BEACONSFIELD – GEORGE TOWN SOIL REPORT

Reconnaissance Soil Map Series of Tasmania

By

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Beaconsfield – George Town Report
and accompanying 1:100 000 Beaconsfield – George Town
Soil Reconnaissance map

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

Natural Heritage Trust
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PREFACE

The Reconnaissance Series

Over a 27 year period (1940 - 1967), the CSIRO Division of Soils, Adelaide undertook a series of reconnaissance (small scale) soil surveys and some more detailed (large scale) 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 the value of this information as a tool for sustainable land management, to a variety of potential users.

This report and map 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 1 inch to 1 mile and 1 inch to 2 miles (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 1:100 000 Tasmanian 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.

Correlation of the Beaconsfield-George Town Reconnaissance Soil Map

The Beaconsfield – George Town Reconnaissance Soil Map is the combination of two CSIRO maps which were never formally published by CSIRO.

The CSIRO draft Beaconsfield 1 inch to 1 mile (1:63 360) Reconnaissance Soil Map, without the accompanying report, was reprinted in 1992 by the DPIWE as part of the Tamar 1:100 000 Land Capability Survey, (Noble, 1992). However this is the first time that the Beaconsfield Reconnaissance Soil Map and original report, prepared by Dimmock (1964), have been published in their entirety.

The George Town 1 inch to 1 mile (1:63 360) Reconnaissance Soil Survey, Nicolls (1957), was compiled as a brief three day Reconnaissance survey of the George Town area. The map covers only a small area on the eastern side of the Tamar River around George Town and was printed only as an in-house Technical Memorandum.

The Beaconsfield-George Town report, together with the accompanying map draws together a range of previously published and unpublished information. Users should be aware that it is not the intention of the Correlation project to verify the accuracy of the original maps and reports (whether published or unpublished). The aim of the project has been to bring old terminology up to date, make any necessary boundary modifications where possible to create a seamless map

coverage, and provide additional information about some of Tasmania's dominant agricultural soils.

Edits to the Beaconsfield-George Town Map

The Beaconsfield-George Town Reconnaissance Soil Map lies along the Tamar River. For an index map of the 1:100 000 Reconnaissance soil surveys of Tasmania refer to Appendix 6. The map units within the Beaconsfield-George Town sheet are soil associations, ie an association of two or more soil types occurring in a characteristic pattern (Gunn *et al.*, 1988).

Generally the only data available for the soils within this map sheet are the type profiles described by Dimmock (1964). Due to this lack of data we have been unable to define SPCs for groups of soils defined for the first time on this map sheet.

Soil Taxonomic Units

The soil taxonomic units used by Dimmock & Nicolls in this survey are soil series and great soil groups (Stace *et al.*, 1968). A soil taxonomic unit is a general term for a grouping of soils based on similarities of the soils within the group, and differences compared with other groups. Map units consist of defined areas of contiguous soil taxonomic units. This has been replaced where possible on all correlated map sheets by Soil Profile Class (SPC) as this standardises taxonomic units across the revised maps and is consistent with taxonomic units used within the more recent South Esk soil map and by other States in Australia. 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 soil data in the DPIWE soil database and additional fieldwork. A key to soil horizon designations used within the SPCs is provided in Appendix 1. The lines separating horizons within the SPC reports are shown by broken and solid lines. The broken lines show a diffuse or gradual change to the next horizon whereas the solid lines show a clear or abrupt transition. If the horizon transition is unknown a larger broken line is used. Due to a lack of information we were unable to define a SPC for all map units. However were type profiles have been identified by the original surveyors they have been added to the report.

Map Edits

The map units in this survey also include soil complexes. A soil complex consists of two or more dominant soils that occur in an intricate pattern that cannot be separated at this scale of mapping without unwarranted effort.

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 for DPIWE in-house circulation, 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.

Legend

Where possible the dominant soil of each map unit has been classified to soil order using the Australian Soil Classification (Isbell, 1996). Both the Great Soil Group (Stace *et al.*, 1968) Classification and the Australian Soil classification (ASC) have been included in the body of the text, with the ASC shown in brackets.

Edits to the Beaconsfield-George Town Report

The Beaconsfield-George Town report has been reformatted to provide a more consistent structure with other similar reports. The soil terminology used within the Beaconsfield-George Town report has been updated to be consistent with the Australian Soil and Land Survey Field Handbook (McDonald *et al.*, 1998), old imperial measurements have been converted to the metric system and sentence structure has been changed where it did not read with clarity. Edits and additional information about the soils within map units have been recorded within the main body of this report.

Analytical Data

CSIRO laboratory data is available for some of the dominant soils identified on this map. All CSIRO sites have the character "H" at the beginning of the profile number eg H68. An outline of the different methods used is located in Appendix 2.

Correlation

Eastfield Association

Mapped within this association are the brown soils on dolerite. These soils have been mapped across the state and have been split into two groups. The Bloomfield SPC was first described by Doyle (1993). It defines a moderately well drained brown to red-brown texture contrast soil, Chromosol (Isbell, 1996). In the south east of the state the brown soils on dolerite have been defined as the Tea Tree SPC. These soils lack the texture contrast of the Bloomfield SPC. These soils are moderately well drained gradational brown to red-brown soils, which are either Dermosols or Ferrosols depending on the Iron content. In hindsight these two groups are in fact the same soil but were incorrectly classified by Doyle 1993 due to a lack of data. Where these soils are deemed to be similar in any subsequent publication they will be referred to as the Tea Tree SPC.

Future Work

Correlation of the soils identified on this map and definition of SPCs has been extremely difficult due to the lack of existing soil profile data, the complexity of geology and local climate and topography variations. The continual pressure on the resources of the Tamar basin for urban and rural uses is highlighting the need for more reliable soil information.

Accuracy of Maps

The original map used the Transverse Mercator Projection with co-ordinates displayed in yards. Soil boundaries were delineated by stereoscopic interpretation of aerial photographs. The old paper soil maps were transferred to electronic form in the early 1990s with the co-ordinate system converted to the Australian Map Grid, however no projection was recorded. Accuracy checks of the Beaconsfield digital map have revealed a range of spatial errors. The coastline was incorrect and rivers and estuaries have changed position over time. However the major source of spatial error on all the Reconnaissance Soil Maps has been caused by the absence of rectification of the aerial photographs during delineation of line work. Hence, Ground Control Points (GCP) in some areas on the map sheet, eg hilltops, do not match current true ground positions.

We have not had the resources or time to address all the inaccuracies within this map sheet. Corrections have been made to the coastline only and users need to be aware that in some areas the boundaries of map units may be incorrect by considerable distances.

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 reports by Dimmock or Nicolls.

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1. METHODOLOGY

The mapping units used are essentially geomorphological. Generally, changes in geomorphology reflect broad changes in the soil parent materials and/or geology and frequently in the soils themselves. Some geomorphological units, though distinct in themselves, are composite, consisting of a complex of lithological types eg a series of thinly interbedded sandstones, mudstones and shales. In such a situation, each of these parent materials would give rise to particular soils, but due to differing degrees of dissection of the landscape, the resulting complex pattern of distribution makes separation of the individual soil units impracticable. Similarly, a marine bench may include a number of "planed-off" lithological units covered discontinuously by depositional materials. The soil association, defined as a characteristic pattern of soils in a distinctive landscape, is thus a convenient medium-scale mapping unit for these kinds of situations.

The classification of the dominant soils of each association follows that of "A Handbook of Australian Soils" (Stace et al. 1968). Type profiles included within this report have also been classified according to the Australian Soil Classification (Isbell, 1996) and the Factual Key Notation of Northcote (1979).

Twenty-one soil associations have been mapped. The boundaries of some are well defined by sharp breaks in parent material or topography, or both; in others the boundaries are broad transition zones or may indicate a change in the relative proportions of the constituent members. All available roads and tracks in the area were traversed and altogether more than 300 profile examinations were made. In addition, one representative profile from each of 15 soil associations and two each from a further two associations, were sampled for laboratory analysis. Air-photo interpretation was used fairly widely for delineating the soil boundaries once a satisfactory basis was established on the ground.

The base map for the survey, apart from those portions of the municipality within the "Lilydale" and "Launceston" 1:31680 sheets of the Department of Lands and Surveys Topographic Series, was constructed by the slotted template method from air-photos taken in 1963. Since the soil survey was completed, the 1:31680 sheets with 25 feet contours covering the rest of the municipality have become available, and elevations given in the text refer to them. In addition, Australian Map Grid co-ordinates (in metres) of specific localities mentioned throughout the text have been estimated from the "Tamar" and "St. Patricks" 1:100 000 sheets used as the base map for this publication.

1.1 The Soil Association

Table 1 sets out the main features of each soil association in terms of its dominant soils, classified according to a "Handbook of Australian Soils" (Stace *et al*. 1968) and the Australian Soil Classification (Isbell, 1996) and parent materials, topographic relationships and area. The associations have been grouped into three major sub-divisions based very broadly on the nature of the soil parent materials. Two of these – the Soils Developed on Hard Rocks and Soils Developed on Unconsolidated Sediments – bear a strong relationship to the geological structure of the country, the older hard rocks forming a north-west trending "backbone" extending the full length of the municipality, with the younger unconsolidated sediments of the Tamar Trough ranged along the margins adjacent to the River Tamar. These relationships are illustrated on the soil association map by the use of shades of brown and orange for the soils on hard parent materials (except Eastfield Association which, to maintain consistency, has been coloured according to the

correlated Eastfield Association on the Longford and Quamby Reconnaissance Soil Maps), and of shades of green for those on unconsolidated sediments. The third sub-division, comprises miscellaneous soils on complexes of basalt, dolerite, quartzite, schist and slate with or without various unconsolidated sediments, and appear to bears no such relationship to landform. Refer to Appendix 4 for a description of the geological timescale.

Table 1. The Soil Associations of the Beaconsfield-George Town Reconnaissance Soil Map.

SOILS ON HARD ROCKS

Soil Association and Map Symbol	Dominant Soils	Parent Rocks	Landscape	Altitude Range (Metres)	Area (Hectares)
ASBESTOS (As)	Yellow Podzolics, Lithosols; some Red Podzolics	Quartzites, phyllites, conglomerates	Mostly elevated; steep and stony	0-580	9430
NORTON (Nr)	Yellow Podzolics	Slates, sandstones, siltstones	Low; easy rolling to rolling	15-240	1366
WARRINA (Wa)	Yellow Podzolics	Mudstones, siltstones; sometimes pebbly	Very gently undulating to rolling or hilly; mostly below 150m	0-230	8228
HOLWELL (Ho)	Yellow Podzolics	Mudstone	Steep; mostly above 150m	90-430	4394
TATANA (Tt)	Podzols, Humus Podzols; some Yellow Podzolics	Sandstones	Very gently undulating to easy rolling; occasional cliffs	0-400	6459
FLOWERY GULLY (FG)	Terra Rossas	Limestones	Steep with some sinkholes	90-230	73
EASTFIELD (Ea)	Grey-brown Podzolics; some Krasnozems and Non-calcic Brown soils	Dolerite	Hilly; steep and stony	0-460	16412
VULCAN (Vl)	Lateritic Krasnozems	Ultrabasic rocks	Rolling to low hilly; some gently undulating valley floors	15-140	1056
CRAYTHORNE (Cy)	Krasnozems	Basalt	Gently undulating plateau top	140-200	278

SOILS DEVELOPED ON UNCONSOLIDATED SEDIMENTS

Association and Map Symbol	Dominant Soils	Types of Sediment	Landscape	Altitude Range (Metres)	Area (Hectares)
LEGANA (Le)	Yellow Podzolics, Lateritic Podzolics, Podzols	Sandy and gravelly clays	Rolling to easy rolling valley sides; some dissected terrace remnants	0-180	3925
BEACONSFIELD (Bc)	Podzols	Gravels and sands	Moderately dissected broad ridges	30-140	1660
YORK TOWN (Yt)	Podzols, Yellow Podzolics	Gravelly clays	Gently undulating to easy rolling local piedmont plain	0-90	3924
ROBIGANA (Ri)	Podzols, Wiesenboden; some saline soils	Sandy and gravelly clays	Marine benches	0-25	2281
STOCKPORT (Sp)	Humic Gleys	Clays and some sands	Lagoon floors	15-30	343
DALRYMPLE (Da)	Podzols, Humus Podzols	Sands	Gently undulating coastal sandplain	10-75	7667
KELSO (Kl)	Calcareous Sands	Calcareous sands	Coastal dunes and beach ridges, mostly stabilised	0-30	1299
SUPPLY (Su)	Humic Gleys, Alluvial soils	Fine sandy and silty clays	River and creek flood plains; some low terraces	15-320	1572
TAMAR (Tm)	Saline Humic Gleys	Clays and some sands	Estuarine fringe	0-3	462

