 52	B3	41 - 58	9.3					0.70	0.065	11	2.00								
5366764N																				
Breadalbane	H 87	A1	0 - 5	6.3		700			4.90	0.495	10	22.40	10.50	0.03	0.75	33.7	49	69	0.1	2.13
CSIRO	H 87	A3	5 - 10	6.6		640			3.00	0.327	9	25.00	11.10	0.25	1.20	37.3	49	76	0.5	2.25
Campbell Town	H 87	B2	11 - 27	7.0		690			1.50	0.165	9	25.80	16.70	0.13	0.29	42.8	50	85	0.3	1.54
537346E	H 87	B3	27 - 39	7.2					0.90	0.084	11									
5364910N	H 87	C	39 - 55	7.3								24.40	11.70	0.46	0.15	36.3	41	89	1.1	2.09

Table 3 Analytical data for Breadalbane, taken from Doyle (1993)

Soil Profile Class Grid Reference (AMG)	Profile	Horizon	Sample (cm)	Gravel >2000 (µm) (%)	Sand >250 (µm) (%)	Sand <250 (µm) (%)	Silt (%)	Clay (%)	Clay Mineralogy (Approximate weight %) Smectite	Kaoninite	Goethite	Kaolin-Smectite	Haematite	Inter-Stratified
Breadalbane	SP 15	A1	0 - 16	1	5	48	26	21		80		20		
"Woorak"	SP 15	B2t	16 - 28	1	1	15	8	77				100		
531400E														
5375900N														
Breadalbane	SP 29	A1	0 - 25	3	9	44	14	33	40	55	5			
"Vaucluse"	SP 29	B21t	25 - 55	0	3	16	13	68	45	55				
537300E	SP 29	B22t	55 - 75	0	2	14	21	63	40	60				
5373900N	SP 29	BC	75 - 90	0	1	9	23	68						
Breadalbane	SP 111	A1	0 - 0	0	2	52	12	34						
"Stockwell"	SP 111	A3	11 - 20	0	1	13	7	79						
528850E	SP 111	B2t	20 - 45	1	1	11	4	85						
5368750N														
Breadalbane	H 52	A1	0 - 5	3	5	27	22	40						
CSIRO	H 52	B21	6 - 23	0	2	15	13	67						
Campbell Town	H 52	B22	23 - 38	15	2	13	14	68	50-65	10-20			10-20	10-20
537355E	H 52	B3	41 - 58	0										
5366764N														
Breadalbane	H 87	A1	0 - 5	21	3	31	32	22						
CSIRO	H 87	A3	5 - 10	66	7	33	19	35						
Somerset	H 87	B2	11 - 27	55	14	27	8	45	50-65	10-20			5-10	10-20
537346E	H 87	B3	27 - 39											
5364910N	H 87	C	39 - 55											

Table 3 (Continued)

4.3 Soils on Sandstone

4.3.1 Blessington Association (Bl)

Bl - Blessington Association *(14 sq. km)*
Soils on siliceous sandstones of Triassic age constitute the Blessington Association. Within the Longford map these sandstones are almost restricted to the foothills of the Ben Lomond Plateau near Blessington. The sandstone country is mostly rugged, with steep slopes and frequent cliffs, and except for a few small clearings still carries eucalypt forest.

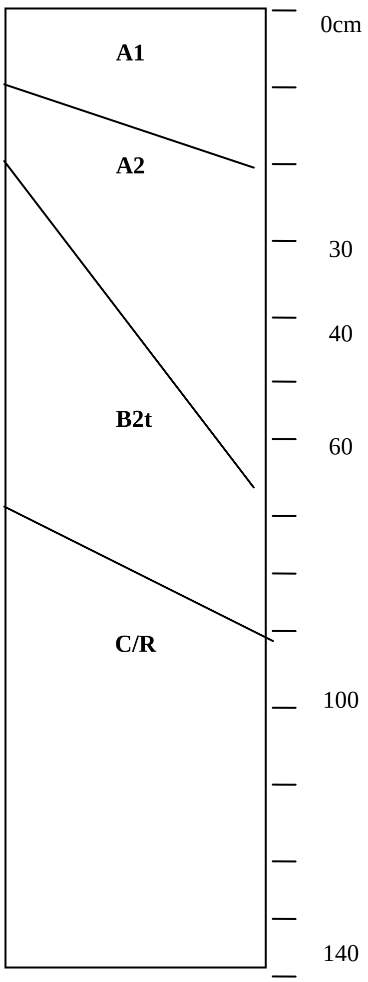
The soils all have a grey-brown sandy surface over a light grey to light brown sandy subsurface with scattered lumps of sandstone. These horizons are underlain, at *20-75cm* or occasionally more, by friable or plastic clays, sandy clays or sandy clay loams, passing to decomposing sandstone.

Land Use

Though similar soils are extensive elsewhere in Tasmania and some are fairly highly developed agriculturally, their area within this sheet is relatively small. Because of the ruggedness of most of the terrain the potential for further development of these soils appears to be slight.

Blessington Soil Profile Class

Name	**Blessington SPC (Bl)**
Concept	**Brown sandy texture contrast soils with sandy surfaces and sandy clay or loamy subsoils developed on Permian and Triassic sandstones. Accumulation of sand on surface common.**
Aust. Soil Classification	Brown Sodosols
Great Soil Group	Yellow podzolic or Solodic soil
Principal Profile Form	Dy
Mapping Units	Bl, Bl-Ca, Bl-Ps
Geology	Permian and Triassic siliceous sandstones
Landform	Moderate to steeply undulating footslopes of scarps and hills
Drainage	Imperfectly drained



A1: Black (10YR 3/2); loamy sand to sandy loam; weak 5-20mm blocky structure parting to single grain structure; loose to very weak (moist and dry) consistence; 2-10% sandstone or quartz gravels; pH 5.5; clear to gradual smooth change to

A2: Grey (7.5YR 4/1, 4/2, 10YR 4/1, 4/2); sand to sandy loam; massive or single grained structure; very weak (moist or dry) consistence; 2-10% sandstone or quartz gravels; pH 5.5; E.C 0.2 dS/m; abrupt wavy change to

B2t: Mottled; brown (7.5YR ¾, 4/4, 5/8 10YR 5/4, 5/6, 5/8); sandy clay loam to sandy heavy clays; strong 50-100mm prismatic or columnar structure; firm to very firm (moist and dry) consistence; many clay coatings; pH 6.5 - 7.0; EC 0.4 dS/m (slightly saline); clear change to

C/R: Weathered sandstone

Morphological Sites: LRRBD L109, 146, 152; WTRBG 8M, 11P
Analysed Sites: No sites available
Related soil names: Unnamed dominant soil, Podzolic soils on sandstone, Blessington SPC
Previously described by: Nicolls (1958), Leamy (1961), Doyle, (1993)

4.4 Soils on Mudstone

4.4.1 Arnon Association (An)

A - Arnon Association *(12 sq. km)*
The Arnon soils are formed on Permian mudstone and siliceous metamorphic rocks at dolerite contacts. They occur in relatively small basin-like depressions amongst the dolerite hills.

Most profiles have a grey to grey - brown loam, fine sandy loam or clay loam surface with a lighter coloured fine sandy or silty loam subsurface. At depths around *30cm* there is usually a mottled grey, grey-brown and yellow-grey clay. These soils may be shallow and/or may contain much fragmented rock, but some borings showed clay to at least *1m*. Where small outcrops of dolerite occur amongst the mudstones, patches of Eastfield soils are mapped with Arnon Association.

Land Use

The association covers only a small area. Much of it has been cleared, and some carries good sown pastures. Such development is rather unusual with Permian mudstone soils in Tasmania.

4.5 Soils of the Basin Sediments, River Terraces & Recent alluvium

4.5.1 Woodstock Association (Wk)

W - Woodstock Association *(100 sq. km)*
These soils are found at the highest levels (*170-240m)* reached by the lake sediments. They occupy the flat to very gently dissected remnants of what may be the ancient lake floor. The Midlands Highway crosses the largest of these to the south of the Longford sheet between Epping Forest and Conara. Lagoons up to one and a half *kilometres* in diameter are a prominent feature particularly west of Longford.

The soils are lateritic and of low fertility. The dominant soil is the Woodstock *SPC*, in which the surface is a dark brownish grey loamy sand to sandy loam with some ironstone gravel, the subsurface a light grey to light brown sand to sandy loam with varying but usually large amounts of ironstone gravel, and the subsoil, at about *45cm*, a mottled bright yellow-brown, red-brown and grey friable clay sometimes with veins of platy ironstone. Occasionally massive boulders of concretionary laterite lie on the surface.

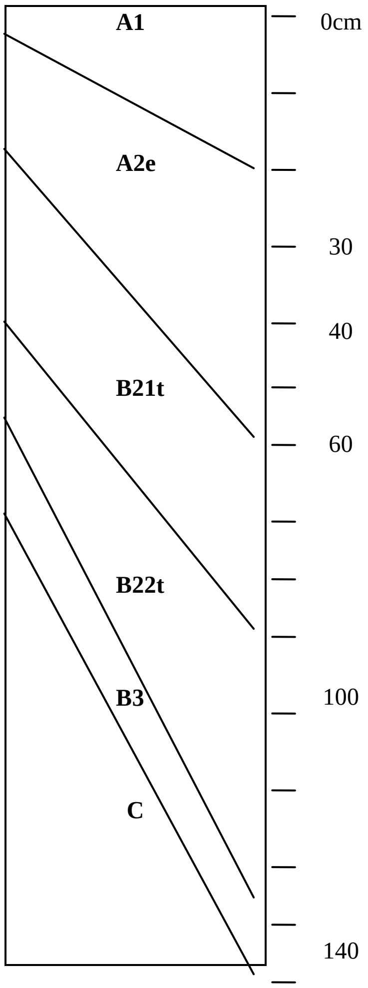
The minor soils of the Woodstock association are similar to the Woodstock SPC. A deeper sandy profile with dull coloured clay subsoils, and little or no ironstone in the subsoil is usually found around the boundary of the Woodstock association. Brown sandy soils occur in the small lunettes with miscellaneous soils found in drainage lines and floors of the smaller lagoons. Small extents of Cressy soils on eroded slopes are included in the Woodstock association.

Land Use

The Woodstock association has largely been left to carry its natural vegetation of sclerophyll forest dominated by black peppermint (*Eucalyptus amygdalina)* which is slowly being exploited for firewood and fence posts. Some areas have been fully cleared and support improved pastures. These can be extended as economy allows.

Woodstock Soil Profile Class

Name	**Woodstock SPC (Wk)**
Concept	**Deeply weathered, texture contrast soils with sandy surfaces rich in ironstone, structured brown clay subsoils developed on peneplain of the tertiary Launceston basin.**
Aust. Soil Classification	Brown Kurosols or Brown Sodosols
Great Soil Group	Lateritic podzolics
Principal Profile Form	Dy, Dr
Mapping Units	Wk, Wk-Ps
Geology	Laterised tertiary lake sediments
Landform	Flat to gently undulating dissected peneplain
Vegetation	Dry sclerophyll forest dominated by *Eucalyptus amygdalina* and *E. viminalis, Banksia marginata* and *Acacia dealbata*
Surface Condition	Occasional petroferric boulders and shale (laterite)
Permeability	Moderately permeable
Drainage	Imperfectly drained



A1: Black or grey (10YR 3/1, 3/2 , 5/2, 7.5YR 3/2); loam sand to sandy loam; single grained or weak <2 - 5mm subangular blocky structure; loose or weak (moist) consistence; few to common 2-6mm ferruginous nodules; pH 5.5-6.0; clear to diffuse smooth change to

A2e: Conspicuously bleached grey (10YR 4/2, 4/3. 5/2, 5/3, 6/2); loamy sand to sandy loam; single grained, massive or weak <2mm subangular blocky structure; loose to weak (moist) consistence; common to abundant 2-20mm ferruginous nodules, occasional quartz pebbles present; pH 5.5-6.0; sharp to abrupt wavy change to

B21t: Mottled; brown (10YR 4/6, 5/4, /6, 5/8, 7.5YR 4/6, 5/6, 5YR 4/6, 5/6, 5/9); medium to heavy clay; moderate 5-10mm angular blocky breaking to 2-5mm angular blocky structure; firm to very firm (moist) consistence; common distinct clay skins; few to common 2-20mm ferruginous nodules; pH 6.0-6.5; gradual or diffuse change to

B22t: Mottled; brown (2.5Y 5/6, 10YR 4/6, 5/6, 5/8, 7.5YR 4/6, 5/6); medium to heavy clay; weak 2-10mm angular blocky structure; firm to very firm (moist) consistence; common distinct clay skins; few to common 2-6mm ferruginous nodules; pH 5.5-6.0; gradual to diffuse change to

B3: Mottled; brown (10YR 4/6, 5/6, 5/8, 7.5YR 5/6, 5/8); light to heavy clay; firm (moist) consistence; few to common 2-6mm ferruginous nodules; pH 5.0-5.7; gradual change to

C: Weathered lateritic clays.