SOILS ON A MIXTURE OF UNCONSOLIDATED SEDIMENTS & HARD ROCK

Association and Map Symbol	Dominant Soils	Types of Sediment	Landscape	Altitude Range (Metres)	Area (Hectares)
ECCLESTONE (Ec)	Grey-brown Podzolics Lateritic Krasnozems Lateritic Podzolics Yellow Podzolics	Dolerite with sporadic shallow cover of sediments	Gently undulating to easy rolling	Southern occurrence 120-210; Northern occurrence 45-110	1062
ROSEVEARS (Rv)	Yellow Podzolics Krasnozems, Lithosols	Slumped basalt and underlying sediments	Steep slopes broken with slump benches; rocky scarps around edge of plateau	15-185	434
ROWELLA (Rw)	Podzols, Yellow Podzolics, non-calcic Brown Soils	Sediments partially overlain by basalt	Rolling to hilly	0-60	415

MISCELLANEOUS SOILS ON LOWER DEVONIAN TO CAMBRIAN ROCKS

Association and Map Symbol	Dominant Soils	Types of Sediment	Landscape	Altitude Range (Metres)	Area (Hectares)
MISCELLANEOUS SOILS 8 (M8)	Insufficient data	Quartzite and schists	Low hills 60-90m above sea level	60-90	6763
MISCELLANEOUS SOILS 9 (M9)	Insufficient data	Slate and schists	Low hills	100-200	1006

MISCELLANEOUS DISTURBED SOILS

Association and Map Symbol	Dominant Soils	Types of Sediment	Landscape	Altitude Range (Metres)	Area (Hectares)
MISCELLANEOUS SOILS 10 (M10)	Insufficient data	Basalts and gravels, clays and sands	Low plateaux and River terraces	0-40	1459

2. SOIL ASSOCIATIONS

2.1 Soils developed on Hard Rocks

2.1.1 Asbestos Soil Association (As) (9430 ha)

The generally shallow and very stony soils of the more rugged, elevated country constitute the Asbestos Association, second largest in extent in the municipality. There are two sub-units: the soils on the Precambrian quartzites and phyllites of the Asbestos Range ranging in elevation from sea level to 580m and the soils on Lower Palaeozoic slates, sandstones and conglomerates of the ridges to the south of Beaconsfield, of which the most prominent are the Cabbage Tree-Salisbury Hill ridge (elevation 215m) and Peaked Hill (335m). All these parent rocks are highly siliceous.

The landscape is strongly dissected and slopes up to 20° are common, particularly on the Asbestos Range. The native vegetation is predominantly a sclerophyll forest with *Eucalyptus obliqua* the main species which, on the Asbestos Range, still provides timber for milling. The understorey is mainly *Casuarina suberosa* (sometimes forming dense stands), *Xanthorrhea australis, Acacia sp., Pultenaea daphnoides, Senecio linearifolius, Bedfordia salicina,* and *Leptospermum scoparium* with a sparse ground cover of heathy shrubs including *Platylobium formosum*. In some of the sheltered gullies near the top of the Asbestos Range rainforest has developed including species such as *Nothofagus cunninghamii* (myrtle) and *Atherosperma moschatum* (sassafras) with *Dicksonia antarctica* in the understorey. In many places the soil surface is bare of vegetation, probably largely due to frequent fires, and is often littered with angular fragments of vein quartz and quartzite.

On the Asbestos Range, the soils of the Precambrian quartzites and phyllites are predominantly stony gradational Yellow Podzolics (Dermosols and Kandosols) and Lithosols (Rudosols). The yellow podzolics have shallow dark grey fine sandy loam A1 horizons over pale compact A2 horizons which grade through transitional material to a mottled fine sandy clay loam or clay B horizon. At depths from about 60cm to 90cm the clay horizon passes into decomposing rock. Profile H259, described later, is typical of the Yellow Podzolic soils. On lower slopes, occasional profiles were observed with an irregular organic B horizon immediately above the clay.

The Lithosols consist essentially of rock fragments in a sandy or fine sandy matrix, with a thin A horizon containing organic matter, but with very little clay.

On the steep slopes, there appears to have been considerable movement of the upper horizons of some profiles. Several instances were observed of surface horizons consisting of sandy material with quartzite fragments, overlying yellowish-brown clay containing fragments of decomposing phyllite. This clay rested on phyllite from which, presumably, it was derived. In one or two places below 240m elevation, there are deep red soils containing small tabular sedimentary rock fragments oriented roughly parallel to the slope. Superficially, these resemble the yellow-brown Soils on Solifluction Deposits found on the upper slopes of the higher dolerite mountains of the State (Nicolls and Dimmock, 1965) but it is unlikely that they have the same periglacial origin.

The soils of the second sub-unit, on the lower Palaeozoic sandstones and conglomerates, like those on the Precambrian sediments, are predominantly yellow podzolics and lithosols. However, red podzolic soils, distinguished from the yellow by the colour of their clay, are occasionally found on the Ordovician sandstones also.

The prevalence of surface stone in soils of this association limits profile examination to the few road cuttings. It is likely that some of these soils, which appear shallow and have been called Lithosols, may, in fact, have well-developed clay B horizons. This would be important in use for forestry.

SITE DESCRIPTION

Site Number:	H259	Property Name:		Runoff:	Very rapid
Project Code:	CSIRO	Property Owner:		Permeability:	Very slowly permeable
Map Scale:		Nearest Town:	BEACONSFIELD	Drainage:	Imperfectly drained
Sheet No:		Describer:	Geoff M. Dimmock	Elevation:	251 m
Map Name:		Date Cored:	24 May 1963		
AMG Easting:	477986 E	Rainfall:	940 mm	Soil Class:	Asbestos Assoc
AMG Northing:	5435800 N	Air Temp (3pm):		Northcote PPF:	Gn3.81
Film No:	6964	Type of Site:		Great Soil Group:	Yellow Podzolic Soil
Run No:	4	Type of Desc:	Soil pit	Soil Taxonomy:	
Frame No:		Soil Samples:	Yes	Land Capability:	
State:	Tasmania	Soil Photos:		Geological Map:	

Location: 7.1KM SW of Beaconsfield 4.9KM from Beaconsfield - Howell Rd on Pugh`s Rd, 35M SE from start of Rd cutting, NE of Rd.
Aust Classn: Acidic, Dystrophic, Red, Dermosol; (Confidence level 4)

Landform: Element steep, upper slope, cut face; Pattern steep hills 90-300m 32-56%, hills;
Land Surface: Slope angle 32.5 %; Aspect 225; limited clearing; Condition of surface soil self-mulching; Coarse Fragments many (20-50%) gravel;
Vegetation:
Substrate: phyllite;

HORIZON DESCRIPTIONS

O	0	3	cm	Moist; black (10YR 2/1 moist); dark brown (10YR 3/3) primary mottles; sapric loam; massive structure; very weak (moist); 4.3 field pH; .146 dSm-1; abrupt (5-20mm) boundary;
A11	3	11	cm	Moderately moist; dark grey (10YR 4/1 moist); grey (10YR 5/1) primary mottles; sandy loam; massive structure; weak (moist); v few (<2%) angular gravels (20-60mm) quartzite; abundant live roots; 4 field pH; .128 dSm-1; gradual (50-100mm) boundary;
A12	11	22	cm	Moderately moist; dark grey (10YR 4/1 moist); heavy sandy loam; massive structure; weak (moist); abundant (50-90%) angular gravels (20-60mm) quartzite; abundant live roots; 4.2 field pH; .065 dSm-1; abrupt (5-20mm) boundary;
A21	22	28	cm	Moderately moist; greyish brown (10YR 5/2 moist); few (2-10%) light brownish grey (10YR 6/2) primary mottles; fine sandy loam; massive structure; few (<1 per 100mm2) fine (1-2mm) macropores; common (10-20%) angular gravels (20-60mm) quartz; moderately cemented massive; few live roots; 4.5 field pH; .036 dSm-1; gradual (50-100mm) boundary;
A22	28	30	cm	Moderately moist; greyish brown (10YR 5/2 moist); few (2-10%) light brownish grey (10YR 6/2) primary mottles; light grey (10YR 7/1) secondary mottles; fine sandy loam; massive structure; strongly cemented massive; few live roots; 4.5 field pH; .033 dSm-1; gradual (50-100mm) wavy boundary;
A23B1	30	37	cm	Moderately moist; greyish brown (10YR 5/2 moist); few (2-10%) light grey (10YR 7/1) primary mottles; yellowish brown (10YR 5/6) secondary mottles; fine sandy loam; massive structure; v few (<2%) angular gravels (6-20mm) phyllite; moderately cemented massive; few live roots; 4.4 field pH; .036 dSm-1; gradual (50-100mm) boundary;
B2	37	56	cm	Moderately moist; yellowish red (5YR 5/6 moist); strong brown (7.5YR 5/6) primary mottles; light grey (5Y 7/2) secondary mottles; fine sandy clay loam; moderate coarse (50-100mm) prismatic structure; strong (moist); few live roots; 4.4 field pH; .039 dSm-1; gradual (50-100mm) boundary;
BC	56	74	cm	Moderately moist; yellowish brown (10YR 5/8 moist); few (2-10%) light grey (5Y 7/2) primary mottles; fine sandy clay loam; weak coarse (50-100mm) prismatic structure; strong (moist); fine (<5mm) cracks; few live roots; 4.6 field pH; .033 dSm-1; clear (20-50mm) wavy boundary;
C	74	91+	cm	Moderately moist; strong brown (7.5YR 5/6 moist); yellowish brown (10YR 5/8) primary mottles; light grey (10YR 7/1) secondary mottles; fine sandy clay loam; weak (moist); common (10-20%) phyllite coarse fragments; 5.1 field pH; .033 dSm-1;

Profile Note: Asbestos Association; 37-91cm prominent dgb coatings; 30-91cm decomposed phyllite increasing; 30-37cm phyllite structure in yb patches. Field pH and EC have been copied from Lab data.

General Note: Isbell classification added by R.Tegg.