Morphological Sites: CARDS CO400, LRRBD L100, 125, 132, 148, 17, 22, 3, 37, 4, 50, 73
Analysed Sites: CSIRO H34, H20, H19, H16; LRRBD L147
Related soil names: Woodstock sand, Woodstock series
Previously described by: Stephens *et al* (1942), Nicolls (1958, 1959), Doyle (1993)

Soil Profile Class "Property" Grid Reference (AMG)	Profile Number	Horizon	Sample Depth (cm)	pH water (1:5)	EC (d/sm)	Total P (mg/kg)	Avail. P (mg/kg)	Avail. K (mg/kg)	Org. Carb. (%)	Total N (%)	C/N Ratio	Ca	Mg	Na	K	Total Bases	CEC	BASE SAT (%)	ESP (%)	Ca/Mg Ratio
												(milli-equivalents / 100 grams of soil)								
Woodstock	SP 166	A1	0 - 20	5.5	0.04	57	2	14	1.50	0.094	16	2.24	1.22	0.40	0.25	4.1	5	87	8.5	1.84
"Cleveland Hwy"	SP 166	A21	20 - 33	6.8	0.02	16	2	14	0.12	0.014	9	0.17	0.50	0.29	0.29	1.2	2	56	13.0	0.33
572000E	SP 166	A22	33 - 51	6.8	0.02	23	1	14	0.00	0.013	0	0.13	0.60	0.33	0.28	1.3	2	64	15.8	0.22
5333200N	SP 166	B21t	51 - 95	6.1	0.15	65	1	64	0.00	0.031	0	0.83	19.38	3.75	0.53	24.5	45	55	8.4	0.04
	SP 166	B22t	95 - 110	6.8	0.19	63	1	79	0.00	0.020	0	0.75	17.33	4.23	0.57	23.0	39	59	10.8	0.04
Woodstock	H 19	A1	0 - 4	6.4		70			2.10	0.176	12	2.70	1.00	0.10	0.22	4.0	16	25	0.6	2.70
CSIRO	H 19	A21	4 - 10	5.6		40			0.90	0.075	12	1.60	0.21	0.10	0.15	2.1	8	26	1.3	7.62
Somerset	H 19	A22	10 - 28	5.7		10			0.30	0.032	9									
530456E	H 19	A23	28 - 36	6.2																
5370494N	H 19	B21	36 - 56	6.3								0.74	7.20	1.70	0.22	9.9	22	45	7.8	0.10
	H 19	B22	56 - 86	6.4																
	H 19	B23	114 - 127	5.4								1.10	7.80	2.90	0.09	11.9	23	51	12.6	0.14

Soil Profile Class "Property" Grid Reference (AMG)	Profile Number	Horizon	Sample Depth (cm)	Gravel (of total) >2000 (µm) (%)	Sand Coarse >250 (µm) (%)	Sand Fine <250 (µm) (%)	Silt (%)	Clay (%)	Clay Mineralogy: Smectite	Kaolinite	Illite	Goethite
									(Approximate weight %)			
Woodstock	SP 166	A1	0 - 20	0	7	83	6	4		100		
CSIRO	SP 166	A21	20 - 33	3	6	83	7	4		85	15	
Somerset	SP 166	A22	33 - 20	16	7	82	6	4		90	5	5
530456E	SP 166	B21t	51 - 33	0	1	10	3	86	5	80		15
5370494N	SP 166	B22t	95 - 110	0	2	13	3	81	5	80		15
Woodstock	H 19	A1	0 - 4	22	11	60	17	9				
"Cleveland Hwy"	H 19	A21	4 - 10	38	9	65	16	8				
572000E	H 19	A22	10 - 28									
5333200N	H 19	A23	28 - 36									
	H 19	B21	36 - 56		1	9	1	86		65-80		20-30
	H 19	B22	56 - 86									
	H 19	B23	114 - 127	22	6	15	8	72				

Table 4: Analytical data for Woodstock, table taken from Doyle (1993)

4.5.2 Cressy Association (Cs)

C - Cressy Association *(90 sq. km)*
Like the Woodstock the Cressy soils are lateritic, but unlike the Woodstock they do not possess the deep sandy and gravelly surface and subsurface horizons. They occupy gently to moderately sloping country between remnants of the Woodstock and Brickendon surfaces. *The Cressy soils are mostly confined to the west of the Lake and South Esk Rivers.*

The dominant soils belong to the Cressy *SPC* and have a grey to brown loam to clay loam surface, sometimes a thin bleached subsurface which may be sandy, and, at shallow depths, a subsoil clay identical with that of the Woodstock *SPC*. Platy or sometimes rounded ironstone gravel occurs throughout the profile.

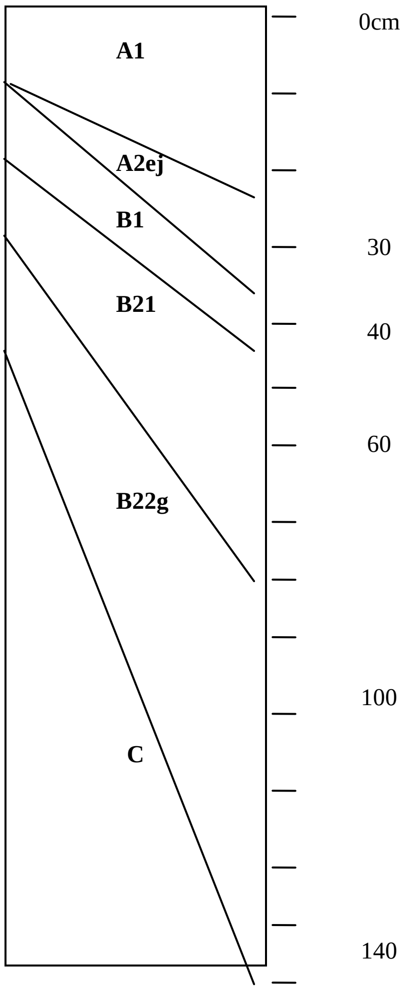
Several variants occur, including red-brown profiles with a looser, more friable consistence which are similar to the Basaltic soils of the Deloraine Association (Deloraine SPC) on the Quamby map sheet (Appendix 9). There are also some profiles with more sandy surface horizons, and some with a loose powdery surface. In depressions and along drainage ways are small extents of soils of the Kinburn association *(Kb)* described in *section 4.5.7.*

Land Use

The Cressy soils have been extensively exploited and most have undergone prolonged cultivation. Diagnosis and treatment of the molybdenum deficiency characteristic of these soils has enabled the establishment of sown pastures, and fat lamb raising has largely replaced their former cultivation.

Cressy Soil Profile Class

Name	**Cressy SPC (Cs)**
Concept	**Structured brown clay loam surface soils overlying clayey subsoils containing shale fragments on gently undulating slopes below the Woodstock and Brickendon surfaces of the Launceston basin**
Aust. Soil Classification	Brown Dermosols
Great Soil Group	Lateritic podzolic soil
Principal Profile Form	Dy3, Dr3, Db2, Gn3
Mapping Units	Cs
Geology	Lateritic tertiary lake sediments of the Launceston basin
Landform	Eroded gently to moderately undulating hillslopes formed by the dissection of a peneplain
Vegetation	Savannah woodland dominated by *Eucalyptus pauciflora* and *E. ovata*
Surface Conditions	Occasional shale lateritic boulders, ironstone pebbles common
Permeability	Moderately permeable
Drainage	Imperfect to moderately well drained



A1: Black (10YR 2/1,3/1,3/2, 7.5YR 2/2,3/2, 5YR 2/2,3/1,3/2); clay loam to light clay; weak <2-5mm granular structure; moderately weak (moist) consistence; common 6-20mm ferruginous nodules; pH 5.5-6.0; clear to diffuse change to

A2e: Occasionally absent, occasionally mottled; conspicuously or sporadically bleached (10YR 4/2,5/2,5/3, 7.5YR 4/2); clay loam to medium clay; massive or weak to moderate 5-10mm granular or sub-angular blocky structure; moderate weak (moist) consistence; many 6-20mm ferruginous nodules; occasionally quartz pebbles or gravels; pH 5.0 - 6.2; abrupt or clear change to

B1: Mottled; brown, red or grey (7.5 YR 4/4,5/4, 5YR 4/4,3/4, 2.5YR 3/6, 10YR 4/3,4/4,5/3); medium to heavy clay; massive, weak or moderate 5-10mm blocky structure; moderately weak to firm (moist) consistence; common or many 6-20mm ferruginous nodules; pH 5.5-6.5; diffuse change to

B21: Mottled; brown or red (10YR 4/4,5/4 7.5YR 4/4, 5/4, 5/6, 5YR ¾,4/4,4/6, 2.5YR 3/6,4/6); medium to heavy clay; moderate 5-10mm angular blocky structure; moderately firm (moist) consistence; common 6-20mm ferruginous nodules; pH 5.5-6.5; diffuse change to

B22g: Mottled; gleyed or grey (5Y 4/1,5/1, N 6/0,7/0); heavy clay; moderate 5-50mm angular blocky structure; very firm (moist) consistence; common 6-20mm ferruginous nodules; pH 4.5-6.0;

C: Weathered shale (laterite

Morphological Sites:
Analysed Sites: CSIRO H7, 194, 196, 242, 243, 244, 260
Related soil names: Cressy series, Cressy shaley clay loam
Previously described by: Kershaw (1975), Nicolls (1958), Stephens *et al* (1942)

4.5.3 Brickendon Association (Bk)

B - Brickendon Association (180 sq. km)
The Brickendon soils are characterised by the presence of varying but usually large amounts of quartz gravels, mostly water worn and *1 - 2.5cm* in diameter, and concentrated in the upper *metre* of the profile. *These soils belong to the highest relict river terrace (or group of terraces) of the dissected Woodstock surface and are found at elevations between 140 - 180m.* The Midlands Highway traverses the Brickendon Association almost continuously for *25km* between Perth and Epping Forest.

The Brickendon soils are lateritic and apart from the presence of the quartz gravels, very closely resemble the Woodstock *soils*, merging with the latter when the quartz gravels are rare. *The dominant soils are of the Brickendon SPC; they have a grey sandy surface over a light grey sand with varying amounts of quartz and ironstone gravels, a mottled yellow-brown, red-brown and grey friable clay subsoil is present at about 45cm.* This clay tends to be less brightly coloured than the Woodstock but is often of identical appearance. Massive boulders of laterite studded with the quartz pebbles occur in a few places. The Brickendon series is characteristic of the nearly flat benches but may extend down the slopes.

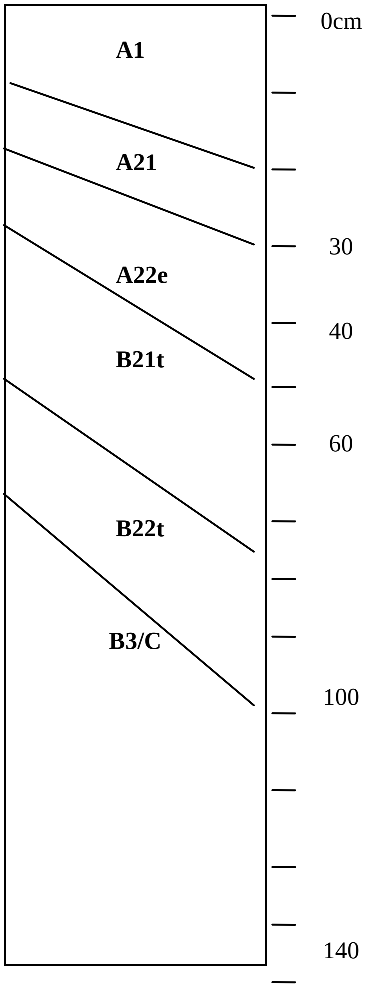
At higher elevations *(180m)* the Brickendon soils are usually very gravelly, mostly quartz, but a sandy soil having the clay subsoil with little or no gravel is also common. On some slopes, chiefly at the lower elevations, the Newham soils described below may replace the Brickendon *SPC*. On slopes to the east of the rivers there may be a cover of varying thickness of windblown sand over the Brickendon soils. *These windblown sands belong to the Panshanger SPC (Ps) and are described below.*

Land Use

Much of the Brickendon Association at the higher elevations, like the Woodstock Association, carries a sclerophyll woodland of Black peppermint (*Eucalyptus amygdalina)* and is used for woodcutting and rough grazing. Considerable areas carry a savannah woodland with Cabbage gum (*E. pauciflora)* and Swamp gum (*E. ovata*) and are used for grazing at varying levels of intensity. *Some areas are cultivated or under improved pasture. Large areas should be capable of similar use as clearing and establishment costs permit. The gravelly sub-surface horizons of the Brickendon soils are a valuable source of road-surfacing materials.*

Brickendon Soil Profile Class

Name	**Brickendon SPC (Bk)**
Concept	**Deeply weathered brown textured contrast soils with a sandy topsoil containing water worn quartz gravels overlying a clayey subsoil, found between the Brumby and Woodstock surfaces of the Launceston Basin.**
Aust. Soil Classification	Brown Chromosols or Kurosols
Great Soil Group	Lateritic Podzolic
Principal Profile Form	Db, Dy
Mapping Units	Bk
Geology	Aeolian sands and tertiary lake sediment of the Launceston Basin
Landform	Highest relict tertiary river terrace
Vegetation	Mostly cleared
Permeability	Quartz pebbles common Slow to moderate
Drainage	Imperfectly drained



A1: Black to grey (7.5YR 3/2, 10YR3/1, 3/2, 4/1); sandy loam to fine sandy loam; single grained to weak, 5-10mm subangular blocky structure, very weak to weak (moist) consistence, 10 - 20%, water worn quartz pebbles, few 2-6mm ferruginous nodules; pH 5.5 - 6.2; clear change to

A21: Mottled; grey to brown (10YR 5/2, 5/1, 7YR 5/2, 6/2); sandy loam to fine sandy loam; single grained to massive structure; very weak (moist) consistence; 20-50%, water worn quartz pebbles, common 2-6mm ferruginous nodules; pH 6.0 - 6.5; clear change to

A22e: Conspicuously bleached, mottled grey to yellow (10YR 6/2, 6/1, 6/4, 7.5YR 5/2, 6/2); sandy loam to fine sandy loam; massive structure; loose to very weak (moist) consistence; 20-50% water worn quartz pebbles, common 2-6mm ferruginous nodules; pH 6.0 - 6.5; abrupt change to

B21t: Mottled; grey to brown (2.5Y 5/4, 4/4, 5/2, 6/2, 6/6, 10YR 5/4, 5/8); medium clay; moderate, 5-10mm angular blocky structure; firm (moist) consistence; 10-20% water worn quartz pebbles; very few 2-6mm ferruginous nodules; pH 5.5 - 6.5; diffuse change to

B22t: Mottled; yellow to brown some red mottling (2.5Y 5/2, 5/6, 6/4); heavy clay; moderate 5-10mm angular blocky structure; firm (moist) consistence; <2% water worn quartz pebbles, very few 2-6mm ferruginous nodules; pH 6.5 - 7.5; gradual change to