Figure 1. **Type Profile for the Asbestos Soil Association**

ASBESTOS ASSOC Yellow Podzolic Soil Gn3.81 phyllite H259/CSIRO/459 477986E 5435800N BEACONSFIELD

Sample Layer	Depths Upr cm	Depths Lwr cm	pH 1:5 H2O	pH 1:5 CaCl	EC 1:5 dS/m	Soluble Chloride mg/kg	Exchangeable Cations Ca meq	Mg meq	K meq	Na meq	Exch H meq	Exch Al meq	ECEC Sum meq	CEC Meas meq	TEB Sum meq	Base Sat %	ESP %	Ca/Mg Ratio
O	0	3	4.3		.146 B	70 A					55.3 B							
A11	3	11	4.0		.128 B	90 A					36.5 B							
A12	11	22	4.2		.065 B	40 A												
A21	22	28	4.5		.036 B	20 A												
A22	28	30	4.5		.033 B	20 A	.1	.24	.09	.1 A	4.5 B		5.03		.53	11	2.0 B	.42
A23B1	30	37	4.4		.036 B	200 A	.1	.21	.08	.1 A	6 B		6.49		.49	8	1.5 B	.48
B2	37	56	4.4		.039 B	20 A	.1	.23	.09	.12 A	12.5 B		13.04		.54	4	.9 B	.43
BC	56	74	4.6		.033 B	20 A	.15	.18	.1	.14 A	16.5 B		17.07		.57	3	.8 B	.83
C	74	91	5.1		.033 B	30 A												

Sample Layer	Depths Upr cm	Depths Lwr cm	Loss Ign %	Organic Carbon %	Total N %	C/N Ratio	Avail N mg/kg	Air Dry Moi%	Grav Moi%	Total P %	Avail P mg/kg	Extract P mg/kg	Total K %	Avail K mg/kg	Extract K meq
O	0	3	27.7	16.7 C	.525 A	32		3.5		.009 A					
A11	3	11	14.6	7.91 C	.254 A	31		2.4		.005 A					
A12	11	22	5.4	2.6 C	.102 A	25		.78							
A21	22	28	2.1	.6 C	.049 A	12		.35							
A22	28	30	1.9					.38							
A23B1	30	37	2.2					.6							
B2	37	56	4.1					1.5							
BC	56	74	5.7					1.9							
C	74	91	6.3					1.6							

Sample Layer	Depths Upr cm	Depths Lwr cm	<-----Extractable--------> Cu	Mn	Zn	Fe	B mg/kg	Free Fe %	Extractable Al %	Si %	Total Fe %	Total S %	Avail SO4-S mg/kg	CaCO3 %	Dispersion Particle Size GV %	CS %	FS %	S %	C %
O	0	3													0	9	35	22	10 C
A11	3	11									.1 C				2	10	45	24	8 C
A12	11	22																	
A21	22	28									.1 C								
A22	28	30													0	9	47	31	13 B
A23B1	30	37													2	7	47	31	15 B
B2	37	56									2.15 C				0	4	34	32	29 B
BC	56	74													0	5	24	36	34 C
C	74	91									3 C								

Horizon	Depth cm	Method	Mineral Code & Range(%)		
BC	56 - 74	XRD	Il 65-80	Ka 10-20	St 10-20

Table 2. **Analytical data for Asbestos Soil Association Type Profile**

2.1.2 **Norton Soil Association (Nt)** (1366 ha)

The Norton soils are confined to an area south and north-west of Beaconsfield, mostly on easy rolling to rolling foothills flanking the steeper ridges of Asbestos Association. The parent rocks are Lower Palaeozoic sediments, including Cambrian slates, siltstones and keratophyre, and Ordovician sandstones and siltstone. The association ranges in elevation from 15m to 240m.

The natural vegetation is an open sclerophyll forest dominated by black peppermint *(Eucalyptus amygdalina)* and manna gum *(E. viminalis)* with an understorey of *Banksia marginata, Casuarina distyla, Exocarpus sp*. and *Leptospermum scoparium*. The fairly dense ground cover consists largely of heaths *(Epacris impressa, Leucopogon sp.), Acacia myrtifolia* and the sedges *Lepidosperma filiforme and L. squamatum*. Some of the gentler slopes have been cleared and sown to pasture but much of the vegetation still remains in its native state.

Yellow Podzolic soils (Kandosols) with gradational profiles predominate. The normal profile consists of a thin fine sandy or silty A1 horizon over a compact bleached A2 of similar texture. The lower part of this A2 horizon often forms a transition to the underlying B, becoming mottled with yellow and increasing in clay content to a fine sandy or silty clay loam. Depth to the B horizon is usually shallow but ranges from 10cm to at least 50cm. The boundary between it and the overlying A horizon is usually gradual but may occasionally be quite distinct. The B horizon is a variously mottled light yellowish-brown, light grey-brown and brownish-yellow, silty or fine sandy clay, with weak coarse prismatic breaking to moderate medium blocky structure, the surface of the aggregates often showing dark organic staining. Colours become lighter with depth and clay content decreases as the C horizon is reached; within the C horizon original sedimentary structures may still be preserved.

The surface of these soils is usually littered to varying degrees with angular rock fragments; these are mainly vein quartz and sometimes quartzite or phyllite.

Profile H254, described below, is typical of the yellow podzolic soils.

SITE DESCRIPTION

Site Number: H254	Property Name:	Runoff:	Moderately rapid
Project Code: CSIRO	Property Owner:	Permeability:	Very slowly permeable
Map Scale:	Nearest Town: BEACONSFIELD	Drainage:	Imperfectly drained
Sheet No:	Describer: Geoff M. Dimmock	Elevation:	52 m
Map Name:	Date Cored: 21 May 1963		
AMG Easting: 484230E	Rainfall: 940 mm	Soil Class:	Norton Assoc
AMG Northing: 5436280N	Air Temp (3pm):	Northcote PPF:	Gn3.91
Film No: 6964	Type of Site:	Great Soil Group:	Yellow Podzolic Soil
Run No: 4	Type of Desc: Soil pit	Soil Taxonomy:	
Frame No:	Soil Samples: Yes	Land Capability:	
State: Tasmania	Soil Photos:	Geological Map:	

Location: 2.7KM SSW of Beaconsfield, eastern side of Denmans Rd 1.8M E of east rd fence + 32M SW along rd from sharp crest.
Aust Classn: Acidic-Mottled, Petroferric, Yellow, Kandosol; (Confidence level 4)

Landform: Element gently inclined, hillslope; Pattern undulating low hills 30-90m 3-10%, low hills;
Land Surface: Slope angle 3.5 %; Aspect 225; no effective disturbance;
Vegetation:
Substrate: siltstone;

HORIZON DESCRIPTIONS

A1	0	3	cm	Wet; dark grey (10YR 4/1 moist); silty loam; weak ex fine (<2mm) granular structure; loose (moist); v few (<2%) gravel coarse fragments; abundant live roots; 4.7 field pH; .104 dSm-1; diffuse (>100mm) boundary;
A1A2	3	6	cm	Moist; greyish brown (10YR 5/2 moist); silty loam; weak ex fine (<2mm) subangular blocky structure; very weak (moist); common (10-20%) angular stratified gravels (20-60mm) quartz; common live roots; 4.8 field pH; .06 dSm-1; abrupt (5-20mm) boundary;
A3	6	10	cm	Moist; greyish brown (2.5Y 5/2 moist); light brownish grey (2.5Y 6/3) primary mottles; silty clay loam; weak ex fine (<2mm) subangular blocky structure; very weak (moist); common (10-20%) angular stratified gravels (20-60mm) quartz; few live roots; 4.8 field pH; .033 dSm-1; clear (20-50mm) boundary;
B21	10	23	cm	Moist; light yellowish brown (2.5Y 6/4 moist); light brownish grey (2.5Y 6/2) primary mottles; brownish yellow (10YR 6/8) secondary mottles; silty medium clay; weak very fine (2-5mm) subangular blocky structure; weak (moist); 20-60mm ferruginous crystals; many (20-50%) stratified gravels (20-60mm) quartz; 5.1 field pH; .021 dSm-1; diffuse (>100mm) boundary;
B22	23	36	cm	Moist; light yellowish brown (2.5Y 6/4 moist); light brownish grey (2.5Y 6/2) primary mottles; brownish yellow (10YR 6/8) secondary mottles; silty medium clay; weak very fine (2-5mm) subangular blocky structure; weak (moist); ferruginous crystals; many (20-50%) stratified gravels (20-60mm) quartz; 5.1 field pH; .027 dSm-1; gradual (50-100mm) boundary;
B23	36	51	cm	Moist; light yellowish brown (2.5Y 6/4 moist); few (2-10%) faint strong brown (7.5YR 5/8) primary mottles; silty medium clay; weak coarse-very coarse (100-200mm) prismatic parting to moderate medium (20-50mm) angular blocky structure; weak (moist); few live roots; 5.2 field pH; .024 dSm-1; clear (20-50mm) boundary;
BC1	51	74	cm	Moderately moist; white (5Y 8/2 moist); brownish yellow (10YR 6/8) primary mottles; strong brown (7.5YR 5/8) secondary mottles; silty clay loam; weak coarse-very coarse (100-200mm) prismatic parting to moderate medium (20-50mm) angular blocky structure; weak (moist); 5.1 field pH; .018 dSm-1; diffuse (>100mm) boundary;
BC2	74	94	cm	Moderately moist; white (5Y 8/2 moist); brownish yellow (10YR 6/8) primary mottles; strong brown (7.5YR 5/8) secondary mottles; silty clay loam; weak coarse-very coarse (100-200mm) prismatic parting to moderate medium (20-50mm) prismatic structure; weak (moist); 5 field pH; .021 dSm-1; diffuse (>100mm) boundary;
BC3	94	117	cm	Moderately moist; white (5Y 8/2 moist); reddish yellow (7.5YR 6/8) primary mottles; brownish yellow (10YR 6/8) secondary mottles; silty clay loam; weak coarse-very coarse (100-200mm) prismatic parting to moderate medium (20-50mm) prismatic structure; weak (moist); 4.9 field pH; .024 dSm-1;
C	211	223+	cm	Dry; white (5Y 8/2 moist); brownish yellow (10YR 6/8) primary mottles; red (2.5YR 4/6) secondary mottles; silty clay loam; weak (dry); 4.6 field pH; .083 dSm-1;

Profile Note: Norton Association; 36-94cm prisms have a colloidal coating of clay + organic material; bc material <6mm fine pm lamination (vert.). Field pH and EC have been copied from Lab data.

General Note: Isbell classification added by R.Tegg.

Figure 2 **Type Profile for Norton Soil Association**

NORTON ASSOC Yellow Podzolic Soil Gn3.91 siltstone H254/CSIRO/454 484230E 5436280N BEACONSFIELD

Sample Layer	Depths Upr cm	Depths Lwr cm	pH 1:5 H2O	PH 1:5 CaCl	EC 1:5 dS/m	Soluble Chloride mg/kg	Exchangeable Cations Ca meq	Mg meq	K meq	Na meq	Exch H meq	Exch Al meq	ECEC Sum meq	CEC Meas meq	TEB Sum meq	Base Sat %	ESP %	Ca/Mg Ratio
A1	0	3	4.7		.104 B	100 A	2.2	1.7	.24	.44 A	21.3 B		25.88		4.58	18	1.7 B	1.29
A1A2	3	6	4.8		.06 B	70 A	.54	.41	.08	.26 A	13.6 B		14.89		1.29	9	1.7 B	1.32
A3	6	10	4.8		.033 B	20 A	.32	.1	.06	.11 A	10 B		10.59		.59	6	1.0 B	3.20
B21	10	23	5.1		.021 B	10 A	.16	.21	.11	.1 A	8.8 B		9.38		.58	6	1.1 B	.76
B22	23	36	5.1		.027 B	20 A												
B23	36	51	5.2		.024 B	20 A	.14	.31	.06	.13 A	7.9 B		8.54		.64	7	1.5 B	.45
BC1	51	74	5.1		.018 B	20 A												
BC2	74	94	5.0		.021 B	20 A												
BC3	94	117	4.9		.024 B	20 A	.06	.26	.04	.1 A	13 B		13.46		.46	3	.7 B	.23
C	211	223	4.6		.083 B	150 A												

Sample Layer	Depths Upr cm	Depths Lwr cm	Loss Ign %	Organic Carbon %	Total N %	C/N Ratio	Avail N mg/kg	Air Dry Moi%	Air Grav Moi%	Total P %	Avail P mg/kg	Extract P mg/kg	Total K %	Avail K mg/kg	Extract K meq
A1	0	3	12	5.67 C	.234 A	24		2		.01 A					
A1A2	3	6	5.2	2.05 C	.102 A	20		1.4		.007 A					
A3	6	10	3.1	.82 C	.057 A	14		1.1		.006 A					
B21	10	23	3.1					1.2							
B22	23	36	3.8					1.4							
B23	36	51	4.9					1.5							
BC1	51	74	5.2					1.8							
BC2	74	94	4.7					1.6							
BC3	94	117	5.1					1.9							
C	211	223	4.5					1.4							

Sample Layer	Depths Upr cm	Depths Lwr cm	<------Extractable--------> Cu	Mn	Zn	Fe	Free B mg/kg	Free Fe %	Extractable Al %	Extractable Si %	Total Fe %	Total S %	Avail SO4-S mg/kg	Avail CaCO3 %	Dispersion GV %	Particle Size CS %	FS %	S %	C %
A1	0	3									.41 C				1	5	48	26	13 C
A1A2	3	6													11	13	45	27	12 C
A3	6	10									.7 C				14	12	44	30	15 B
B21	10	23													30	11	40	28	22 B
B22	23	36																	
B23	36	51									1.57 C				0	6	25	33	38 B
BC1	51	74																	
BC2	74	94																	
BC3	94	117									1.28 C				0	1	9	50	40 B
C	211	223																	

Horizon	Depth cm	Method	Mineral Code & Range(%)			
B23	36 - 51	XRD	Il 50-65	Ka 20-30	Ch 10-20	Vm 10-20

Table 3. **Analytical data for Norton Soil Association Type Profile**

2.1.3 **Warrina Soil Association (Wa)** (8228 ha)

Yellow podzolic soils developed on fine-grained Permian sediments constitute this association. The sediments include mudstones, siltstones and fine sandstones, some of which contain variable amounts of strongly waterworn pebbles. With increasing abundance of pebbles the sediments grade into conglomerates. The main occurrence is a broad belt of country extending from Middle Arm southwards to the basin of the Supply River, with smaller areas around West Arm and Bridgenorth.