B3/C: Heavy sediments; massive

Morphological Sites: LRRBD L62, CSIRO H78, H17, H203
Analysed Sites: LRRBD L59, L62, L82; CSIRO H17, H155, H198, H203, H219, H239, H2412
Related soil names: Brickendon series, Brickendon sand, Brickendon soils, Brickendon SPC
Previously described by: Doyle (1993), Nicolls (1958 & 1959), Kershaw (1975), Stephens *et al* (1942), Hubble (1947)

Soil Profile Class "Property" Grid Reference (AMG)	Profile Number	Horizon	Sample Depth (cm)	pH water (1:5)	EC (d/sm)	Total P (mg/kg)	Avail. P (mg/kg)	Avail. K (mg/kg)	Org. Carb. (%)	Total N (%)	C/N Ratio	Ca	Mg	Na	K	Total Bases	CEC	BASE SAT (%)	ESP (%)	Ca/Mg Ratio
												(milli-equivalents / 100 grams of soil)								
Brickendon	SP 59	A1	0 - 13	5.7	0.06	478	58	85	4.50	0.287	16	4.01	1.23	0.20	0.27	5.7	9	65	2.3	3.27
"Formosa"	SP 59	A2	13 - 30	5.9	0.03	148	13	79	1.40	0.098	14	1.83	0.64	0.15	0.22	2.8	4	63	3.4	2.85
507200E	SP 59	B21tg	30 - 52	6.1	0.05	163	0	68	1.20	0.085	14	5.01	8.26	0.72	0.25	14.3	30	48	2.4	0.61
5377600N	SP 59	B22t	52 - 78	6.0	0.06	161	0	56	1.20	0.085	14	3.38	10.15	1.06	0.22	14.8	27	55	3.9	0.33
	SP 59	B23t	78 - 93	5.7	0.08	98	0	32	0.60	0.042	14	1.70	8.08	3.43	0.22	13.4	30	45	11.4	0.21
Brickendon	SP 62	A1	0 - 13	5.1	0.06	362	58	103	4.30	0.278	15	2.84	0.73	0.17	0.35	4.1	7	59	2.5	3.88
"Formosa"	SP 62	A21	13 - 30	5.6	0.02	418	4	32	0.60	0.036	17	0.50	0.24	0.17	0.16	1.1	2	45	7.2	2.09
507000E	SP 62	A22	30 - 42	6.2	0.03	109	0	38	0.60	0.031	19	1.69	1.09	0.79	0.19	3.8	6	68	14.3	1.54
5376650N	SP 62	B21t	42 - 85	5.3	0.08	150	0	21	0.80	0.031	26	1.45	4.82	0.74	0.20	7.2	29	25	2.6	0.30
	SP 62	B22t	85 - 95	5.0	0.09	154	0	21	0.40	0.025	16	0.42	3.82	0.72	0.22	5.2	24	22	3.0	0.11

Soil Profile Class "Property" Grid Reference (AMG)	Profile Number	Horizon	Sample Depth (cm)	Gravel (of total) >2000 (μm) (%)	Sand Coarse >250 (μm) (%)	Sand Fine <250 (μm) (%)	Silt (%)	Clay (%)	Clay Mineralogy: Kaolinite	Illite	Goethite	Lepidocrocite
									(Approximate weight %)			
Brickendon	SP 59	A1	0 - 13	19	23	49	13	15				
"Formosa"	SP 59	A2	13 - 30	78	57	26	10	8	85		5	
507200E	SP 59	B21tg	30 - 52	0	2	6	1	91	75		15	5
5377600N	SP 59	B22t	52 - 78	0	1	3	0	97	85		10	2
	SP 59	B23t	78 - 93	0	2	12	3	84	90		5	
Brickendon	SP 62	A1	0 - 13	27	27	50	12	11				
"Formosa"	SP 62	A21	13 - 30	52	35	42	13	10				
507000E	SP 62	A22	30 - 42	0	26	30	17	27	65	5	20	5
5376650N	SP 62	B21t	42 - 85	0	9	6	10	75	85		10	2
	SP 62	B22t	85 - 95	0	14	11	13	62	80		15	

Table 5 Analytical data for Brickendon, taken from Doyle (1993)

4.5.4 Newham Association (Ne)

N - Newham Association *(26 sq. km)*
This association bears the same relationship to the Brickendon Association as does the Cressy to the Woodstock, that is, it occupies some slopes falling away from the Brickendon. *The Newham soils occur only to a small extent within this map and are often found in association with the Brickendon soils. Frequently the Brickendon terrace joins the next Lower Brumby terrace in short steep slopes too small in extent to be mapped separately.*

The Newham SPC, containing the dominant soils of this association, has a brownish grey loam or sandy loam surface over a light brownish grey bleached sandy loam subsurface, with variable (occasionally large) amounts of quartz and/or ironstone gravel. At about *30cm* is the subsoil of dull yellow-brown mottled tough clay, with dark grey staining on aggregate faces.

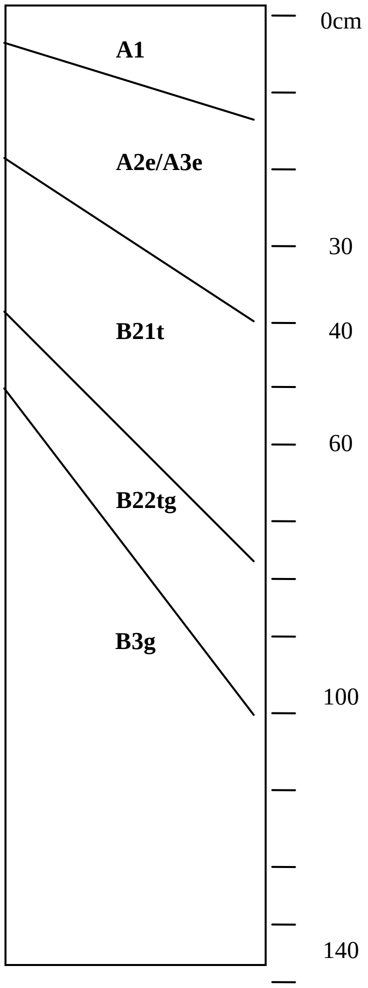
In places the Newham soils have a hummocky micro-relief, with a darker, more organic surface in the depressions and sometimes exposures of clay on the mounds. Small areas of Brickendon soils are included with this association.

Land Use

These soils have been cultivated in places and some carry improved pastures. Others have been little developed and are used for rough grazing, these should be capable of much more intensive use.

Newham Soil Profile Class

Name	**Newham SPC (Ne)**
Concept	**Brown loamy soils with quartz and/or ferruginous nodules over a mottled brown structured clay developed on the slopes between the Brickendon surface and Brumby terraces of the Launceston basin**
Aust. Soil Classification	Brown Chromosol
Great Soil Group	Yellow podzolic soil or Soloth
Principal Profile Form	Dy, Db
Mapping Units	Ne, Ne-Ps
Geology	Colluvium and aeolian sediments as well as deeply weathered tertiary clays of the Launceston tertiary basin
Landform	Simple gently to moderately undulating pediment between terraces of a peneplain.
Permeability	Slowly permeable
Drainage	Imperfectly drained



A1: Occasionally mottled; black (10YR 3/2, 7.5YR 3/2); loam to fine sandy loam; weak to moderate 5-10mm subangular blocky structure; very weak (dry) consistence; 2-10% quartz pebbles; pH 5.5 - 6.5; abrupt to clear change to

A2e/A3e: Conspicuously bleached; sandy loam to sandy clay loam; massive to weak 5-10mm blocky structure; weak to firm (dry) consistence; occasionally common to many manganiferous or ferruginous nodules; 2-50% quartz pebbles; pH 5.0-6.5; abrupt to clear change to

B21t: Mottled; brown or grey (10YR 5/4,5/5,5/6, 2.5Y 5/2); medium to heavy clay; moderate 5-20mm angular blocky structure; dark organic staining on ped faces; very firm (dry) ; <2% quartz pebbles; pH 6.0 - 7.0; gradual to diffuse boundary change to

B22tg: Mottled, grey or gleyed (2.5Y 4/3, 5/2, 5/3, 5/4, 5Y 5/1, N 4/0); medium to heavy clay; massive or moderate 10-50mm angular blocky structure; 2-10% quartz pebbles ; pH 6.0 - 7.5; gradual to diffuse change to

B3g: Mottled, gleyed or grey (2.5Y 5/2, 5/3, 5/4); heavy clay; massive structure; pH 6.5 - 7.5

Morphological Sites: LRRBD L60, 67, 71, 145
Analysed Sites: LRRBD L81; PINK 12171, 12178, 12241, 12244
Related soil names: Newham series, Newham loam, Type B, Newham SPC
Previously described by: Nicolls (1958 & 1959), Stephens *et al* (1942), Hubble (1947), Doyle (1993)

4.5.5 Brumby Association (Br)

Br - Brumby Association *(132 sq. km)*
The lower relict river terraces are distinguished from the higher Brickendon terraces not only by their topographic position but also by their soils, which unlike the Brickendon soils are not lateritic. *These lower terraces and their soils which lie typically 3 - 6m above the floodplain, are mapped as the Brumby Association. They are particularly extensive along the South Esk and Lake Rivers, the South Esk reaching a width of 3km near its confluence with the Nile River.*

Soils of the Brumby and the Nuka *SPCs* are co-dominant in this Association. The two series merge into one another and are distinguishable chiefly by the tendencies of greater depths to the clay subsoil in the Brumby *SPC* and the presence of lime in the *subsoil of the Nuka SPC.* Both have surface horizons of grey or brownish-grey sandy loam or loam, and lighter coloured sub-surface horizons of fine sand, fine sandy loam or loam. These horizons are underlain sharply at depths around *40cm* in the Brumby series, or *25cm* in the Nuka *SPC,* by dark grey-brown or dark yellow-grey tough or plastic clay. Below this is yellower, mottled, more friable clay or sandy clay, usually slightly alkaline, and in the Nuka series often with small amounts of lime. Fine rounded ferruginous or quartz gravel may occur throughout the profile usually concentrated in the sub-surface horizon. Uncultivated areas of the Nuka SPC may show a hummocky micro-relief, with clay exposed at the surface in the shallow pans.

Soils of the Brumby association often cannot be mapped separately from soils of the Canola Association which occur on the most recent floodplains, consequently Canola soils traverse parts of the Brumby Association. Where windblown sands (Panshanger soils) occur as isolated small banks on the Brumby terraces or as only a thin covering to the Brumby soils, they are included with the Brumby Association. Other more clayey aeolian deposits on the Brumby terrace are also included. Soils of these deposits belong mostly to the Tara series *which correlates* with Type A *of Hubble, (1947*). The Tara soils have a greyish brown loam surface over brown sandy loam, over brown finely mottled clay which becomes more yellowish below, sometimes with lime in small amounts. The Tara soils have a sandy surface and sub-surface like the Panshanger *SPC* (see below) over a reddish or yellowish brown clay or sandy clay subsoil, sometimes passing to sand below.

Land Use

Much of the Brumby Association has been cultivated or sown to pasture, while appreciable areas now less developed appear capable of greater productivity. Because of poor external and internal drainage the Brumby soils, though dry in summer, are liable to excessive wetness in winter. Nevertheless should the practice of spray irrigation in summer develop much further the particularly favourable location, topography and extent of the Brumby soils is evident. Small salt patches, an infrequent feature of the Launceston Basin, occur most often on the Brumby terraces.

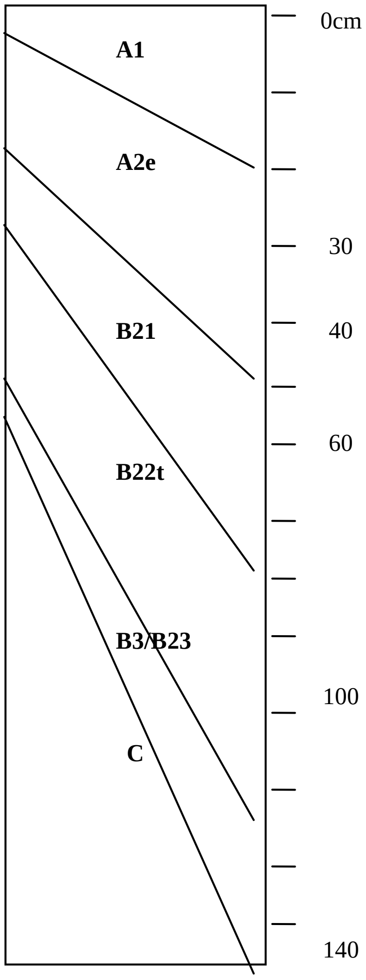
Brumby Soil Profile Class

Name **Brumby SPC (Br)**

Concept **Sodic, grey or brown texture contrast soils with shallow rooting depth, developed on low river terrace sediments**

Aust. Soil Classification Brown Sodosols or Chromosols
Great Soil Group Solodized Solonetz, Solodic
Principal Profile Form Dy, Db
Mapping Units Br, Br-Ca, Br-Ps, Br-Ta
Geology Quaternary Alluvium
Landform Flat to gently undulating river terraces

Permeability Slowly permeable
Drainage Poorly drained



A1: Black or grey (10YR 3/1, 3/2, 4/2, 7.5YR 3/2, 4/2); sandy loam to loam; weak to moderate, 5-20mm sub-angular blocky structure; very weak to weak (moist) consistence; pH 5.5 - 6.0; abrupt to clear change to

A2e: Occasionally mottled, bleached, grey (10YR 5/2, 6/2, 6/3, 6/4); loamy sand to loam fine sand; massive weak 5-20mm angular blocky structure; very weak to weak (moist) consistence; few <2mm ferruginous nodules; pH 5.5 - 6.5; abrupt to clear change to

B21: Mottled; brown to grey (2.5Y, 5/4, 4/2, 5/3, 4/3, 10YR 4/3); medium clay; moderate 100-200mm, prismatic structure parting to moderate 20-50mm angular blocky structure; firm (moist); consistence; very few <2mm manganiferous nodules; pH 6.0 - 7.0; gradual to diffuse change to

B22t: Mottled; brown (2.5Y 5/3, 5/4, 4/3, 4/2); medium to heavy clay; massive to moderate 20-50mm angular blocky structure; very firm (moist) consistence; very few <2mm manganiferous nodules present in some profiles; pH 6.0 - 8.0; EC 0.2 dS/m; gradual to diffuse change to