The topography is mainly rolling to hilly with smooth convex slopes but includes some very gently undulating valley floors, of which the Supply Basin is the most important. This very gently undulating country accounts for about one fifth of the total area of the association. Rock outcrops are uncommon. Elevation ranges from sea level to 230m with the majority less than 150m. Soils of the Holwell Association, formed on similar parent materials but on steeper slopes at higher elevation, overlap with the Warrina soils at the higher levels. At lower levels on the very gently undulating valley floors there is also overlap with soils of the Tatana Association. Slopes in the Warrina Association may be up to 15° but are commonly between 5° and 10°.

The native vegetation is a sclerophyll forest of black peppermint *(Eucalyptus amygdalina)* and manna gum *(E. viminalis)* with understorey species such as *Exocarpus cupressiformis, Casuarina distyla, Acacia dealbata* and *Leptospermum scoparium*, and a rather sparse ground cover of heaths, small legumes and sedges. Dense thickets of swamp tea-tree *(Melaleuca ericifolia)* occur in certain small low-lying situations. About 45% of the association has been cleared for pastures and orchards. Newly-developed pastures on Warrina soils often carry a strong growth of rushes *(Juncus spp).*

The ground surface is often scattered with variable amounts of water-worn siliceous pebbles and stones derived as a residue from weathering of the parent mudstones and conglomerates. The pebbles are often fractured to yield some sharp angular faces but usually retain a part of their original well-rounded surface. This layer of rounded pebbles, when present, is a very useful distinguishing feature for soils of the association.

The soils fall broadly into two groups, with either duplex or gradational profiles, duplex being the more common. In the duplex profiles, the change from the fine sandy or silty A2 horizon to the underlying clay B2 horizon takes place over a depth of less than 10cm. In some instances this may be quite abrupt, while in others, an intermediate A3/B1 horizon of fine sandy clay loam texture may be developed which, if sufficiently thick, makes the profile gradational.

Surface textures in both groups are fine sandy loams, sandy loams or silty loams. When undisturbed, the A2 horizon is rather compact and finely vesicular, but upon repeated cultivation, as in orchards, the whole A horizon tends to become powdery. The mean depth to the top of the B horizon in the 33 profiles described was 40cm with a range from 8cm to 60cm. The duplex profiles tend to have the B horizon at shallower depths than the gradational. Parent rock ranges in depth from 90cm to about 150cm. Water-worn siliceous pebbles may occur throughout the profile, with the greatest concentration in the A2 horizon.

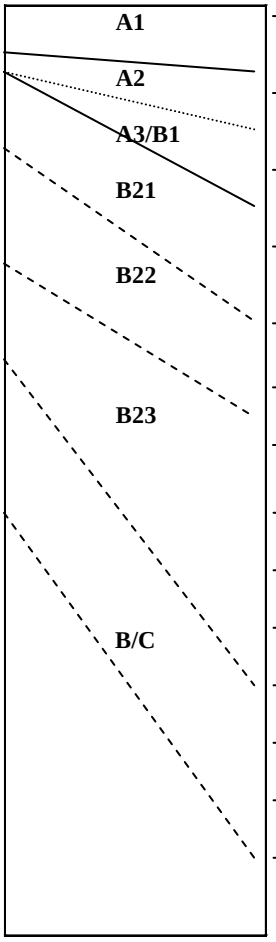
Two profiles, H257 and H262, both duplex, are typical of the association and are described below. H257 has a B horizon with a higher clay content and more strongly-developed structure than H262.

Minor soils in the association consist of small areas of Tatana association and various alluvial soils, including some highly organic profiles with strongly mottled subsoils under tea-tree swamps. Around Bridgenorth, the broad floor of the north-west-trending Long Plains trough is made up of low knolls of Warrina, and to a minor extent, Tatana soils surrounded by fine-textured alluvium.

Some of the soils called Mersey clay loam by Stephens and Taylor (1935) in the Glengarry area probably belong to the Warrina Association.

Warrina Soil Profile Class

Concept	**Stony yellow to brown texture contrast soils with sandy loam topsoils, weakly cemented A2 horizons and clayey subsoils.**
Aust. Soil Classification	Mottled brown Kurosols
Great Soil Group	Yellow Podzolics
Principal Profile Form	Dy3
Mapping Units	Wa
Geology	Permian mudstones, siltstones and fine sandstones
Landform	Rolling to hilly slopes
Vegetation	Sclerophyll forests of *Eucalyptus amygdalina & E. viminalis*
Permeability	Very slowly to slowly permeable
Drainage	Imperfectly to poorly drained



A1: Black (4/1, 3/1); sandy loam; weak extra fine granular (<2mm) to weak very fine (2-5mm) sub-angular blocky structure; weak (moist) consistence; 2-20% 6mm-60mm angular gravel; common live roots; pH 4.3-5.0; clear boundary change to

A2: Grey (10YR 5/1, 2.5Y 5/1); fine sandy loam; massive structure; very weak (moist) consistence; weakly cemented; 20-90% 6mm-60mm angular gravel; few live roots; pH 4.7-4.9; gradual change to

A3/B1: Mottled; grey to yellow (10YR 6/2, 2.5Y 6/4, 5Y 5/1) with (10YR 5/3, 5/4) mottles; fine sandy clay loam; massive structure; weakly cemented; 20-50% 6-60mm angular gravels; few live roots; pH 4.7 – 5.0; clear to change to

B21: Mottled; brown (10YR 5/6) with (5YR 5/6, 10YR 3/2, 2.5Y 5/4) mottles; heavy clay; weak fine (5-10mm) angular blocky structure; 2-10% 20mm-60mm rounded gravels; few live roots; pH 5.0; gradual change to

B22: Mottled: brown (10YR 5/6, 5/4) with (5YR 5/6, 2.5Y 5/4, 7.5YR 5/6, 4/4) mottles; heavy clay; moderate fine (5-10mm) angular blocky structure; 2-10% 20mm-60mm rounded gravels; few live roots; pH 5.1 – 5.2; gradual change to

B23: Mottled; grey (2.5Y 5/4, 5Y 5/2) with (10YR 5/6, 5/4, 2.5YR 4/8) mottles; heavy clay; moderate to weak fine (5-10mm) angular blocky structure; 2-10% 20mm-60mm rounded gravels; few live roots; pH 5.0 – 5.2; gradual change to

B/C: Mottled; brown (7.5YR 5/6, 2.5Y 5/4) with (10YR 5/1, 5YR 5/6, 7.5YR 5/6, 2.5YR 4/8) mottles; sandy medium clay; massive structure

Morphological sites: CSIRO H262, H257
Analysed sites: CSIRO H262, H257
Related soil names:
Correlation references: Dimmock *et al* (2001)

Figure 3. Warrina Soil Profile Class

Soil Profile Class Grid Reference	**Profile Number**	**Horizon**	**Sample Depth (cm)**	**pH water (1:5)**	**EC (d/sm)**	**Total P (mg/kg)**	**Org. Carb. (%)**	**Total N (%)**	**C/N Ratio**	**Ca**	**Mg**	**Na**	**K**
Warrina	H262	A11	0-3	4.3	0.063	0.011	8.73	0.279	31	5.5	2.2	0.25	0.36
488600E		A12	3-8	4.6	0.092	0.007	5.54	0.149	37	4	1.9	0.36	0.2
5425854N		A2	8-14	4.7	0.027		2.21	0.051	43				
		A3B1	16-23	4.9	0.024		0.72	0.022	33				
		B21	23-36	5.0	0.021					0.23	0.28	0.11	0.13
		B22	36-51	5.1	0.021								
		B23	51-69	5.2	0.024					0.08	1.1	0.17	0.16
		BC1	69-84	5.3	0.021								
		BC2	84-104	5.2	0.027					0.08	1.2	0.22	0.12
Warrina													
487191E	H257	A1	0-5	5.0	0.045	0.008	4.38	0.181	24	3.4	1.6	0.18	0.35
5435691N		A2	5-9	4.9	0.03	0.005	1.84	0.072	26	1.04	0.68	0.09	0.12
		A2A3	9-14	4.8	0.033		0.92	0.037	25				
		A3	14-28	5.0	0.024		0.36	0.085	4	0.15	0.14	0.07	0.04
		B21	29-41	5.0	0.033		0.59	0.044	13	0.35	1.5	0.2	0.21
		B22	41-56	5.2	0.036					0.36	2.1	0.29	0.2
		B23	56-76	5.3	0.03								
		B24	76-94	5.2	0.027								
		B25	94-107	4.9	0.048								
		BC1	107-122	5.1	0.03					0.08	1.2	0.19	0.07
		BC2	137-147	5.1	0.033								

Table 4 Analytical data for the Warrina SPC

Soil Profile Class Grid Reference	**Profile Number**	**Horizon**	**Sample Depth (cm)**	**Total Bases Sum meq**	**ECEC meq**	**BASE SAT (%)**	**ESP (%)**	**Ca/Mg Ratio**	**Gravel (of total) >2000 (um) (%)**	**Sand Coarse >200 (um) (%)**	**Sand Fine <200 (um) (%)**	**Silt (%)**	**Clay (%)**
Warrina	H262	A11	0-3	8.31	38.61	22	0.6	2.50	1	7	35	37	9
488600E		A12	3-8	6.46	31.86	20	1.1	2.11	1	7	37	40	9
5425500N		A2	8-14										
		A3B1	16-23										
		B21	23-36	0.75	16.15	5	0.7	0.82	1	4	21	33	39
		B22	36-51										
		B23	51-69	1.51	20.71	7	0.8	0.7	0	2	16	28	50
		BC1	69-84										
		BC2	84-104	1.62	22.32	7	1.0	0.7	1	5	19	26	47
Warrina	H257	A1	0-5	5.53	20.73	27	0.9	2.13	14	9	46	29	10
487191E		A2	5-9	1.93	10.63	18	0.8	1.53	21	14	46	29	9
5435691N		A2A3	9-14										
		A3	14-28	0.4	5.9	7	1.2	1.07	23	15	46	24	14
		B21	29-41	2.26	21.46	11	0.9	0.23	2	6	24	16	51
		B22	41-56	2.95	26.35	11	1.1	0.17	6	3	15	10	71
		B23	56-76										
		B24	76-94										
		B25	94-107										
		BC1	107-122	1.54	15.54	10	1.2	0.07	37	13	36	16	33
		BC2	137-147										

Table 4 Cont

2.1.4 **Holwell Soil Association (Ho)** (4394 ha)

Dark soils, generally with gradational profiles and formed on Permian mudstones, siltstones, shales and conglomerates constitute this association. The parent materials are similar to those on which soils of the Warrina Association have formed. The Holwell soils occupy steeper slopes and generally more elevated country, but there is a broad overlap between the two associations. Holwell Association ranges in elevation from 90m-430m with most of it over 150m. The landscape is hilly with steep slopes, which may range up to 20° or more. Landslips are a common feature. Small subdued rock outcrops occur infrequently and in some areas of shaly parent materials the surface of the soils is scattered with many small angular rock fragments.

The vegetation was originally a wet sclerophyll forest dominated by stringybark *(Eucalyptus obliqua)* with numerous understorey species including silver wattle *(Acacia dealbata)*, musk *(Olearia argophylla)* and dogwood *(Pomaderris apetala)*. In some of the upper gullies, tree ferns *(Dicksonia an+ tarctica)* are common, as well as other species usually associated with rainforest understorey. In the early days of settlement of the district, about 70% of the association was cleared of the native vegetation but over 800 hectares of this has since been allowed to revert to bracken.

Compared with the Warrina soils on the same parent materials, the Holwell soils are darker and generally lack the development of an A2 horizon. A horizons vary from dark grey-brown to black with surface textures most commonly loam or fine sandy loam, occasionally silty loam or clay loam. The texture change to the dark blocky clay B horizon is usually gradational but may occasionally be abrupt. The depth to the B horizon varies from 10cm to about 60cm but is usually about 20cm. Increasing amounts of decomposing mudstone appear with depth, passing into solid rock between 60cm and 110cm.

Profile H258, described on the next page, is typical of the association.

Yellow podzolic soils occur on some lower slopes of the Holwell Association, particularly near the broad zone of overlap with the Warrina soils. Local sandstone cliffs surmounted by small benches carrying sandy podzolic soils are included with the association, especially to the west of Flowery Gully.

SITE DESCRIPTION

Site Number: H258	Property Name:	Runoff: Moderately rapid	
Project Code: CSIRO	Property Owner:	Permeability: Slowly permeable	
Map Scale:	Nearest Town: BEACONSFIELD	Drainage: Moderately well drained	
Sheet No:	Describer: Geoff M. Dimmock	Elevation: 408 m	
Map Name:	Date Cored: 20 May 1963		
AMG Easting: 482849 N	Rainfall: 1010 mm	Soil Class: Holwell Assoc	
AMG Northing: 5429847 E	Air Temp (3pm):	Northcote PPF: Dy2.51	
Film No: 6966	Type of Site:	Great Soil Group: Grey-Brown Podzolic Soil	
Run No: 4	Type of Desc: Soil pit	Soil Taxonomy:	
Frame No:	Soil Samples: Yes	Land Capability:	
State: Tasmania	Soil Photos:	Geological Map:	

Location: 2.0KM east of Holwell, 32M south of boundary corner of fence B on 242degrees and 134degrees respectively.
Aust Classn: Acidic, Mesotrophic, Grey, Kandosol; (Confidence level 4)

Landform: Element moderately inclined, mid-slope, hillslope; Pattern rolling hills 90-300m 10-32%, hills;
Land Surface: Slope angle 10.5 %; Aspect 315; complete clearing - pasture but never cultivated;
Vegetation:
Substrate: mudstone;

HORIZON DESCRIPTIONS

A1	0	10	cm	Moist; dark greyish brown (10YR 4/2 moist); clay loam; weak ex fine (<2mm) granular structure; weak (moist); few (2-10%) rounded gravels (6-20mm) same as substrate material; abundant live roots; 5.4 field pH; .068 dSm-1; diffuse (>100mm) boundary;
A1A2	10	16	cm	Moderately moist; dark greyish brown (10YR 4/2 moist); light clay; weak ex fine (<2mm) subangular blocky structure; weak (moist); few (2-10%) stones (60-200mm) same as substrate material; common live roots; 4.9 field pH; .048 dSm-1; diffuse (>100mm) boundary;
B21	16	25	cm	Moderately moist; dark greyish brown (10YR 4/2 moist); medium clay; weak ex fine (<2mm) subangular blocky structure; weak (moist); common live roots; 4.9 field pH; .042 dSm-1; diffuse (>100mm) boundary;
B22	25	33	cm	Moderately moist; dark greyish brown (10YR 4/2 moist); heavy clay; weak ex fine (<2mm) subangular blocky structure; weak (moist); common live roots; 4.8 field pH; .045 dSm-1; diffuse (>100mm) boundary;
B23	33	41	cm	Moderately moist; dark greyish brown (10YR 4/2 moist); heavy clay; weak ex fine (<2mm) subangular blocky structure; weak (moist); few (2-10%) rounded gravels (20-60mm) quartz; common live roots; 4.8 field pH; .042 dSm-1; diffuse (>100mm) boundary;
B24	41	53	cm	Moderately moist; brown (10YR 4/3 moist); medium clay; massive structure; weak (moist); few (2-10%) grit (2-6mm) mudstone; few live roots; 4.8 field pH; .051 dSm-1; abrupt (5-20mm) boundary;
C	61	64+	cm	Moderately moist; brown (10YR 4/3 moist); yellowish brown (10YR 5/6) primary mottles; light clay loam; massive structure; very weak (moist); few (2-10%) gravels (6-20mm) mudstone; 4.9 field pH; .051 dSm-1;

Profile Note: Holwell Association; 0-64cm soft w`d mu fragments increasing to <60% at 64cm; 10-16cm (<2mm) and33-41cm(<40mm) bl silicified mudstone fragmen. Field pH and EC have been copied from Lab data.

General Note: Isbell classification added by R.Tegg.

Figure 4. Type Profile for Holwell Soil Association

HOLWELL ASSOC Grey-Brown Podzolic Soil Dy2.51 mudstone H258/CSIRO/458 482849E 5429847N BEACONSFIELD

Sample Layer	Depths Upr cm	Depths Lwr cm	pH 1:5 H2O	PH 1:5 CaCl	EC 1:5 dS/m	Soluble Chloride mg/kg	Exchangeable Cations Ca meq	Mg meq	K meq	Na meq	Exch H meq	Exch Al meq	ECEC Sum meq	CEC Meas meq	TEB Sum meq	Base Sat %	ESP %	Ca/Mg Ratio
A1	0	10	5.4		.068 B	40 A	4.9	1.2	1.15	.21 A	14.8 B		22.26		7.46	33	.9 B	4.08
A1A2	10	16	4.9		.048 B	40 A	3.2	1.3	.61	.2 A	17.7 B		23.01		5.31	23	.9 B	2.46
B21	16	25	4.9		.042 B	30 A	2.6	1.4	.6	.16 A	21.9 B		26.66		4.76	18	.6 B	1.86
B22	25	33	4.8		.045 B	20 A	2.3	1.3	.68	.16 A	30.1 B		34.54		4.44	13	.5 B	1.77
B23	33	41	4.8		.042 B	10 A												
B24	41	53	4.8		.051 B	20 A	1	.39	.39	.19 A	38 B		39.97		1.97	5	.5 B	2.56
C	61	64	4.9		.051 B	30 A												

Sample Layer	Depths Upr cm	Depths Lwr cm	Loss Ign %	Organic Carbon %	Total N %	C/N Ratio	Avail N mg/kg	Air Dry Moi%	Grav Moi%	Total P %	Avail P mg/kg	Extract P mg/kg	Total K %	Avail K mg/kg	Extract K meq
A1	0	10	7.2	2.8 C	.222 A	13		2		.026 A					
A1A2	10	16	6.1	2.07 C	.168 A	12		2.2		.015 A					
B21	16	25	5.9	1.35 C	.139 A	10		3.3							
B22	25	33	7.7	1.97 C				4		.014 A					
B23	33	41	9.8	2.85 C				5.4							
B24	41	53	13.2	4.26 C				7.6							
C	61	64	8.5	1.95 C				6.3		.016 A					

Sample Layer	Depths Upr cm	Depths Lwr cm	<-----Extractable--------> Cu mg/kg	Mn mg/kg	Zn mg/kg	Fe mg/kg	Free B mg/kg	Free Fe %	Extractable Al %	Extractable Si %	Total Fe %	Total S %	Avail SO4-S mg/kg	Dispersion CaCO3 %	Particle Size GV %	CS %	FS %	S %	C %
A1	0	10									1.22 C				1	9	36	21	27 C
A1A2	10	16													11	8	31	23	35 C
B21	16	25													0	8	25	19	46 C
B22	25	33									2.88 C				0	6	21	16	55 C
B23	33	41																	
B24	41	53													6	10	20	13	49 C
C	61	64									2.67 C								

Table 5. Analytical data for Holwell Soil Association Type Profile

2.1.5 **Tatana Soil Association (Tt)** (6459 ha)

In this association, the dominant soils are Podzols with subdominant Humus Podzols and Yellow Podzolic Soils. Parent rocks are Permian and Triassic sandstones. Soils may be either in situ or formed on colluvium or alluvium mainly derived from sandstone. Rock outcrops are very rare amongst the in situ soils, occurring chiefly as cliffs adjacent to streams, and are completely absent from the soils on transported materials. The sandstones are predominantly highly siliceous, but some are also micaceous.

The Tatana Association occupies a generally subdued landscape, often forming the broad floors of basins and troughs surrounded by more resistant dolerite ridges or hills. Altitude ranges from sea level to 390m with two thirds below 150m. Even where the association occurs at high elevation, within it relief is still rather subdued apart from occasional flanking cliffs. Two fifths of the total area consists of flat to very gently undulating basin and trough floors. This, together with similar country in the Warrina Association, has been mapped as a separate slope category, because of its significance to land-use. The remainder is mainly undulating to rolling, but there are some hilly areas to the south-west of Glengarry.

Flanking the extensive very gently undulating basin floor of the Supply River is a zone of undulating to rolling country carrying both Tatana soils and soils of the Warrina Association, developed over alternating strata of sandstones and mudstones respectively. Although the soils of the two associations are morphologically quite distinct, the dissection pattern has tended to obliterate any corresponding topographic difference in the generally low relief of the landscape. Boundaries mapped in these places are therefore rather arbitrary.

The native vegetation is a sclerophyll forest consisting chiefly of black peppermint *(Eucalyptus amygdalina)*, manna gum *(E. viminalis)* and stringybark *(E. obliqua)* with a dense shrub layer of numerous leguminous and epacrid species and bracken *(Pteridium esculentum)*. In poorly-drained situations, tea-trees, particularly *Melaleuca squarrosa* and *Leptospermum scoparium*, and cutting grass *(Gahnia psittacorum)* are common, sometimes forming narrow impenetrable thickets *3-4m* high immediately along stream courses. Coral fern *(Gleichenia circinnata)* is also found in the more open wetter situations.

The soils of the association fall broadly into two categories:

(1) In well-drained situations such as the easy rolling to hilly country and on low knolls on the very gently undulating valley floors, sandy podzols are dominant with very subordinate yellow podzolics. The distinction between podzols and Yellow Podzolics is a fine one, depending upon the degree of development of the organic B horizon. Where this is well developed the profile is classified as a Podzol (Podosol); where it is minimal, chiefly in the form of organic coatings on the faces of the clay aggregates, the profile is classified as Yellow Podzolic. The Podzols are characterised by a dark grey speckled sandy A1 horizon overlying a light grey sandy A2 horizon which in turn overlies a thin and extremely irregular organic B horizon grading into a mottled sandy clay which may continue to a depth of at least 4m. The Yellow Podzolics lack the separate organic B horizon but often have prominent organic staining on the faces of the clay aggregates. Deep weathering is a general feature of the sandstones throughout the area and accounts for the scarcity of outcrop. There are exceptions, however, for instance, in several road cuttings to the south-east of Bridgenorth where micaceous sandstones occur at about *120cm* in the profile.

Profile H264 (described over the page) is a typical Podzol of well-drained situations.

(2) In poorly-drained situations such as depressions on the very gently undulating valley floors, profiles are either humus podzols or they may show a gradational texture change from sandy loam at the surface, through sandy clay loam to sandy clay at depth. Prominent mottling is common in the gradational profiles.

Profile H251 (see page 25) represents a Humus-Iron Podzol, common in poorly-drained areas.

Some minor variants of the podzol group have strongly cemented A1 horizons. Another Podzol variant observed near Sidmouth (491000E 5433900N) had a much more strongly developed organic B horizon than usual, showing distinct horizontal laminations of differing hardness and intensity of colour.