B3/B23: Mottled; brown (7.5YR 5/8, 2.5Y 5/4, 5/3); sandy medium clay to heavy clay; massive to weak 20-50mm angular blocky structure; pH 7.0 - 8.0, EC 0.5 dS/m; gradual change to

C: Massive clay to sandy clay; pH 8.0; EC 0.2 dS/m

Morphological Sites: SOILCO 21, 25
Analysed Sites: None available
Related soil names: Holloway (Ho), Archer Lateritic Krasnozems (ArLv)
Previously described by: Laffan *et al* (1995), Nicolls (1959)

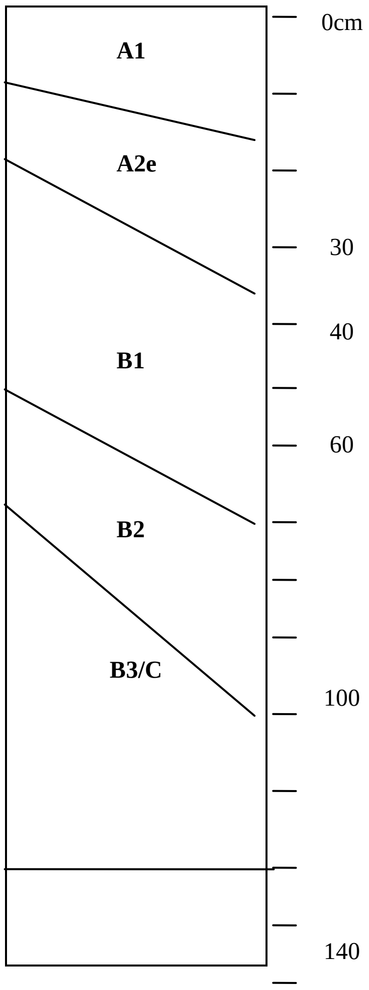
Nuka Soil Profile Class

Name **Nuka SPC (Nk)**

Concept **Poorly drained alluvial texture contrast soils with loamy grey shallow topsoils, bleached sandy subsurfaces and yellow or grey clayey subsoils with lime nodules developed on low river terraces.**

Aust. Soil Classification Black or Grey Vertosols or Sodosols
Great Soil Group Rendzina
Principal Profile Form Dd
Mapping Units Br, Br-Ca, Br-Ps, Br-Ta
Geology Quaternary alluvium
Landform Flat to very gently sloping terraces on alluvial plains

Permeability Very slowly permeable
Drainage Poorly drained



A1: Grey or black (2.5Y 5/2,6/2, 10YR 5/2, 6/2, 4/2, 5YR 2/2); loam fine sandy to clay loam; massive structure; weak to firm (moist) consistence; pH 6.0 - 6.5

A2e: Conspicuously bleached fine sandy loam to loam fine sandy, massive structure; weak (moist) consistence; very few soft manganic concretions and occasional quartz gravels present; pH 6.5 - 7.0;

B1: Mottled; grey or brown (2.5Y 3/2, 4/2, 5/3, 6/3, 6/4, 10YR 5/4, 5/6, 5/8); medium heavy to heavy clay; strong prismatic structure; very strong (moist) consistence; slickensides common, occasionally slightly calcareous; pH 6.5 - 7.0.

B2: Mottled; grey (2.5Y 5/2, 6/2); medium heavy to heavy clay; strong prismatic or columnar structure; very strong (moist) consistence; slickensides occasionally common; slightly calcareous; pH 7.5 - 8.5

B3/C: Mottled; grey (2.5Y 5/2, 6/2, 5Y 4/2); light to heavy clay; strong structure; strong (moist) consistence; calcareous soft segregations common; pH 7.5 - 8.5.

C/R: Coarse gravel beds

Morphological Sites: CARDS CO942 ; SOILCO 13
Analysed Sites: No sites available
Related soil names: Nuka loam, Nuka soils, Nuka series, Nuka SPC
Previously described by: Hubble (1947), Nicolls (1959), Doyle (1993)

Soil Profile Class "Property" Grid Reference (AMG)	Profile Number	Horizon	Sample Depth (cm)	pH water (1:5)	EC (d/sm)	Total P (mg/kg)	Avail. P (mg/kg)	Avail. K (mg/kg)	Org. Carb. (%)	Total N (%)	C/N Ratio	Ca	Mg	Na	K	Total Bases	CEC	BASE SAT (%)	ESP (%)	Ca/Mg Ratio
												(milli-equivalents / 100 grams of soil)								
Brumby	SP 39	A1	0 - 20	5.1	0.19	223	20	60	3.30	0.296	11	4.86	2.64	0.39	0.29	8.2	12	70	3.3	1.84
"Leverington"	SP 39	A2	20 - 26	5.9	0.05	83	8	33	0.70	0.069	10	1.95	2.80	0.46	0.20	5.4	8	69	5.9	0.70
521400E	SP 39	B21tg	26 - 32	6.3	0.13	68	1	95	1.10	0.117	9	5.72	14.90	1.76	0.46	22.8	26	88	6.7	0.38
5374100N	SP 39	B22tg	32 - 53	7.3	0.18	71	0	123	1.00	0.111	9	8.49	24.34	3.10	0.60	36.5	36	102	8.7	0.35
	SP 39	B23tg	53 - 82	8.6	0.54	62	0	130	0.30	0.045	7	8.45	31.02	6.13	0.66	46.7	37	127	16.6	0.27
	SP 39	B24t	82 - 165	8.9	0.66	38	0	74	0.20	0.016	13	6.53	21.74	6.19	0.43	35.5	30	119	20.8	0.30
Brumby	SP 63	A1	0 - 18	5.7	0.04	239	9	44	1.80	0.161	11	3.60	1.27	0.27	0.27	5.4	7	78	3.8	2.82
"Formosa"	SP 63	A2	18 - 25	6.5	0.02	71	0	21	0.40	0.036	11	1.45	0.71	0.19	0.21	2.6	4	73	5.4	2.04
507700E	SP 63	B21t	25 - 60	7.3	0.08	125	0	91	0.80	0.079	10	8.72	11.85	1.34	0.41	22.5	35	65	3.9	0.74
5376700N	SP 63	B22t	60 - 70	8.1	0.30	95	0	85	0.60	0.036	17	10.76	16.51	3.43	0.46	27.7	36	77	9.5	0.65
Brumby	SP 66	A1	0 - 20	5.0	0.17	328	35	104	2.30	0.140	16	1.73	0.44	0.11	0.34	2.6	6	44	1.9	3.88
"Cressy Station"	SP 66	A2	20 - 32	6.0	0.07	152	9	55	0.60	0.060	10	1.10	0.28	0.07	0.16	1.6	3	63	2.7	3.89
506300E	SP 66	B21tg	32 - 50	6.2	0.07	270	4	109	0.60	0.090	7	9.83	11.53	1.23	0.61	23.2	20	119	6.3	0.85
5379200N	SP 66	B22tg	50 - 80	6.5	0.06	196	2	88	1.50	0.070	21	6.38	11.26	1.58	0.42	19.6	19	105	8.5	0.57
	SP 66	Cg	90 - 95	7.9	0.12	92	0	98	0.80	0.050	16	7.21	14.96	3.88	0.41	26.5	19	142	20.9	0.48
Brumby	SP 89	A1	0 - 10	5.3	0.13	179	8	107	1.50	0.161	9	2.69	0.81	0.28	0.29	4.1	8	51	3.5	3.33
"Connorville"	SP 89	A2	10 - 36	6.8	0.03	139	3	43	0.12	0.031	4	2.96	1.63	0.39	0.20	5.2	8	61	4.6	1.82
507700E	SP 89	B21tg	36 - 50	8.2	0.09	86	3	64	0.12	0.049	2	4.25	13.54	3.17	0.26	21.2	30	72	10.7	0.31
5371400N	SP 89	B22t	50 - 70	8.9	0.16	64	2	71	0.00	0.028	0	5.69	20.25	6.03	0.37	32.4	36	91	16.9	0.28
	SP 89	B3g	70 - 90	9.6	0.40	52	6	71	0.00	0.014	0	5.23	18.22	7.35	0.34	31.2	24	128	30.1	0.29
Brumby	SP 113	A1	0 - 15	5.6	0.06	302	90	143	2.75	0.228	12	6.04	4.15	0.39	0.24	10.8	13	83	3.0	1.45
"Fosterville"	SP 113	A2	15 - 31	6.3	0.06	156	46	64	1.00	0.077	13	4.77	7.82	0.87	0.24	13.7	15	89	5.7	0.61
536100E	SP 113	B21tg	31 - 45	7.2	0.13	114	12	179	0.75	0.085	9	7.96	25.93	3.04	0.58	37.7	37	102	8.2	0.31
5354800N	SP 113	B22t	45 - 75	8.2	0.27	90	6	179	0.25	0.028	9	5.98	28.06	4.36	0.55	39.4	36	110	12.2	0.21
	SP 113	B3k	75 - 95	9.4	0.66	48	3	164	0.00	0.013	0	13.71	30.20	7.62	0.46	52.0	37	141	20.7	0.45

Table 6 Analytical data for Brumby, taken from Doyle (1993)

Soil Profile Class "Property" Grid Reference (AMG)	Profile Number	Horizon	Sample Depth (cm)	Gravel (of total) >2000 (µm) (%)	Sand Coarse >250 (µm) (%)	Sand Fine <250 (µm) (%)	Silt (%)	Clay (%)	Clay Mineralogy (Approximate weight %) Smectite	Kaolinite	Illite	Goethite
Brumby	SP 39	A1	0 - 20	14	5	60	18	17				
"Leverington"	SP 39	A2	20 - 26	13	9	55	18	18				
521400E	SP 39	B21tg	26 - 32	11	4	27	12	58				
5374100N	SP 39	B22tg	32 - 53	11	3	20	9	67				
	SP 39	B23tg	53 - 82	7	2	17	8	73				
	SP 39	B24t	82 - 165	8	6	44	8	42				
Brumby	SP 63	A1	0 - 18	2	6	55	22	17	15	85		
"Formosa"	SP 63	A2	18 - 25	2	8	53	26	12	5	90	5	
507700E	SP 63	B21t	25 - 60	0	3	21	9	67	20	75		5
5376700N	SP 63	B22t	60 - 70	0	2	19	13	66	35	55		10
Brumby	SP 66	A1	0 - 20	2	6	72	6	17				
"Cressy Station"	SP 66	A2	20 - 32	10	13	64	15	8				
506300E	SP 66	B21tg	32 - 50	2	6	34	6	55				
5379200N	SP 66	B22tg	50 - 80	0	5	40	5	49				
	SP 66	Cg	80 - 95	0	5	46	9	41				
Brumby	SP 89	A1	0 - 10	50	6	41	39	14				
"Connorville"	SP 89	A2	10 - 36	27	21	32	33	14				
507700E	SP 89	B21tg	36 - 50	2	5	16	22	57				
5371400N	SP 89	B22t	50 - 70	1	1	14	41	44				
	SP 89	B3g	70 - 90	0	1	28	11	59				
Brumby	SP 113	A1	0 - 15	0	3	52	23	23				
"Fosterville"	SP 113	A2	15 - 31	0	3	46	23	28	75	25		
536100E	SP 113	B21tg	31 - 45	0	1	24	14	61	75	25		
5354800N	SP 113	B22t	45 - 75	0	2	29	12	57	70	30		
	SP 113	B3k	75 - 95	0	1	28	14	56	80	20		

Table 6 (Continued)

4.5.6 Nile Association (Nl)

Nl - Nile Association *(18 sq. km)*
The Nile soils occur on terraces which are continuous with the Brumby terrace at the same level, but differ in containing varying, sometimes large, amounts of waterworn dolerite gravel and stone. *The Brumby soils have an almost complete absence of dolerite gravels.* Nile soils are fairly extensive outside the Longford sheet but within it are mostly confined to the terraces of the Nile River.

The major soils of the Nile Association closely resemble the Nuka SPC of the Brumby Association and commonly have lime at depth, sometimes cementing the dolerite gravels. A fair proportion of the area of the Nile Association is made up of narrow strips of Canola soils. *Aeolian deposits (Panshanger soils) described for the Brumby Association occur to only a very small extent in the Nile Association. The Nile soils are generally a stony phase of the Nuka soils, therefore refer to the Nuka SPC.*

Land Use

Land Use in the Nile Association is as described for the Brumby Association.

4.5.7 Kinburn Association (Kb)

K - Kinburn Association *(18 sq. km)*
The Kinburn Association consists of the soils of the flat bottoms of a system of valleys, *up to a kilometre wide*, dissecting areas of the Cressy Association. Kinburn soils also occupy a few disconnected hollows surrounded by Cressy soils. Thus the Kinburn and Cressy soils are closely related genetically and in places where the valley sides are gently sloping they grade into one another.

The dominant soils are of the Kinburn SPC in which a dark grey rather friable clay loam or clay overlies at about 30cm a yellow-grey or dark yellow-grey, sometimes mottled, plastic clay, greater than a metre in depth. Ferruginous gravel, sometimes platy but mostly rounded, black and rather soft or brittle, occurs throughout the profile but concentrated at depth sometimes into large masses.

Other soils of less extent are soils with subsoil horizons similar to the Kinburn SPC but with a grey loam or sandy loam surface and sometimes a lighter grey subsurface, and transitional between the Kinburn SPC and Cressy SPC.

Land Use

Like the Cressy Association the Kinburn soils have been intensively farmed. They have poor drainage and are probably liable to molybdenum deficiency.

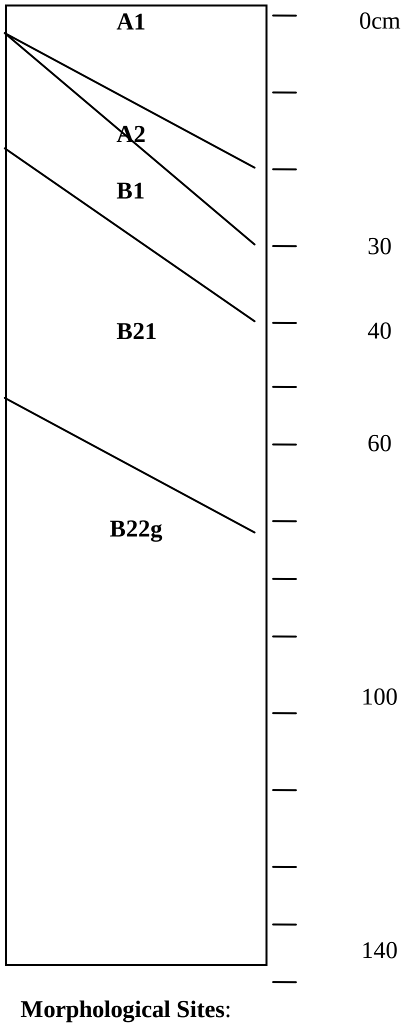
Kinburn Soil Profile Class

Name **Kinburn SPC (Kb)**

Concept **Poorly drained, structured clayey soil with grey subsoils and ferruginous nodules throughout the profile, developed on locally derived colluvium from the surrounding Cressy surfaces of the Launceston Basin.**

Aust. Soil Classification Grey Vertosol or Redoxic Hydrosol
Great Soil Group
Principal Profile Form Ug 5, Ug 6, Gn 3, Gn 4
Mapping Units Kb
Geology Colluvial sediments derived from adjacent remnants of the Launceston tertiary basin
Landform Flat to very gently inclined small valley flats of a dissected peneplain
Vegetation Savannah woodland dominated by *Eucalyptus pauciflora* and *E. ovata*

Permeability Very slow
Drainage Very poor



A1: Black (10YR 3/1, 3/2, 4/1, 5YR 2/2); light to medium clay; moderately weak (moist) consistency; common 6-20mm ferruginous nodules; pH 5.5-6.0; E.C 0.1ds/m; clear to diffuse change to

A2: Occasionally present, occasionally bleached; light medium to medium clay; massive or moderate 5-10mm sub-angular blocky structure; moderately firm (moist) consistence; many 6-20mm ferruginous nodules; pH 6.0-7.0; E.C 0.1 dS/m; clear to diffuse change to

B1: Occasionally mottled, grey or brown (10YR 4/1,5/2,5/3,5/4 7.5YR 4/4); medium to heavy clay; massive to moderate 5-10mm blocky structure; moderately firm (moist) consistence; many 6-20mm ferruginous nodules ; pH 6.0 - 6.5; gradual to diffuse change to

B21: Mottled, grey or brown (10YR 5/2,5/3,5/4, 2.5Y 5/2, 5Y 4/1); medium to heavy clay, moderate 5-10mm angular blocky; moderately firm (moist) consistence; common to many 6-20mm ferruginous nodules; pH 5.3-6.7; 0.1-0.5 dS/m; diffuse change to

B22g: Mottled, gleyed or grey (2.5Y 4/2, 5/2, 5Y 4/1, 5/1); heavy clay; moderate 5-10mm angular blocky structure; moderately firm (moist) consistence; common to many 6-20mm ferruginous nodules or soft segregation ; pH 4.5 - 5.0; EC 0.05 - 0.1 dS/m; occasionally a ferricrete pan may be present;

Morphological Sites:
Analysed Sites:
Related soil names: Kinburn gravelly clay, Kinburn series, Kinburn SPC
Previously described by: Stephens *et al* (1942), Nicolls (1958 & 1959)

4.5.8 Canola Association (Ca)

Ca - Canola Association *(98 sq. km)*
The Canola Association includes soils of the current river floodplains, narrow strips of local alluvium and the beds of drained lagoons. All areas are flat, subject to poor drainage if not to frequent flooding, and in the case of the river floodplains broken by meanders and oxbows. The largest extent of the association is along the South Esk River upstream from Evandale, where the floodplains are up to *2 ½ km* in width.

The dominant soils are the Canola SPC, in which the surface is a dark grey to dark grey-brown highly organic clay loam or sometimes clay, with rusty colouring along root channels reflecting the poor drainage. This passes at about *20cm* to a dark brownish grey or black clay, with rusty coloured mottling. Below about *1m* is less organic clay with yellow mottling continuing for *1 to 1.5m*. These profiles are acid throughout. *Also found with the Canola SPC is a black organic clay, (Talisker clay, Loveday et al, 1952), with yellowish mottling below about 75cm and, unlike the Canola series, having concretions of lime in the subsoil. These are typical of the alluvium of the Rose Rivulet and of some other small streams. The third co-dominant soil is similar to the Canola series but has a light grey fine sandy or silty clay loam subsurface horizon.*

At the scale of mapping used, the floodplains cannot be completely separated from remnants of the lower terraces, consequently soils of the Brumby Association form minor components of the Canola Association. Similarly, some small patches of Panshanger soils are included. Other minor soils include more peaty profiles associated with the Canola SPC, in a few places, brownish clay loams and clays of small banks on the floodplains, and riverine deposits of coarse sands and gravels.

Land Use

The frequency of flooding along the rivers limits the agricultural use of most of the area of the Canola Association. The beds of drained lagoons, narrow strips of creek alluvium, and a few less exposed portions of the river flats have been cultivated or sown to pasture but the remainder is vegetated largely by rushes and tussock grasses and provides only rough and intermittent grazing. Some protection from flooding has been attempted and considerable further improvement of pastures should be possible.

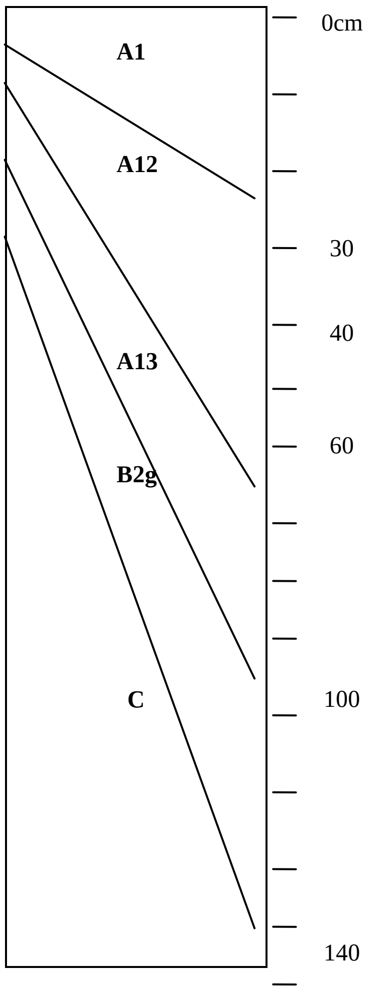
Canola Soil Profile Class

Name — **Canola SPC (Ca)**

Concept — **Uniform, black, cracking clay with subsoils associated with active flood plains, stream valleys and drainage depressions on alluvial fans**.

Aust. Soil Classification — Black Vertosol
Great Soil Group — Black earth, Wiesenboden or Chernozem
Principal Profile Form — Ug5, Ug6, Gn
Mapping Units — Ca, Ca-Gl, Ca-Hg, Ca-Ps, Ca-Ta
Geology — Quaternary alluvial deposits
Landform — Lower terrace flats, swamps and drainage depressions on active alluvial plains of large rivers.

Vegetation — Mostly cleared
Permeability — Very slowly permeable
Drainage — Very poor to imperfectly drained



A1: Black (10YR 2/1, 3/1, 3/2 7.5YR 2/1, 3/2); clay loam to light clay; moderate <2mm, granular or subangular blocky structure; firm (moist) consistence; pH 5.5 - 6.5; clear or abrupt change to

A12: Black (10YR 2/1,3/1, 7.5YR 2/1); light to heavy clay; moderate, 5-20mm, blocky structure; firm (moist) consistence; occasionally slickensides present, occasionally water worn gravel present; pH 6.0-7.0; clear to gradual change to

A13: Black (10YR 2/1, 3/1, 3/2, 2.5Y 2/1); light to heavy clay; weak to moderate, 5-50mm, blocky structure occasional manganiferous &/or calcareous nodules; occasional dolerite gravels; slickensides present; pH 6.0-8.0; abrupt to clear change to

B2, B2g: Mottled grey or gleyed (10YR 4/1, 2.5Y 4/2, 5Y 4/1,6/1, N 3/0, N 4/0); light medium to heavy clay; moderate to strong, 5-50mm, angular blocky or lenticular structure; firm (moist) consistence; common to many manganiferous or calcareous soft segregations; slickensides common; pH 5.5-8.0; gradual to diffuse change to

C: Sandy unconsolidated mineral material

Morphological Sites: CARDS 186-200, 207-209, 397, 435, 721, 1036, 1065-67, 1101, 1102, 1245, 146: CSIRO H26, H156
Analysed Sites: LRRBD L7, L103, L104, L112, L115; CSIRO H26, H156
Related soil names: Canola clay loam, Canola series, Canola SPC
Previously described by: Nicolls (1958 & 1959), Doyle (1993)

Soil Profile Class "Property" Grid Reference (AMG)	Profile Number	Horizon	Sample Depth (cm)	pH water (1:5)	EC (d/sm)	Total P (mg/kg)	Avail. P (mg/kg)	Avail. K (mg/kg)	Org. Carb. (%)	Total N (%)	C/N Ratio	Ca	Mg	Na	K	Total Bases	CEC	BASE SAT (%)	ESP (%)	Ca/Mg Ratio
												(milli-equivalents / 100 grams of soil)								
Canola	SP 11	A11	0 - 14	7.4	0.39	524	17	179	8.80	0.725	12	18.59	28.13	4.69	0.52	52.1	52	99	9.0	0.66
"Kelvin Grove"	SP 11	A12(a)	14 - 40	8.7	0.81	230	1	203	2.50	0.207	12	14.27	32.43	9.09	0.55	57.1	63	90	14.3	0.44
540400E	SP 11	A12(b)	40 - 65	9.0	0.87	152	0	168	1.80	0.118	15	16.64	31.98	9.39	0.49	59.4	55	108	17.1	0.52
5377700N	SP 11	A13k	65 - 80	8.9	0.78	123	0	156	0.80	0.066	12	18.46	31.16	6.29	0.51	56.9	47	120	13.3	0.59
	SP 11	A14g	80 - 120	8.7	0.42	164	0	162	0.60	0.048	13	14.14	26.46	3.56	0.59	45.1	42	106	8.4	0.53
	SP 11	C	120 - 130	8.9	0.10	146	0	132	0.20	0.025	8	5.71	10.38	1.31	0.34	17.7	19	93	6.9	0.55
Canola	SP 103	A11	0 - 26	6.3	0.05	175	7	37	2.40	0.174	14	7.82	3.40	0.44	0.16	11.8	18	66	2.5	2.30
"St Johnstone"	SP 103	A12	26 - 36	6.8	0.04	185	2	24	0.40	0.037	11	4.75	3.33	0.47	0.13	8.7	13	68	3.7	1.43
529800E	SP 103	A13g	36 - 53	7.5	0.06	96	2	70	0.50	0.077	6	10.26	11.36	0.89	0.31	22.8	33	70	2.7	0.90
5361300N	SP 103	Cw	53 - 95	8.5	0.08	52	2	50	0.20	0.002	100	5.67	6.07	0.72	0.20	12.7	17	76	4.3	0.93
Canola	SP 104	A11	0 - 13	6.0	0.06	314	17	50	3.40	0.281	12	9.04	4.69	0.47	0.19	14.4	24	61	2.0	1.93
"St Johnstone"	SP 104	A12	13 - 35	6.5	0.05	224	4	34	0.90	0.095	9	6.27	4.15	0.53	0.16	11.1	18	60	2.9	1.51
529400E	SP 104	A31	35 - 50	7.0	0.05	146	2	72	0.50	0.073	7	10.40	9.65	0.70	0.26	21.0	31	68	2.3	1.08
5361500N	SP 104	A32	50 - 55	7.5	0.06	132	0	66	0.20	0.040	5	10.29	10.28	0.97	0.29	21.8	30	73	3.2	1.00
Canola	SP 112	A11	0 - 6	5.9	0.18	265	26	257	7.30	0.569	13	15.00	7.22	0.32	0.53	23.1	32	73	1.0	2.08
"Fosterville"	SP 112	A12	6 - 28	6.4	0.11	102	5	130	2.80	0.242	12	16.09	11.01	0.43	0.33	27.9	37	76	1.2	1.46
535400E	SP 112	A13	28 - 45	6.9	0.09	72	0	88	1.40	0.147	10	18.21	15.05	0.65	0.31	34.2	39	88	1.7	1.21
5354600N	SP 112	A3	45 - 65	7.8	0.08	62	0	74	1.30	0.106	12	22.47	19.27	0.97	0.30	43.0	46	93	2.1	1.17
Canola	SP 115	A11	0 - 10	6.1	0.15	282	23	98	4.30	0.349	12	10.38	7.01	0.93	0.29	18.6	26	73	3.6	1.48
"Fosterville"	SP 115	A12	10 - 27	6.6	0.07	181	8	34	1.90	0.195	10	7.67	6.09	0.88	0.18	14.8	21	70	4.2	1.26
536500E	SP 115	A13g	27 - 46	7.6	0.23	79	2	60	0.90	0.118	8	10.08	16.12	3.39	0.30	30.1	37	82	9.2	0.63
5355200N	SP 115	B2g	46 - 75	7.9	1.12	53	0	53	0.46	0.030	15	7.67	14.12	4.75	0.25	28.1	27	103	17.4	0.54
	SP 115	Cwg	75 - 95	8.7	1.13	52	0	47	0.06	0.007	9	10.62	11.38	4.53	0.20	27.9	22	128	20.8	0.93

Table 7 Analytical data for Canola, taken from Doyle (1993)