CSIRO Soil Surveys (1949-70)

SITE DESCRIPTION

Site Number: H264	Property Name:	Runoff:	Very slow
Project Code: CSIRO	Property Owner:	Permeability:	Moderately permeable
Map Scale:	Nearest Town: QUAMBY	Drainage:	Rapidly drained
Sheet No:	Describer: Geoff M. Dimmock	Elevation:	73 m
Map Name:	Date Cored: 9 Apr 1964		
AMG Easting: 494648 E	Rainfall: 930 mm	Soil Class:	Tatana Assoc
AMG Northing: 5429621 N	Air Temp (3pm):	Northcote PPF:	Uc2.33
Film No: 42	Type of Site:	Great Soil Group:	Podzol
Run No: 7	Type of Desc: Soil pit	Soil Taxonomy:	
Frame No:	Soil Samples: Yes	Land Capability:	
State: Tasmania	Soil Photos:	Geological Map:	

Location: 2.0KM NW of Exeter, 64M along Rd (on 189degrees) from fence (on 280degrees) and 33M from Rd fence into paddock.
Aust Classn: Fragic, Pipey, Semiaquic, Podosol; (Confidence level 4)

Landform: Element gently inclined, upper slope, hillslope; Pattern undulating low hills 30-90m 3-10%, low hills;
Land Surface: Slope angle 7.0 %; Aspect 315; no effective disturbance; Condition of surface soil self-mulching;
Vegetation:
Substrate: sandstone, silicified;

HORIZON DESCRIPTIONS

A11	0	3	cm	Moist; very dark grey (10YR 3/1 moist); fibric sand; massive structure; very weak (moist); abundant fine (1-2mm) live roots; 5.6 field pH; .051 dSm-1; diffuse (>100mm) boundary;
A12	3	11	cm	Moist; very dark grey (10YR 3/1 moist); fibric sand; massive structure; very weak (moist); few (2-10%) gravels (6-20mm) charcoal; abundant fine (1-2mm) live roots; 4.7 field pH; .051 dSm-1; gradual (50-100mm) boundary;
A12A2	11	19	cm	Moist; very dark grey (10YR 3/1 moist); sand; single grain structure; very weak (moist); common live roots; 4.5 field pH; .039 dSm-1; diffuse (>100mm) boundary;
A21	19	28	cm	Moist; light brownish grey (10YR 6/2 moist); few (2-10%) greyish brown (10YR 5/2) primary mottles; sand; single grain structure; loose (moist); v few (<2%) charcoal coarse fragments; common live roots; 5 field pH; .012 dSm-1; diffuse (>100mm) boundary;
A22	30	43	cm	Moist; light brownish grey (10YR 6/2 moist); sand; single grain structure; loose (moist); few live roots; 4.8 field pH; .012 dSm-1; diffuse (>100mm) boundary;
A23	43	71	cm	Moist; light brownish grey (10YR 6/2 moist); sand; single grain structure; loose (moist); few live roots; 5.1 field pH; .009 dSm-1; abrupt (5-20mm) tongued boundary;
B21h	71	91	cm	Moist; very dark brown (10YR 2/2 moist); sand; massive structure; massive organic pan; 4.8 field pH; .022 dSm-1;
B22h	76	89	cm	Moist; yellowish brown (10YR 5/6 moist); olive brown (2.5Y 4/4) primary mottles; strong brown (7.5YR 5/6) secondary mottles; sand; single grain structure; very weak (moist); 5 field pH; .02 dSm-1;
B23h	96	112	cm	Moderately moist; very dark brown (10YR 2/2 moist); yellowish brown (10YR 5/6) primary mottles; light olive brown (2.5Y 5/4) secondary mottles; sand; massive structure; massive organic pan; 5.3 field pH; .021 dSm-1;
BC	99	110	cm	Moist; dark brown (10YR 3/3 moist); dark greyish brown (10YR 4/2) primary mottles; sand; single grain structure; very weak (moist); 5 field pH; .024 dSm-1;
C1	107	114	cm	Moist; yellowish brown (10YR 5/6 moist); light olive brown (2.5Y 5/4) primary mottles; clayey sand; single grain structure; firm (moist); fine (<5mm) cracks; few live roots; 5.4 field pH; .018 dSm-1;
C2	114	137	cm	Moist; yellowish brown (10YR 5/6 moist); light olive brown (2.5Y 5/4) primary mottles; clayey sand; single grain structure; firm (moist); 5.5 field pH; .021 dSm-1;
C3	137	165	cm	Moist; strong brown (7.5YR 5/6 moist); yellowish brown (10YR 5/6) primary mottles; greyish brown (2.5Y 5/2) secondary mottles; light sandy clay loam; single grain structure; firm (moist); 5.6 field pH; .018 dSm-1;
C4	193	203	cm	Moist; yellowish brown (10YR 5/6 moist); light olive brown (2.5Y 5/4) primary mottles; strong brown (7.5YR 5/6) secondary mottles; clayey sand; single grain structure; weak (moist); 5.6 field pH; .018 dSm-1;
C5	244	251+	cm	Moderately moist; dark greyish brown (10YR 4/2 moist); greyish brown (10YR 5/2) primary mottles; yellowish brown (10YR 5/6) secondary mottles; sand; massive structure; moderately cemented massive organic pan;

Figure 5. Type Profile for podzols within well drained area of the Tatana Soil Association

TATANA ASSOC Podzol Uc2.33 sandstone H264/CSIRO/464 494648E 5429621N QUAMBY

Sample Layer	Depths Upr cm	Depths Lwr cm	pH 1:5 H2O	PH 1:5 CaCl	EC 1:5 dS/m	Soluble Chloride mg/kg	Exchangeable Cations Ca meq	Mg meq	K meq	Na meq	Exch H meq	Exch Al meq	ECEC Sum meq	CEC Meas meq	TEB Sum meq	Base Sat %	ESP %	Ca/Mg Ratio
A11	0	3	5.6		.051 B	10 A	5.7	1.7	.23	.12 A	11.5 B		19.25		7.75	40	.6 B	3.35
A12	3	11	4.7		.051 B	10 A	2.3	.85	.13	.12 A	9.2 B		12.6		3.4	27	1.0 B	2.71
A12A2	11	19	4.5		.039 B	10 A												
A21	19	28	5.0		.012 B	10 A												
A22	30	43	4.8		.012 B	10 A												
A23	43	71	5.1		.009 B	10 A												
B21h	71	91	4.8		.022 B	110 A												
B22h	76	89	5.0		.02 B	10 A												
B23h	96	112	5.3		.021 B	10 A												
BC	99	110	5.0		.024 B	10 A												
C1	107	114	5.4		.018 B	10 A												
C2	114	137	5.5		.021 B	10 A												
C3	137	165	5.6		.018 B	10 A	.08	1.4	.11	.17 A	6.8 B		8.56		1.76	20	2.0 B	.06
C4	193	203	5.6		.018 B	10 A												

Sample Layer	Depths Upr cm	Depths Lwr cm	Loss Ign %	Organic Carbon %	Total N %	C/N Ratio	Avail N mg/kg	Air Dry Moi%	Grav Moi%	Total P %	Avail P mg/kg	Extract P mg/kg	Total K %	Avail K mg/kg	Extract K meq
A11	0	3	7.4	3.3 C	.15 A	22		1.2		.006 A					
A12	3	11	4.6	2.17 C	.09 A	24		.81		.004 A					
A12A2	11	19	2.5	1.22 C	.044 A	28		.56							
A21	19	28	1.1					.36							
A22	30	43	.84					.26							
A23	43	71	.3	.08 C	.004 A	20		.1							
B21h	71	91	1.8	.7 C	.027 A	26		.69							
B22h	76	89	1.3	.27 C	.018 A	15		.82							
B23h	96	112	2.3	.68 C	.025 A	27		.1							
BC	99	110	1.5	.36 C	.017 A	21		.59							
C1	107	114	1.8	.1 C	.009 A	11		1.3							
C2	114	137	2.4					1.4							
C3	137	165	2.3					1.4							
C4	193	203	1.5					.94							

Sample Layer	Depths Upr cm	Depths Lwr cm	<------Extractable--------> Cu	Mn	Zn mg/kg	Fe	B mg/kg	Free Fe %	Extractable Al %	Si %	Total Fe %	Total S %	Avail SO4-S mg/kg	CaCO3 %	Dispersion GV %	Particle Size CS %	FS %	S %	C %
A11	0	3									.1 C				0	32	56	3	2 C
A12	3	11													0	32	61	3	2 C
A12A2	11	19																	
A21	19	28																	
A22	30	43																	
A23	43	71									.13 C								
B21h	71	91									.21 C								
B22h	76	89									.65 C								
B23h	96	112									.6 C								
BC	99	110									.37 C								
C1	107	114									1.01 C								
C2	114	137																	
C3	137	165													0	22	56	1	19 B
C4	193	203																	

Table 6. Analytical data for Tatana Soil Association Type Profile H264

CSIRO Soil Surveys (1949-70)

SITE DESCRIPTION

Site Number:	H251	Property Name:		Runoff:	Very slow
Project Code:	CSIRO	Property Owner:		Permeability:	Slowly permeable
Map Scale:		Nearest Town:		Drainage:	Moderately well drained
Sheet No:		Describer:	Geoff M. Dimmock	Elevation:	226 m
Map Name:		Date Cored:	25 Apr 1963		
AMG Easting:	495584 E	Rainfall:	910 mm	Soil Class:	TATANA ASSOC
AMG Northing:	5419438 N	Air Temp (3pm):		Northcote PPF:	Uc2.33
Film No:	43942	Type of Site:		Great Soil Group:	Podzol
Run No:	4	Type of Desc:	Soil pit	Soil Taxonomy:	
Frame No:		Soil Samples:	Yes	Land Capability:	
State:	Tasmania	Soil Photos:		Geological Map:	

Location: 2.5KM WNW of Bridgenorth about 10m W of rd into property "Jennyfield".
Aust Classn: Fragic, Humic/Alsilic, Semiaquic, Podosol; (Confidence level 4)

Landform: Element level, flat,
Land Surface: Limited clearing; Water Table Depth -3.6 m;
Vegetation:
Substrate: sandstone;

HORIZON DESCRIPTIONS

A11	0	3	cm	Moderately moist; very dark grey (10YR 3/1 moist); dark grey (10YR 4/1) primary mottles; loamy sand; massive structure; weak (moist); abundant fine (1-2mm) live roots; 5.3 field pH; .063 dSm-1; diffuse (>100mm) boundary;
A12	3	11	cm	Moderately moist; very dark grey (10YR 3/1 moist); grey (10YR 5/1) primary mottles; loamy sand; massive structure; weak (moist); common coarse (>5mm) live roots; 4.5 field pH; .042 dSm-1; diffuse (>100mm) boundary;
A12A2	11	25	cm	Moderately moist; dark greyish brown (10YR 4/2 moist); heavy sand; single grain structure; very weak (moist); common live roots; 4.7 field pH; .021 dSm-1; diffuse (>100mm) boundary;
A21	25	46	cm	Moderately moist; greyish brown (10YR 5/2 moist); sand; single grain structure; very weak (moist); 5.1 field pH; .009 dSm-1; diffuse (>100mm) boundary;
A22	46	51	cm	Moderately moist; light brownish grey (10YR 6/2 moist); sand; single grain structure; very weak (moist); weakly cemented; 5.4 field pH; .018 dSm-1; abrupt (5-20mm) irregular boundary;
B1h	55	57	cm	Moist; very dark grey (10YR 3/1 moist); dark grey (10YR 4/1) primary mottles; greyish brown (10YR 5/2) secondary mottles; clayey sand; massive structure; moderately cemented organic pan; 4.6 field pH; .027 dSm-1; clear (20-50mm) boundary;
B21h	57	60	cm	Moist; very dark brown (10YR 2/2 moist); sandy clay loam; massive structure; weak (moist); 4.5 field pH; .045 dSm-1; abrupt (5-20mm) boundary;
B22h	60	66	cm	Moist; yellowish brown (10YR 5/8 moist); dark reddish brown (5YR 2/2) primary mottles; clayey sand; massive structure; fine (<5mm) cracks; moderately cemented; 5 field pH; .03 dSm-1; clear (20-50mm) boundary;
B23t	69	86	cm	Moist; yellowish brown (10YR 5/6 moist); sandy clay loam; massive structure; weak (moist); few (2-10%) 6-20mm ferruginous-organic concretions; ortstein; few live roots; 5.4 field pH; .021 dSm-1; diffuse (>100mm) boundary;
B24t	86	99	cm	Moist; yellowish brown (10YR 5/6 moist); light olive brown (2.5Y 5/4) primary mottles; dark reddish brown (5YR 2/2) secondary mottles; sandy clay loam; massive structure; weak (moist); 5.4 field pH; .018 dSm-1;
B25t	109	127	cm	Moist; strong brown (7.5YR 5/6 moist); yellowish brown (10YR 5/6) primary mottles; light grey (N 7/0) secondary mottles; sandy clay loam; massive structure; weak (moist); 5.6 field pH; .015 dSm-1;
C11g	147	155	cm	Moist; light grey (N 7/0 moist); strong brown (7.5YR 5/6) primary mottles; sandy medium clay; very firm (moist); 5.4 field pH; .021 dSm-1;
C12g	234	246+	cm	Moist; strong brown (7.5YR 5/6 moist); light grey (N 7/0) primary mottles; red (2.5YR 4/6) secondary mottles; sandy medium clay; very firm (moist); 5.3 field pH; .015 dSm-1;

Profile Note: Tatana Association (podzols on sandstone); 11-25cm aestivating worm and copious organic casts. Field pH and EC have been copied from Lab data.

General Note: Isbell classification added by R.Tegg.

Figure 6. Type profile of Podzol in poorly drained areas of the Tatana Soil Association

TATANA ASSOC Podzol Uc2.33 sandstone H251/CSIRO/451 495794E 5419878 N

Sample Layer	Depths Upr cm	Depths Lwr cm	pH 1:5 H2O	PH 1:5 CaCl	EC 1:5 dS/m	Soluble Chloride mg/kg	Exchangeable Cations Ca meq	Mg meq	K meq	Na meq	Exch H meq	Exch Al meq	ECEC Sum meq	CEC Meas meq	TEB Sum meq	Base Sat %	ESP %	Ca/Mg Ratio
A11	0	3	5.3		.063 B	30 A	6.1	1.5	.18	.07 A	11.8 B		19.65		7.85	40	.4 B	4.07
A12	3	11	4.5		.042 B	20 A	1.3	.6	.08	.07 A	9.2 B		11.25		2.05	18	.6 B	2.17
A12A2	11	25	4.7		.021 B	20 A												
A21	25	46	5.1		.009 B	20 A												
A22	46	51	5.4		.018 B	20 A	.05	.05	.01	.03 A	.4 B		.54		.14	26	5.6 B	1.00
B1h	55	57	4.6		.027 B	20 A												
B21h	57	60	4.5		.045 B	20 A												
B22n	60	66	5.0		.03 B	20 A	.07	.28	.12	.14 A	80.7 B		81.31		.61	1	.2 B	.25
B23t	69	86	5.4		.021 B	150 A	.13	.07	.12	.18 A	30 B		30.5		.5	2	.6 B	1.86
B24t	86	99	5.4		.018 B	20 A												
B25t	109	127	5.6		.015 B	10 A												
C11g	147	155	5.4		.021 B	10 A	.05	.65	.11	.15 A	12.8 B		13.76		.96	7	1.1 B	.08
C12g	234	246	5.3		.015 B	10 A												

Sample Layer	Depths Upr cm	Depths Lwr cm	Loss Ign %	Organic Carbon %	Total N %	C/N Ratio	Avail N mg/kg	Air Dry Moi%	Grav Moi%	Total P %	Avail P mg/kg	Extract P mg/kg	Total K %	Avail K mg/kg	Extract K meq
A11	0	3	8.5	4.7 C	.166 A	28		1.5		.007 A					
A12	3	11	4.8	2.14 C	.089 A	24		.89		.004 A					
A12A2	11	25	1.8	.93 C	.039 A	24		.28							
A21	25	46	.43	.18 C	.01 A	18		.11							
A22	46	51	.26	.09 C	.015 A	6		.06							
B1h	55	57	2.9	1.19 C	.057 A	21		1							
B21h	57	60	10.2	4.36 C	.242 A	18		3.1							
B22n	60	66	18.8	5.73 C	.168 A	34		8.1							
B23t	69	86	13.4	1.76 C	.089 A	20		9							
B24t	86	109	9.2					7.1							
B25t	109	137	3.3					1.8							
C11g	147	155	6.4					4.3							
C12g	234	246	4.7					3.1							

Sample Layer	Depths Upr cm	Depths Lwr cm	<------Extractable--------> Cu mg/kg	Mn mg/kg	Zn mg/kg	Fe mg/kg	B mg/kg	Free Fe %	Extractable Al %	Si %	Total Fe %	Total S %	Avail SO4-S mg/kg	CaCO3 %	Dispersion GV %	Particle Size CS %	FS %	S %	C %
A11	0	3									.2 C				0	18	65	8	2 C
A12	3	11													0	20	67	7	2 C
A12A2	11	25																	
A21	25	46																	
A22	46	51									.06 C				0	19	70	11	2 B
B1h	55	57									.74 C								
B21h	57	60									.93 C								
B22n	60	66									5.61 C				0	11	30	5	35 C
B23t	69	86									6.52 C				0	8	28	9	49 C
B24t	86	99																	
B25t	109	127																	
C11g	147	155													0	9	38	5	49 B
C12g	234	246																	

Table 7. Analytical data for Tatana Soil Association Type Profile H251

2.1.6 Flowery Gully Soil Association (FG) (73 ha)

The Flowery Gully Association, very small in area but distinct, is named from the single locality where it occurs. It comprises mainly Terra Rossa soils on the Ordovician Gordon Limestone, and a variety of others on mixed parent materials, which include Permian conglomerates, as well as older slates and quartzites. Slopes are steep, up to 20°, and most of the drainage discharges underground into sink holes. Caves are common and rock outcrops generally subdued.

The limestone, which often contains over 90% $CaCO_3$, is extensively quarried for use in the aluminium industry at Bell Bay and also crushed for agricultural lime.

The native vegetation was an open sclerophyll forest, mainly of manna gum *(Eucalyptus viminalis)*, with an understorey of prickly box *(Bursaria spinosa)* and a ground cover of bracken fern and native grasses chiefly *Danthonia spp*.

On the limestones, the most common soils are the red well-structured Terra Rossas. Profile H265, described below, is representative of these soils in the locality.

Typical of limestone soils in general, profiles vary greatly in depth to underlying rock from a few centimetres to a few metres, the deeper ones occurring mainly along cracks and pipes. Profiles redder than that described are also fairly common. Along the eastern and southern margins of the area, Podzolic profiles have formed on mixed colluvial and sedimentary parent material arising from the various sedimentary rocks which outcrop on the adjacent steep slopes.

SITE DESCRIPTION

Site Number: H265	Property Name:	Runoff:	Moderately rapid
Project Code: CSIRO	Property Owner:	Permeability:	Moderately permeable
Map Scale:	Nearest Town: FRANKFORD	Drainage:	Rapidly drained
Sheet No:	Describer: Geoff M. Dimmock	Elevation:	108 m
Map Name:	Date Cored: 9 Apr 1964		
AMG Easting: 484310 E	Rainfall: 940 mm	Soil Class:	Flowery Gully Assoc
AMG Northing: 5431909 N	Air Temp (3pm):	Northcote PPF:	Dr2.13
Film No: 6875	Type of Site:	Great Soil Group:	Terra Rossa Soil
Run No: 5	Type of Desc: Soil pit	Soil Taxonomy:	
Frame No:	Soil Samples: Yes	Land Capability:	
State: Tasmania	Soil Photos:	Geological Map:	

Location: 4.1KM SSW of Flowery Gully Post Office, face of disused limestone quarryowner Mr. Pentland.
Aust Classn: Haplic, Calcareous, Red, Ferrosol; (Confidence level 4)

Landform: Element steep, cut face;
Land Surface: Slope angle 34.4 %; Aspect 000; no effective disturbance; Rock Outcrops 2-10% bedrock exposed, Limestone;
Vegetation:
Substrate: limestone;

HORIZON DESCRIPTIONS

A11	0	3	cm	Moist; brown (7.5YR 4/2 moist); heavy clay loam; moderate very fine (2-5mm) subangular blocky structure; weak (moist); many (20-50%) stones (60-200mm) limestone; abundant fine (1-2mm) live roots; 7.6 field pH; .161 dSm-1; diffuse (>100mm) boundary;
A12	3	8	cm	Moist; brown (7.5YR 4/2 moist); heavy clay loam; moderate very fine (2-5mm) subangular blocky structure; weak (moist); few (2-10%) angular gravels (20-60mm) limestone; common fine (1-2mm) live roots; 7.7 field pH; .122 dSm-1; gradual (50-100mm) boundary;
A3	8	16	cm	Moist; brown (7.5YR 4/3 moist); light clay; moderate very fine (2-5mm) subangular blocky structure; weak (moist); few (2-10%) gravels (20-60mm) limestone; common fine (1-2mm) live roots; 7.6 field pH; .09 dSm-1;
B1	16	24	cm	Moist; brown (7.5YR 4/3 moist); reddish brown (5YR 4/4) primary mottles; heavy clay; moderate fine (5-10mm) subangular blocky structure; weak (moist); few (2-10%) gravel coarse fragments; common fine (1-2mm) live roots; 7.6 field pH; .08 dSm-1;
B21	24	41	cm	Moist; yellowish red (5YR 4/6 moist); heavy clay; moderate fine (5-10mm) subangular blocky structure; weak (moist); few (2-10%) gravel coarse fragments; few fine (1-2mm) live roots; 7.7 field pH; .071 dSm-1;
B22	41	63	cm	Moist; yellowish red (5YR 4/6 moist); heavy clay; moderate fine (5-10mm) subangular blocky structure; weak (moist); few (2-10%) gravel coarse fragments; few fine (1-2mm) live roots; 7.8 field pH; .098 dSm-1;
B23	63	91+	cm	Moist; yellowish red (5YR 4/6 moist); heavy clay; moderate fine (5-10mm) subangular blocky structure; weak (moist); few fine (1-2mm) live roots; 8.2 field pH; .149 dSm-1; abrupt (5-20mm) irregular boundary;
Profile Note:				Flowery Gully Association (Terra Rossa); >91cm on large li boulder; 0-2.5cm few worms active; 8-16cm <2% rounded +angular qz gv also. Field pH and EC have been copied from Lab data.
General Note:				Isbell classification added by R.Tegg.

Figure 7. Type Profile for Flowery Gully Soil Association

FLOWERY GULLY ASS Terra Rossa Soil Dr2.13 limestone H265/CSIRO/465 484310E 5431909N FRANKFORD

Sample Layer	Depths Upr cm	Depths Lwr cm	pH 1:5 H2O	PH 1:5 CaCl	EC 1:5 dS/m	Soluble Chloride mg/kg	Exchangeable Cations Ca meq	Mg meq	K meq	Na meq	Exch H meq	Exch Al meq	ECEC Sum meq	CEC Meas meq	TEB Sum meq	Base Sat %	ESP %	Ca/Mg Ratio
A11	0	3	7.6		.161 B	110 A					4.3 B							
A12	3	8	7.7		.122 B	90 A					4 B							
A3	8	16	7.6		.09 B	70 A												
B1	16	24	7.6		.08 B	60 A	17.6	2	.22	.24 A	4 B		24.06		20.06	83	1.0 B	8.80
B21	24	41	7.7		.071 B	60 A												
B22	41	63	7.8		.098 B	70 A	24	3.6	.45	.33 A	5.7 B		34.08		28.38	83	1.0 B	6.67
B23	63	91	8.2		.149 B	90 A												

Sample Layer	Depths Upr cm	Depths Lwr cm	Loss Ign %	Organic Carbon %	Total N %	C/N Ratio	Avail N mg/kg	Air Dry Moi%	Grav Moi%	Total P %	Avail P mg/kg	Extract P mg/kg	Total K %	Avail K mg/kg	Extract K meq
A11	0	3	13.3	5.42 C	.328 A	17		3.3		.028 A					
A12	3	8	10.3	4.21 C	.264 A	16		3		.026 A					
A3	8	16	9	3.49 C	.228 A	15		2.9							
B1	16	24	8.2	2.76 C	.202 A	14		2.9							
B21	24	41	9.1					4							
B22	41	63	11.7					6.4							
B23	63	91	12.1					6.1		.04 A					

Sample Layer	Depths Upr cm	Depths Lwr cm	<-----Extractable--------> Cu	Mn	Zn	Fe	B mg/kg	Free Fe %	Extractable Al %	Si %	Total Fe %	Total S %	Avail SO4-S mg/kg	CaCO3 %	Dispersion GV %	Particle Size CS %	FS %	S %	C %
A11	0	3						2.85 A			3.04 C				2	4	24	33	32 C
A12	3	8													5	6	25	34	31 C
A3	8	16													10	7	25	34	31 C
B1	16	24						5.74 A			4.01 C				7	5	24	33	36 C
B21	24	41																	
B22	41	63													4	2	9	18	67 B
B23	63	91						9.02 A			11.2 C								

Table 8. Analytical data for Flowery Gully Soil Association Type Profile

2.1.7 Eastfield Soil Association (Ea) (16412 ha)

This is the most extensive soil unit, occupying nearly one quarter of the municipality. The parent rock is dolerite and the landscape is characteristically rugged and hilly, with slopes varying from gentle to steep. Rock outcrops are extremely common and the soils generally stony. Elevations range from sea level along the Tamar to 460m in the south-western corner of the municipality.