Soil Profile Class "Property" Grid Reference (AMG)	Profile Number	Horizon	Sample Depth (cm)	Gravel (of total) >2000 (μm) (%)	Sand Coarse >250 (μm) (%)	Sand Fine <250 (μm) (%)	Silt (%)	Clay (%)	Clay Mineralogy Smectite (Approximate weight %)	Clay Mineralogy Kaolinite (Approximate weight %)
Canola	SP 11	A11	0 - 14	0	6	27	21	46	70	30
"Kelvin Grove"	SP 11	A12(a)	14 - 40	0	5	9	11	75	80	20
540400E	SP 11	A12(b)	40 - 65	0	6	10	10	74		
5377700N	SP 11	A13k	65 - 80	11	5	17	13	64	80	20
	SP 11	A14g	80 - 120	0	3	26	15	55	85	15
	SP 11	C	120 - 130	0	10	51	15	24		
Canola	SP 103	A11	0 - 26	0	16	47	14	23		
"St Johnstone"	SP 103	A12	26 - 36	20	35	36	9	21		
529800E	SP 103	A13g	36 - 53	0	19	27	3	52		
5361300N	SP 103	Cw	53 - 95	0	15	55	0	29		
Canola	SP 104	A11	0 - 13	0	29	30	11	30		
"St Johnstone"	SP 104	A12	13 - 35	12	48	25	8	20		
529400E	SP 104	A31	35 - 50	2	34	22	5	39		
5361500N	SP 104	A32	50 - 55	19	30	24	7	39		
Canola	SP 112	A11	0 - 6	2	10	38	21	30		
"Fosterville"	SP 112	A12	6 - 28	11	11	23	17	48	65	35
535400E	SP 112	A13	28 - 45	2	10	19	11	60	70	30
5354600N	SP 112	A3	45 - 65	4	9	15	11	64	70	30
Canola	SP 115	A11	0 - 10	0	4	56	21	19		
"Fosterville"	SP 115	A12	10 - 27	0	5	55	20	20		
536500E	SP 115	A13g	27 - 46	0	2	35	12	51		
5355200N	SP 115	B2g	46 - 75	0	2	45	12	41		
	SP 115	Cwg	75 - 95	2	2	58	13	27		

Table 7 (Continued)

4.5.9 Relbia Association (Rb)

R - Relbia Association (*40 sq. km)*
North of Evandale the lake sediments, not protected by bars of dolerite as elsewhere, have been deeply dissected by the Rose Rivulet and its tributaries. From an altitude of *180m* near Evandale this dissected country falls at first gently to a prominent bench around *140m*, steeply to another bench around *60m* and steeply again to *30m* on the northern boundary of the Association. At all levels there may be boulders of massive laterite at the surface, and veins of platy laterite through the deeper clay horizons. Similarly at all levels but most commonly on the *140m* bench, waterworn pebbles of quartz, dolerite or basalt may be scattered on the surface.

On the benches, soil profiles *previously described as Type F soil type by Loveday et al, (1952)* generally resemble the Brumby soils, having a grey to grey-brown, sandy loam to loam surface, a lighter coloured fine sandy to sandy loam subsurface and, at depths from *15 - 40cm*, a grey-brown or slightly mottled firm clay. The clay becomes lighter coloured and more friable with depth. There is usually ferruginous gravel and sometimes waterworn quartz in these profiles. The lighter coloured subsurface horizon is often not well developed, or may be absent.

On the moderate to steep slopes some profiles have a loam or sandy loam surface as above, but usually the surface is a grey to grey-brown clay loam or clay, cracking when dry. This passes with depth to a grey-brown, yellow-grey, or mottled firm clay and beneath to a more friable clay, sometimes markedly laminated. Such profiles may represent the bench type of profiles truncated by erosion. Lime may be present in small amounts. *This soil correlates with Type G soil type (Loveday et al., 1952).*

The lateritic soils distinguished on the map by the code *RbLp*, mostly resemble the Woodstock soils, and occur on gentle slopes on benches. These soils were previously described as Type D soil type (Loveday *et al.,* 1952). At the top of a small hill approximately *6km* east of Evandale a red friable soil surrounds a capping of massive laterite.

At higher levels in this association some profiles resemble the Cressy soils. Along some creeks are strips of black alluvial clay, *(Talisker clay, Loveday et al., 1952)* mapped elsewhere with the Canola association but here too narrow for separate mapping. Near Relbia railway station is a small area of Panshanger soils.

Land Use

Most of the Relbia Association carries improved pastures and much of it has been cultivated despite steepness of slope, leading to excessive erosion in places. Landslips are a feature of some of the steeper valley sides.

4.6 Windblown Sands

4.6.1 Panshanger Association (Ps)

P - Panshanger Association *(36 sq. km)*
The Panshanger soils are windblown sands. Deposits of sand, moved in the past by prevailing westerly winds have accumulated as three landforms - crescent shaped "lunettes" on the lee side of the larger lagoons and isolated dunes or continuos sheets, sometimes quite extensive, along the eastern sides of most of the larger valleys. In many such instances wind blown sands overlie other soil material at shallow depth. Where the surface horizons of sand extend to depths of *90cm* or more they have been mapped as the Panshanger Association. In the valleys the sand sheets take the general shape of the underlying formations. *They occur along the top and the edges of the terraces and on the steep dolerite hills*

Soils of the Panshanger Association are generally brown in colour but some may be grey. The dominant soils are those of the Panshanger SPC in which the surface is darkened and made just coherent with organic matter; the subsurface is a yellowish brown, brown or reddish brown loose sand, and in the deeper horizons there may be sufficient clay to give a sandy clay-loam texture or the loose sand may continue from *1m to 1.5m* in depth. The Wilmore soil *(Stephens et al., 1942),* characteristic of the lunettes, is very similar but may be rather more clayey.

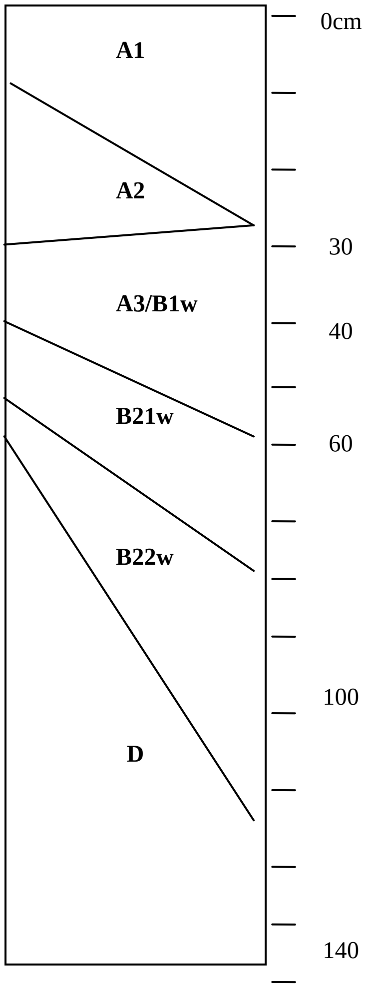
In wetter small hollows on the terraces, and in a few places more extensively, the upper horizons are grey or yellowish grey and iron leached from above is deposited below as softish irregular lumps of sandy "ortstein". Where the windblown sand sheets thin out around the margins of the association small areas of shallow buried soils of the underlying formations may be included.

Land Use

Most areas of the association have been cropped or sown to pasture but some still carry eucalypt woodland or honeysuckle and bracken. These deep sands have been prone to infestation with rabbits in the past and over cultivation or stock trampling is liable to lead to renewed drifting by wind. Because of their depth and free drainage and proximity to rivers these soils may prove particularly valuable with the development of spray irrigation.

Panshanger Soil Profile Class

Name	**Panshanger SPC (Ps)**
Concept	**Deep windblown brown sands overlying clays and bedrock on all surfaces of the Launceston Tertiary Basin.**
Aust. Soil Classification	Brown Tenosol
Great Soil Group	Siliceous sand
Principal Profile Form	Uc
Mapping Units	Ps, Ps-Bo, Ps-Ca, Ps-Mq, Ps-Wk
Geology	Quaternary Aeolian Sand
Landform	Gently undulating dunes and lunettes on fringes of lagoons, river terraces, and plains
Vegetation	Dry sclerophyll woodland
Permeability	Highly permeable
Drainage	Rapidly drained



A1: Black (10YR 3/1,3/2, 7.5 3/2, 5YR 3/2); sand to fine sandy loam; single grained to massive or weak 5-50mm subangular blocky structure, very weak (moist) consistence; pH 5.5 - 6.5; clear to gradual change to

A2: Occasionally present A2; grey (10YR 5/2,5/1); sand to loamy sand; single grained structure; loose (dry) consistency; field pH 6.5.

A3/B1w: Brown or red (5YR 4/4, 4/6, 7.5YR 5/4, 6/4); sand to sandy clay loam; massive to subangular blocky structure; very weak (moist) consistence; pH 6.0 - 6.8; clear to gradual change to

B21w: Brown (7.5YR 4/4,5/6) sand to loamy sand; single grained to massive structure; loose to very weak (moist) consistence; pH 5.5 - 6.5; diffuse change to

B22w: Brown (10YR 5/6, 6/4); sand to clayey sand; single grained to massive structure; few, 2-6mm, ferruginous segregation; pH 6.0-7.0; diffuse change to

D: Occasionally mottled yellow or grey (10YR 7/4, 4/6, 6/1); sand to loamy sand, some clay horizons; single grained or massive; loose (dry) consistence, some clay horizons with firm consistence; pH 6.5

Morphological Sites:
Analysed Sites: LRRBD L42, L54, L88, L102; CSIRO H12, H18
Related soil names: Panshanger series, Unnamed dominant soil, Wilmore sandy loam, Panshanger sand, Panshanger SPC
Previously described by: Nicolls (1958 & 1959), Doyle (1993), Kershaw (1975), Hubble (1947)

Soil Profile Class "Property" Grid Reference (AMG)	Profile Number	Horizon	Sample Depth (cm)	pH water (1:5)	EC (d/sm)	Total P (mg/kg)	Avail. P (mg/kg)	Avail. K (mg/kg)	Org. Carb. (%)	Total N (%)	C/N Ratio	Ca	Mg	Na	K	Total Bases	CEC	BASE SAT (%)	ESP (%)	Ca/Mg Ratio
												(milli-equivalents / 100 grams of soil)								
Panshanger	SP 42	A1	0 - 8	5.2	0.05	125	13	115	2.40	0.180	13	2.44	0.75	0.06	0.14	3.4	5	71	1.2	3.26
"Leverington"	SP 42	A21	8 - 40	5.2	0.02	31	3	24	0.00	0.020	0	0.22	0.06	0.02	0.04	0.3	2	16	1.1	3.91
521700E	SP 42	A22	40 - 66	6.0	0.02	29	1	11	0.00	0.000		0.31	0.16	0.03	0.05	0.6	2	28	1.6	1.93
5375900N	SP 42	B21sm	66 - 80	6.1	0.08	39	0	76	0.10	0.010	10	0.87	4.25	0.62	0.18	5.9	8	75	7.8	0.21
	SP 42	B22t	80 - 115	5.7	0.19	50	0	57	0.10	0.010	10	1.44	13.06	2.04	0.18	16.7	22	77	9.4	0.11
	SP 42	BC	115 - 135	6.0	0.05	23	0	26	0.00	0.000		0.43	4.26	0.75	0.08	5.5	7	76	10.3	0.10
	SP 42	C	135 - 150	6.4	0.06	27	0	13	0.00	0.000		0.30	2.89	0.56	0.06	3.8	5	82	12.1	0.10
Panshanger	SP 54	A1	0 - 22	6.4	0.04	184	0	297	1.30	0.130	10	2.66	0.68	0.08	0.74	4.2	6	64	1.2	3.93
"Mt Joy"	SP 54	A3	22 - 48	6.6	0.04	107	0	216	0.30	0.060	5	6.11	4.53	0.19	0.47	11.3	16	71	1.2	1.35
515800E	SP 54	B21w	48 - 78	8.0	0.04	75	0	87	0.10	0.010	10	4.70	5.29	0.31	0.23	10.5	13	78	2.3	0.89
5377300N	SP 54	B22w	78 - 125	8.1	0.06	59	0	80	0.10	0.020	5	5.43	6.50	0.83	0.25	13.0	17	77	4.9	0.84
	SP 54	B23w	125 - 145																	
Panshanger	SP 88	A1	0 - 12	5.8	0.03	60	17	87	0.60	0.047	13	1.08	0.36	0.26	0.19	1.9	3	69	9.3	2.99
"Connorville"	SP 88	C1	12 - 55	5.7	0.02	30	15	73	0.20	0.000		0.58	0.20	0.27	0.17	1.2	1	85	18.7	2.89
511900E	SP 88	C2	55 - 75	5.5	0.02	15	6	40	0.10	0.000		0.35	0.18	0.28	0.11	0.9	1	76	23.1	1.97
5369400N	SP 88	C3wg	75 - 95	4.9	0.05	28	0	37	0.10	0.000		0.65	1.52	0.32	0.14	2.6	20	13	1.6	0.43
Panshanger	SP 102	A1	0 - 14	5.5	0.06	204	7	489	1.40	0.134	10	3.66	1.51	0.14	1.55	6.9	14	43	3.0	2.42
"St Johnstone"	SP 102	A3	14 - 30	6.5	0.06	211	6	472	0.60	0.055	11	5.01	2.10	0.42	0.75	8.3	14	61	3.1	2.39
530000E	SP 102	B21w	30 - 75	7.3	0.07	171	6	274	0.40	0.033	12	6.27	3.60	0.39	0.49	10.8	15	71	2.6	1.74
5361400N	SP 102	B22wg	75 - 95	8.4	0.06	96	2	102	0.10	0.000		5.28	4.12	0.51	0.24	10.2	13	78	3.9	1.28
Panshanger	H 18	A11	0 - 5	6.0		60			0.80	0.07	11	2.00	0.39	0.05	0.08	2.5	5	48	1.0	5.13
CSIRO	H 18	A12	5 - 13	5.4					0.30	0.04	8	0.70	0.20	0.05	0.05	1.0	2	48	2.5	3.50
"Valley Field"	H 18	B21w	13 - 43	5.5					0.10	0.01	8									
526303E	H 18	B22w	43 - 71	5.7																
5370511N	H 18	B23w	71 - 109	6.0																
	H 18	B3	119 - 140	6.1																
	H 18	C1	173 - 185	5.6		20						0.42	8.40	2.30	0.17	9.0	22	41	10.5	0.05
	H 18	C2	292 - 305	5.6								5.27	2.40	0.44	0.89	8.6				

Table 8 Analytical data for Panshanger, taken from Doyle (1998)

Soil Profile Class "Property" Grid Reference (AMG)	Profile Number	Horizon	Sample Depth (cm)	Gravel (of total) >2000 (µm) (%)	Sand Coarse >250 (µm) (%)	Sand Fine <250 (µm) (%)	Silt (%)	Clay (%)	Clay Mineralogy (Approximate weight %) Smectite	Kaolinite	Illite	Goethite
Panshanger	SP 42	A1	0 - 8	0	9	85	6	1				
"Leverington"	SP 42	A21	8 - 40	0	11	87	2	1				
521700E	SP 42	A22	40 - 66	0	8	77	14	1				
5375900N	SP 42	B21sm	66 - 80	0	9	72	5	14				
	SP 42	B2[illegible]	80 - 115	0	8	46	4	43				
	SP 42	BC	115 - 135	0	11	75	1	13				
	SP 42	C	135 - 150	0	14	73	12	1				
Panshanger	SP 54	A1	0 - 22	0	14	75	4	7	15	80	5	
"Mt Joy"	SP 54	A3	22 - 48	0	11	62	3	25	45	50		5
515800E	SP 54	B21w	48 - 78	0	12	68	3	17	65	30		5
5377300N	SP 54	B22w	78 - 125	0	19	55	3	22	60	35		5
	SP 54	B23w	125 - 145									
Panshanger	SP 88	A1	0 - 12	1	36	50	7	7				
"Connorville"	SP 88	C1	12 - 55	0	33	55	6	6				
511900E	SP 88	C2	55 - 75	0	34	47	9	10				
5369400N	SP 88	C3wg	75 - 95	3	17	24	6	53				
Panshanger	SP 102	A1	0 - 0	0	20	69	4	7				
"St Johnstone"	SP 102	A3	14 - 14	0	22	58	3	17				
530000E	SP 102	B21w	30 - 30	0	17	58	3	22				
5361400N	SP 102	B22wg	75 - 95	0	23	55	4	18				
Panshanger	H 18	A11	0 - 5	0	32	63	4	5				
CSIRO	H 18	A12	5 - 13	0	24	73	1	2				
"Valley Field"	H 18	B21w	13 - 43									
526303E	H 18	B22w	43 - 71									
5370511N	H 18	B23w	71 - 109									
	H 18	B3	119 - 140	0	17	77	3	2				
	H 18	C1	173 - 185	0	14	44	3	39				
	H 18	C2	292 - 305									

Table 8 (Continued)

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Stephens, C.G., Baldwin J.G and Hoskings J.S. (1942), Soils of the parishes of Longford, Cressy and Lawrence, County of Westmorland, Tasmania. CSIRO 1: 63 360 (This report can be used to interpret the adjoining Westmorland map by Hubble (1944)).

Talbot, J., Zund, P.R., Pohlner, P. (1998), Soil and Land database users manual, version1.0, DPIWE, Launceston. unpublished

APPENDICES

Appendix 1

Rating table for analytical properties

General analytical properties

	Very low	Low	Medium	High	Very High
Organic Carbon (%)	<1	1-2	2-4	4-8	>8
Total Nitrogen (%)	<0.1	0.1-0.2	0.2-0.4	>0.4	
Total Phosphorus (mg/kg)	<100	100-200	200-500	500-1000	>1000
CEC (meq/100g soil)	<6	6-12	12-25	25-50	>50
Base Saturation (%)	<20	20-40	40-60	>60	

Note: Organic matter content can be estimated by multiplying organic carbon contents by 1.724.

Colwell Extractable Phosphorus and Potassium

Light soils (sandy loams)	Low	Medium	High
P (mg/kg)	<10	10-35	>35
K (mg/kg)	<100	100-200	>200
Heavy soils (clays)	Low	Medium	High
P (mg/kg)	<30	30-80	>80
K(mg/kg)	<150	150-300	>300

Salinity

	None	Slight	Moderate	High	Very High
(dSm-1)	<0.2	0.2-0.7	0.7-1.2	1.2-3.0	>3.0

Soil Acidity

	Slightly	Moderately	Strongly	Extremely
pH range	6.5-6.0	5.9-5.3	5.2-4.5	<4.5

This table has been taken from Doyle (1993) p 115.

Appendix 2

List of Key Soil Horizon Designations Used in SPCs

Horizons (some of which may be subdivided eg, A11 and A12)

A1 Topsoil, zone of maximum biological activity, usually dark in colour.

A2 Grey, generally sandy, sometimes bleached, eluvial horizon (less clay, organic matter and sesquioxides than horizons above and below).

A3 Transitional horizon between A and B horizon and more similar to A than B horizon.

B1 Transitional horizon between A and B horizon and more similar to B than A horizon.

B2 Main subsoil horizon, either:

1) illuvial clay, humus or sesquioxide accumulations or

2) maximum pedological development such as structure or colour.

B3 Transitional horizon between B2 and C horizon and having significant amount of clay to still be classed as part of the solumn.

BC As above.

C Weathered parent material and partially weathered rock from which the soil has formed.

D Buried horizon which is unlike the pedological organisation of the overlying horizons.

R Bedrock.

P1 Primarily undecomposed organic matter (peat).

P2 Primarily decomposed organic matter (peat).

Horizon Suffixes Used

e conspicuously bleached horizon, for example A2e.

g gleyed horizon caused by very poor drainage.

h accumulation of humified, well decomposed organic matter.

j sporadically bleached horizon, for example, A2j.

k accumulation of carbonate.

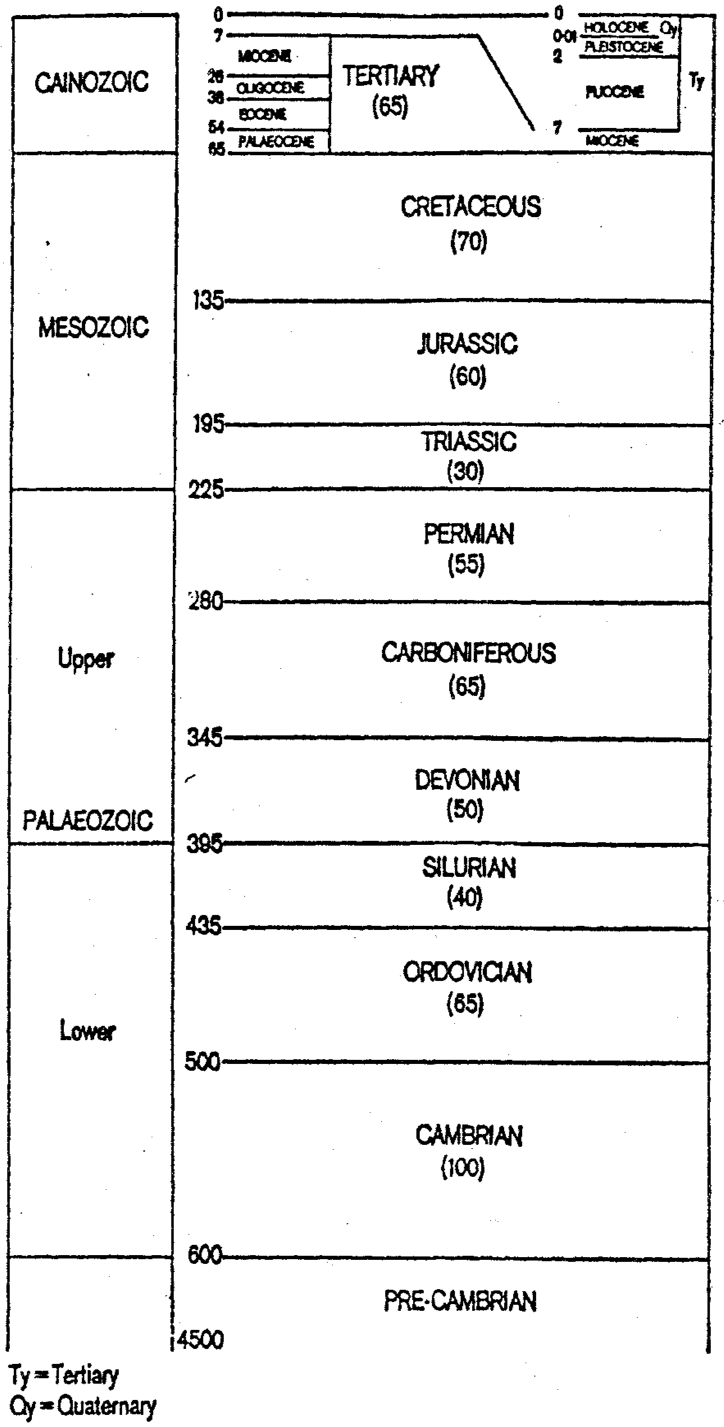
t accumulation of silicate clay (illuviation).

w weakly developed B horizon, ie, colour or structured B horizon, little or no illuviation.

For full horizon definitions refer to MacDonald *et al*. (1990). This figure has been modified from Doyle (1993), p 118.

Appendix 3

Geological Timeline



Taken from Brooks J.R.V and Whitten D.G.A, (1972) Dictionary of Geology. Published by Penguin, England.

Appendix 4 Polygon Line Changes to Soil Map

- Polygon 492 (Wk) has had its western boundary edge matched with the (Wk) of the South Esk map.

- Polygon 594 (Ps) overlapped onto the South Esk Soil Map; a line on its eastern boundary has been deleted to improve edge matching.

- Polygon 577 (Nl) & Polygon 585 (Br) were originally one polygon called (Nl) on the Longford map and Br on the South Esk. This meant there was an inconsistency along the boundary with the South Esk Soil Map. Field work and aerial photo intepretation revealed that the Brumby mapping unit of the South Esk extends into the (Nl) of the Longford.

- Polygons 213 & 224 (Cs) have been added to the Longford map to produce a seamless map boundary.

- Polygons 151 & 189 (Ps) have been added to the Longford map to produce a seamless map boundary.

- Polygon 218 (Ca) has been added to the Longford map to produce a seamless map boundary.

- Line work changes have been made to polygon 62 (Ca). These changes extend into the Quamby map, polygon 7 (Ca).

Appendix 5

Additional Relevant Information

Detailed Maps and Reports:

Hubble G.D. (1944), Portion of the Launceston basin, Westmorland, (map only)

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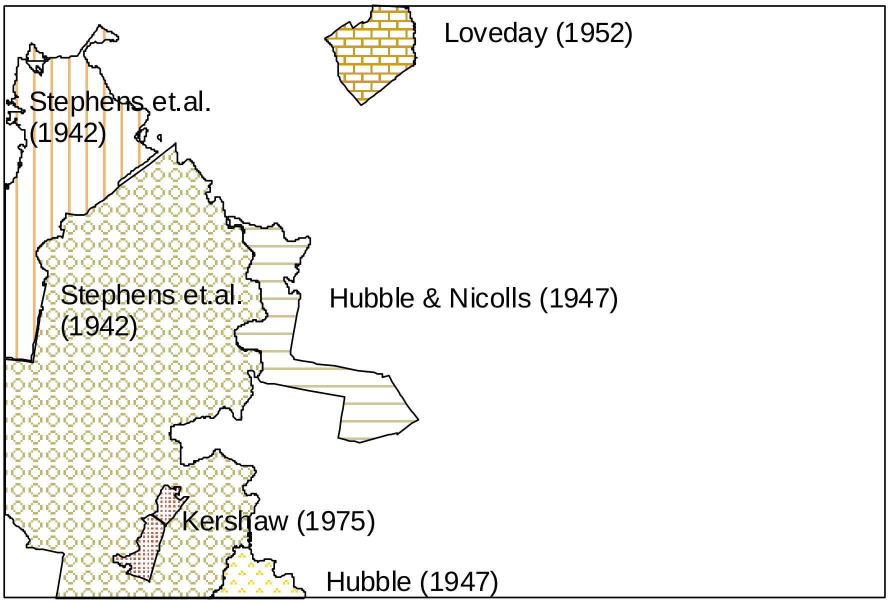
Geology Maps and Reports:

Mathews W.L. (1974), Longford Basin Geology. Tasmanian Department of Mines.

Tasmanian Department of Mines-Hobart (1959), Geological survey of Tasmania, Longford 1:63 360. Zone 7 Sheet No. 47.

Appendix 6.

Index Map Showing Detailed Soil Surveys occurring on the Longford Soil Reconnaissance Map.



Longford Soil Reconnaissance Map

Appendix 7.

List of Reports in the Reconnaissance 1:100 000 Soil Map Series

Cowie, J.D. (1959), Reconnaissance soil map of Tasmania. Sheet 68, **Oatlands**. Div. Rep. Div Soils CSIRO Aust. 4/59**;** Scale 1:63 360

Doyle, R.B. (1993), Soils of the **South Esk** Sheet Tasmania (southern half) Reconnaissance Soil Map. DPIF Soil Survey Series of Tasmania No 1.
Scale 1:100 000

Dimmock, G.M. (1956), Reconnaissance soil map of Tasmania **Flinders Island**. Div. Rep. Div. Soils CSIRO Aust. 8/56**;** Scale 1:63 360

Dimmock, G.M. (1957), Reconnaissance soil map of Tasmania. Sheet 75, **Brighton**. Div. Rep. Div. Soils CSIRO Aust. 2/57**;** Scale 1:63 360

Dimmock, G.M. (1960), Soil reconnaissance of the area between the **Tomahawk and Ringarooma Rivers**, N.E Tasmania. Tech memo. Div. Soils CSIRO Aust. 7/60**;** Scale 1:63 360

Dimmock, G.M. (1961), Reconnaissance soil map of Tasmania. Sheet 74, **Ellendale**. Div. Rep. Div. Soils CSIRO Aust. 5/61**;** Scale 1:63 360

Dimmock, G.M. (1964), **Beaconsfield** Soil Survey. CSIRO (unpublished)**;**
Scale 1: 100 000

Hubble, G.D. (1951), Reconnaissance survey of the **Coastal Heath Country, N.W** Tasmania. Div. Rep. Div. Soils CSIRO Aust. 10/5**;** Scale 1:126 720

Leamy, M.L. (1961), Reconnaissance soil map of Tasmania, Sheet 61. **Interlaken**. Div. Rep. Div. Soils CSIRO Aust. 6/61**;** Scale 1:63 360

Loveday, J. and Dimmock, G.M. (1958), Reconnaissance soil map of Tasmania. Sheet 76, **Buckland**. Div. Rep. Div. Soils CSIRO Aust. 13/57**;** Scale 1:63 360

Loveday, J. (1955), Reconnaissance soil map of Tasmania, sheets 22 and 28 - **Table Cape and Burnie**. Div. Rep. Div. Soils CSIRO Aust. 14/55**;** Scale 1:126 720

Loveday, J. (1955), Reconnaissance soil map of Tasmania. Sheet 83, **Sorell**. Div Rep Div Soils CSIRO Aust 10/55**;** Scale 1:63 360

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Nicolls, K.D. (1955), Soils, geomorphology and climate of an area between the **Lagoon and Arthur River**, West Coast of Tasmania Div. Rep. Div. Soils CSIRO Aust. 7/55**;** Scale 1:126 720

Nicolls, K.D. (1957), Reconnaissance of the soils around **Georgetown**, Tasmania. Tech. Memo Div Soils CSIRO Aust 3/57**;** Scale 1:126 720

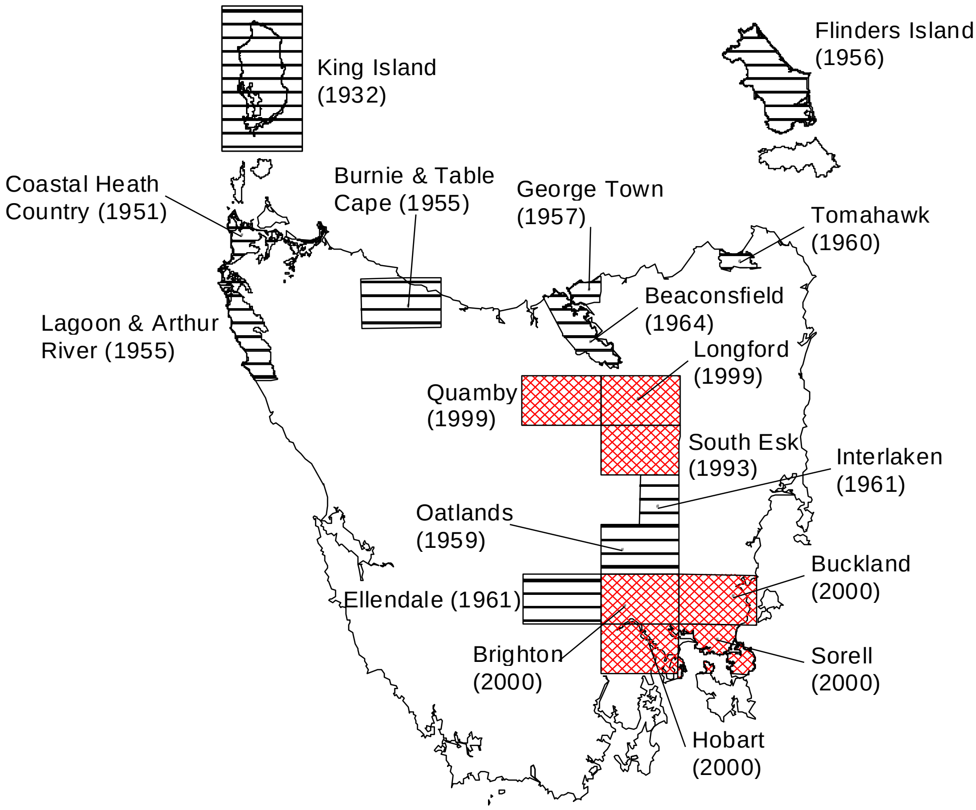
Nicolls, K.D. (1958), Reconnaissance soil map of Tasmania. Sheet 47, **Longford**. Div. Rep. Div Soils CSIRO Aust. 14/57**;** Scale 1:63 360

Nicolls, K.D. (1959), Reconnaissance soil map of Tasmania. Sheet 46, **Quamby**. CSIRO Div. Report No. 9/58**;** Scale 1: 63 360

Stephens, C.G. and Hosking, J.S. (1932), A soil survey of **King Island**. Bull. No 70 CSIRO Aust**;** Scale 1:126 720

Appendix 8

Index Map of the 1:100 000 Reconnaissance Soil Surveys of Tasmania

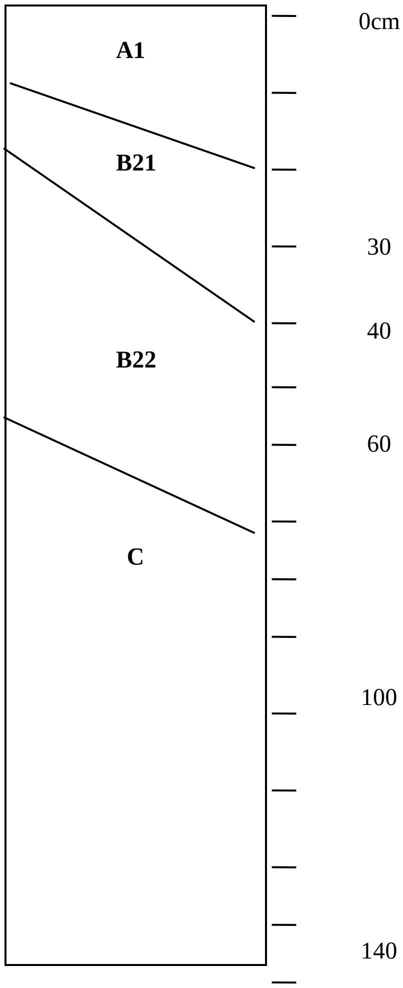


Correlated maps depicted by hatching.

Appendix 9 Additional Soil Profile Class Descriptions

Archer Soil Profile Class

Name	**Archer SPC (Ar)**
Concept	**Stony shallow, red or brown friable clayey soil developed on dolerite**
Aust. Soil Classification	Red or Brown Ferrosols
Great Soil Group	Krasnozem
Principal Profile Form	Gn3.12, Gn3.21
Mapping Units	Ar, ArLv
Geology	Jurassic dolerite
Landform	Moderate to steep hillslopes of hills and mountains
Vegetation	Dry sclerophyll forest
Permeability	Highly permeable
Drainage	Well drained



A1: Red or brown (5YR 3/3, 10YR 3/6); clay loam to light medium clay; strong <2mm - 5mm granular or subangular blocky structure; moderately firm (dry) consistence, very few to common 2-6mm manganiferous nodules; 50-90% dolerite fragments or pebbles; pH 5.5 - 7.5; gradual to diffuse change to

B21: Red or brown (5YR 3/3, 10YR 4/4); light to light medium clay; strong, 2mm-5mm granular or subangular blocky structure; moderately firm (dry) consistence; very few to common, 2-6mm manganiferous nodules, 20-50% dolerite fragments of variable size; pH 6.0 - 7.0; gradual to diffuse change to

B22: Red or brown (5YR 4/6, 10YR 4/6); medium clay; strong 2-5mm subangular or polyhedral structure; firm (dry) consistence; very few to common, 2-6mm, manganiferous nodules or soft veins; 10-20% dolerite fragments of variable size; pH 6.0 - 7.0; clear to diffuse change to

C: Weathered dolerite

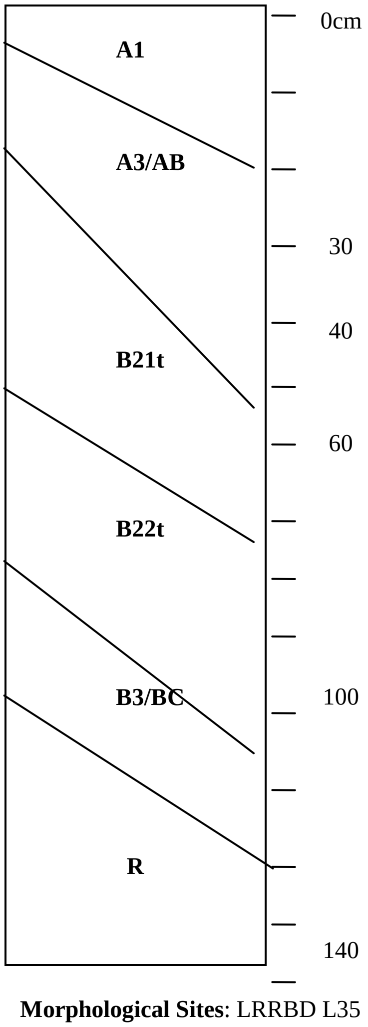
Morphological Sites: SOILCO 21, 25
Analysed Sites: None available
Related soil names: Holloway (Ho), Archer Lateritic Krasnozems (ArLv)
Previously described by: Laffan *et al* (1995), Nicolls (1959)

Bloomfield Soil Profile Class

Name **Bloomfield SPC (Bo)**

Concept **Structured brown soil with a loamy topsoil and a clayey subsoil developed on dolerite.**

	Eutrophic Brown Chromosol
Aust. Soil Classification	Non-calcic brown soil
Great Soil Group	Db
Principal Profile Form	Bo
Mapping Units	Jurassic dolerite
Geology	Moderate to steeply undulating hillslopes on hills and mountains
Landform	
	Slowly permeable
Permeability	Moderately well drained
Drainage	



A1: Dark brown to black (7.5YR 3/2 - 10YR 2/0); sandy loam or clay loam; moderate fine sub-angular blocky or granular structure; very weak to weak (dry) consistence; few medium (6-20mm) gravels of dolerite; field pH 5.9; E.C 0.2 dSm-1; clear, smooth change to

A3/AB: Dark brown (7.5YR 3/2 - 4/3); variable clay (medium); moderate fine to medium angular blocky structure; weak to firm (dry) consistence; few to common medium to coarse (6-60mm) gravels of dolerite; field pH 6.2; EC 0.1 dSm-1; abrupt, smooth change to

B21t: Dark reddish brown to dark yellowish brown (5YR 3/3 - 10YR 4/4); few very dark grey mottles in some profiles (10YR 3/1); medium clay; moderate to coarse angular blocky structure; strong (dry) consistence; few dolerite stones; field pH 6.8; gradual change to

B22t: Yellowish brown to brown (10YR 5/6 - 7.5YR 4/4); medium clay (sandy); moderate medium angular blocky structure; strong (dry) consistence; few slickensides in some profiles; few dolerite stones; field pH 7.5; gradual change to

B3/BC Light olive brown or brown (2.5Y 5/4 or 7.5YR 4/4); few red or yellowish mottles in some profiles (2.5YR 3/6 - 10YR 5/6); medium to light clay variable blocky structure; earthy fabric; few dolerite stones; field pH 7.5; sharp change to

R Dolerite bedrock with clayey matrix penetrating down cracks.

Morphological Sites: LRRBD L35
Analysed Sites: LRRBD L123
Related soil names: Brown soils on dolerite
Previously described by: Leamy (1961), Nicolls (1958), Doyle (1993)

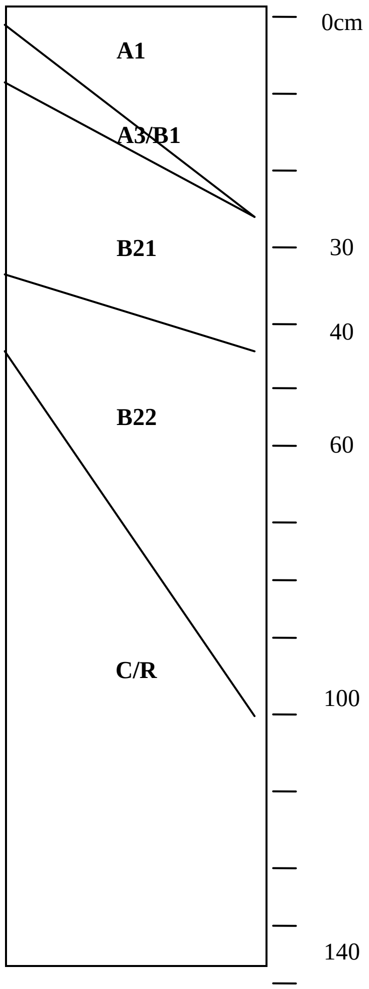
Deloraine Soil Profile Class

Name — **Deloraine SPC (Dl)**

Concept — **Red friable clayey soil developed on Tertiary basalt**

Aust. Soil Classification — Red Ferrosol
Great Soil Group — Krasnozems
Principal Profile Form — Gn3.11
Mapping Units — Dl, DlLv
Geology — Tertiary Basalt
Landform — Upper to mid slope of gently to moderately undulating hillslopes of low hills. Mostly cleared

Permeability — Highly permeable
Drainage — well drained



A1: Black or red (2.5YR 3/2, 5YR 3/3, ¾, 7.5YR 3/2); loam to clay loam; strong <2mm granular structure; moderately weak (dry) consistence; very few 2-6mm ferruginous nodules; 0-20% basalt gravels; pH 5.5 - 6.5; gradual to diffuse change to

A3/B1: Black or red (2.5 YR 3/2, 5YR 3/3); light to heavy clay; moderate to strong <2mm granular structure; moderately weak to firm (dry) consistence; none to very few, <2-6mm, ferruginous nodules; 0-20% basaltic gravels; pH 5.5 - 6.5; clear change to

B21: Red (2.5 YR 3/4, 3/6, 5YR 3/4); clay loam to light clay; moderate to strong <2mm granular structure; very few to few, <2mm-6mm, ferruginous nodules; 0-50% basaltic gravels; diffuse change to

B22: Red (2.5 YR 3/6, 4/6, 5YR 3/4); medium to heavy clay; strong to weak, <2mm granular structure; firm (dry) consistence; none to very few,<2mm, ferruginous nodules; 0-10% basaltic gravel; diffuse change to

C/R: Weathered basalt

Morphological Sites: SOILCO 24; Cards 869, 883, 974
Analysed Sites: CSIRO H91, H197
Related soil names: Krasnozems on basalt (Kb); Lateritic Krasnozems on basalt (LKb)
Previously described by: Nicolls (1959)