At the date of aerial photography (1963), only 13% of the association *on the western side of the Tamar Riv*er had been cleared of its natural vegetation. On the remainder the native sclerophyll forest is dominated by black peppermint *(Eucalyptus amygdalina)* with subordinate manna gum *(E. viminalis)* and an understorey of silver wattle *(Acacia dealbata).* The ground cover consists of *saggs (Lomandra longifolia)* and some epacrids, with native grasses, chiefly *Danthonia spp* which afford some rough grazing. Clearing in the Eastfield Association has usually been by extension on to the less stony and gentler slopes from adjoining more easily developed soils of other associations. The 52.6097 ha of orchard on Eastfield soils are on such lower slopes.

The name Eastfield is that used by Stephens et al. (1942) and by Nicolls (1958), (revised by Spanswick & Zund, 1999), for similar soils in the Longford-Cressy area to the south. These Eastfield soils are typical of the group of Grey-brown Podzolic Soils dominant over some 5,120 *square kilometres* of dolerite country in Tasmania, mainly in the east and south-east (Nicolls and Dimmock, 1965)

Due to rockiness and the wide range of slopes, soil profiles vary greatly in their depth and degree of development from extremely shallow lithosols on the steeper slopes and other rocky areas, to strongly differentiated profiles up to 1.20m deep on some relatively gently sloping benches.

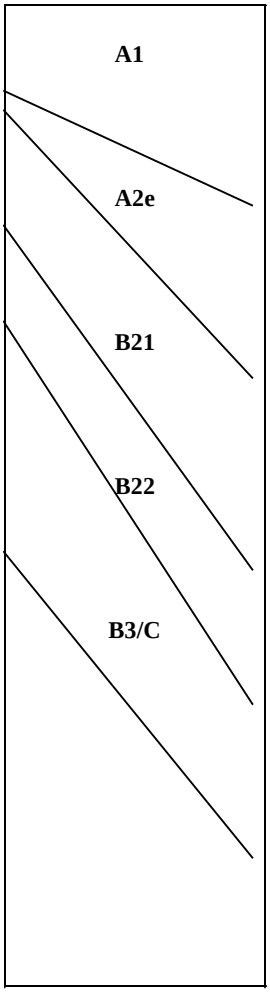
The most common profiles have grey fine sandy loam or silty loam A horizons, overlying dense impervious clay B horizons at depths usually about 30cm, but ranging from 10cm to 55cm. The boundary between the A and B horizons is abrupt and often wavy. A pale A2 horizon, often containing hard round ferruginous concretions 0.2 – 0.6cm in diameter ("buckshot"), usually overlies the clay. A2 development and the distribution of buckshot gravel tend to be sporadic and are often directly related to the configuration of the undulating surface of the clay B horizon: over depressions the A2 is deepest and palest and contains the largest amounts of gravel, while over crests it is much thinner or may be completely absent, with the A1 horizon resting directly on the clay. The B horizons have weak to moderate blocky structure and are usually dark olive-brown or dark yellowish-brown, sometimes with indistinct fine mottling in lighter shades of these colours. With increasing amounts of gritty decomposing dolerite fragments, the profile passes down into an olive C horizon of clay and mealy decomposing dolerite, with hard weathering rock at depths commonly of 90cm to 120cm. Small amounts of free carbonate sometimes occur in the C horizon or in joints in the underlying rock. Profiles are stony throughout, with angular fragments and boulders of dolerite occupying up to a quarter or more of the total volume. There is often a particular concentration of stones at the bottom of the A2. During winter, the dense clay B horizon restricts penetration of water, and often perches a water table above it, even on moderate slopes.

Correlation

The dominant soil of the Eastfield Soil Association, the Eastfield SPC, correlates with the dominant soil of the Eastfield Soil Association in the north of the state and the dominant soil of the Podzolics on Dolerite 1 in the south east of the state.

Eastfield Soil Profile Class

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	Eutrophic Brown or Grey Chromosols and Sodosols
Great Soil Group	Grey-Brown Podzolics & Soloths
Principal Profile Form	Db, Dd
Mapping Units	Ea, Ea-Bo, Ea-Bm, Pd1
Parent material	Jurassic Dolerite
Landform	Moderately to steeply undulating hills
Permeability	Slowly permeable
Drainage	Imperfectly drained



A1: Grey to black (19YR 2/1, 3/1, 3/2, 4/1, 4/2, 5/2): 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, variable amounts of dolerite stones and boulders; pH 5.5- 7.0; clear to gradual change to

A2e: Conspicuously bleached (10YR 4/2, 5/1, 5/2, 6/2): fine loamy sand to fine 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 5.5-7.0; sharp to abrupt change to

B21: Mottled: brown (10YR ¾, 4/3, 4/4, 4/6, 5/4): medium to heavy clay; massive to weak or moderate, 50-200mm angular blocky, 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 (2.5Y 4/4, 4/6, 10YR ¾, 4/3, 4/4, 4/6, 5/4, 7.5YR 4/4, 5/6, 4/6, 5YR 3/3); medium to heavy clay; massive to weak or 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: CSIRO H86, H78, H24, H163, H125, H237, H128, H250; LRRBD L6, 34, 93, 126; SOILCO 70, 72, 73
Analysed sites: CSIRO H86, H78, H24, H163, H125, H237, H128; LRRBD L12, 43
Related soil names: Eastfield Series, Eastfield Sand, Type 1, Eastfield SPC, Podzolic on dolerite, Shawfield Series
Correlation references: Laffan *et al* (1995), Stephens et al (1942), Loveday (1957), Doyle (1993), Spanswick & Zund (1999a, 1999b), Spanswick (2000), Spanswick & Kidd (2000a, 2000b, 2000c, 2000d)

Figure 8. Eastfield Soil Profile Class

Soil Profile Class Grid Reference	**Profile Number**	**Horizon**	**Sample Depth (cm)**	**pH water (1:5)**	**EC (d/sm)**	**Total P (mg/kg)**	**Org. Carb. (%)**	**Total N (%)**	**C/N Ratio**	**Ca**	**Mg**	**Na**	**K**
Eastfield	H250	A11	0-2	5.9	0.077	.009	4.74	0.244	19	8.1	4.7	0.23	0.46
496846 E		A12	2-9	6.1	0.054	0.008	3.74	0.186	20	7	4.1	0.26	0.21
5415522 N		A1/A2	9-23	6.2	0.036		1.76	0.096	18				
		A2	24-33	6.4	0.018		0.61	0.033	18	1.9	2.1	0.13	0.49
		B21	34-48	6.6	0.036		0.7	0.059	12	10.6	16.2	0.77	0.16
		B22	48-74	6.7	0.065								
		B23	74-89	7.3	0.116								
		B/C	94-109	8.1	0.164								
		C1	109-127	8.5	0.259								
		C2	127-135	8.6	0.307								

Soil Profile Class Grid Reference	**Profile Number**	**Horizon**	**Sample Depth (cm)**	**Total Bases Sum meq**	**ECEC meq**	**BASE SAT (%)**	**ESP (%)**	**Ca/Mg Ratio**	**Gravel (of total) >2000 (um) (%)**	**Sand Coarse >200 (um) (%)**	**Sand Fine <200 (um) (%)**	**Silt (%)**	**Clay (%)**
Eastfield	H250	A11	0-2	13.49	28.89	47	0.8	1.72	0	7	46	23	16
496846 E		A12	2-9	11.57	25.67	45	1.0	1.71	0	11	44	23	15
5415522 N		A1/A2	9-23										
		A2	24-33	4.62	10.72	43	1.2	0.9	21	33	34	19	13
		B21	34-48	27.73	38.03	73	2.0	0.65	1	6	11	7	74
		B22	48-74										
		B23	74-89										
		B/C	94-109						0	10	27	20	42
		C1	109-127										
		C2	127-135										

Table 9. Analytical data for the Eastfield SPC

Lithosols (Rudosols), which are an important component of the association, occur in small pockets up to a few inches deep or as a thin veneer of grey fine sandy A horizon material amongst bare rock outcrops.

Of minor extent but nevertheless widespread throughout the association are various reddish soils. These consist of:

(a) Very stony Krasnozems (Ferrosols) in the wetter parts of the municipality, such as the south-west corner and, in small occurrences, near Winkleigh and Holwell. Such occurrences are shown on the map by the symbol "Ea - F", and where of sufficient extent are delineated separately from the normal Eastfield soils. The krasnozemic variants are closely related in morphology to certain soils of the Ecclestone association. Outcrops and scattered lumps of pisolitic laterite, also similar to that associated with the Ecclestone soils, occur at several localities within the Eastfield association, particularly on the slopes west of "Danbury Park" (505300E 5418350N) and along some ridge tops south of Exeter.

(b) Soils resembling the Non-calcic Soils on dolerite, previously called "Brown Earths" (Nicolls and Dimmock 1965). These are common in locally warm and exposed situations where rock is fairly close to the surface eg the top of the dolerite ridge running south-east from West Head (475200E 5454000N). The shallowest soils are brown medium-textured Lithosols, but deeper profiles showing the characteristic texture contrast with a brown or reddish-brown clay subsoil may sometimes be observed

(c) Soils having grey A horizons with ferruginous gravel in the A2 overlying a reddish clay subsoil.

In some lower slope situations within the Eastfield Association, the ferruginous gravel in the A2 horizon of some profiles is so abundant as to exceed in amount the light grey fine sandy matrix. In this reverse situation the gravels coalesce and become cemented together with ferruginous material, enclosing small irregular voids partly or wholly filled with loose, light grey fine sand. This cemented material appears to be groundwater laterite and sometimes forms large irregular masses up to 90cm in diameter. Similar material was observed along the broad shallow drainage-ways on the small plateau to the south of Rosevears in the Craythorne Association.

2.1.8 Vulcan Soil Association (Vl) (1056 ha)

This association is practically confined to the central part of the Anderson's Creek drainage catchment. The soils are formed on a variety of parent materials belonging to the Anderson's Creek ultrabasic complex (Green 1959), including Cambrian serpentinite, pyroxenite, metamorphosed greywacke, and dykes of gabbro and albitite. Lateritic iron-ore deposits up to *15m* thick have developed on the serpentinites in some places.

The native vegetation is a sclerophyll forest with stringybark *(Eucalyptus obliqua)* and black peppermint *(E. amygdalina)* the main species, and an often dense understorey of *Casuarina suberosa*. Swamp gum *(E. ovata)* is common in moister situations.

The association ranges in elevation from roughly 30m to 150m above sea level. Three fifths of the area consists of rolling to low hilly country, with the remainder of generally subdued relief, mainly as lower slopes and valley floors. Subdued rock outcrops are common on the serpentinite on the sides of the broad valley of Anderson's Creek, whereas the closely associated pyroxenite forms boulder outcrops up to 6m high. The laterite hills also have small but prominent outcrops near their summits.

Ferruginous gravel is widely scattered on the surface of many of the soils. The ferruginous material sometimes also forms masses cementing together quartz pebbles eroded from the gravels of the Beaconsfield Association to the east.

Because of the great variation in parent materials, it is difficult to assign particular soils to particular rock types. Lateritic krasnozems (Ferrosols), mainly on the serpentinites, are probably the most common, particularly on upper slopes and summits of the lateritic residuals. These soils usually have dark reddish-brown friable clay loam surface horizons grading down into dark red clay subsoils. Variable but usually abundant pisolitic and irregular ferruginous gravel occurs throughout the profile, particularly in the surface horizons. With increasing depth, fragments of highly weathered serpentinite appear. Some of these soils may be at least 2.5m deep. A typical example of this group, Profile H256, is described on the next page.

In association with the finer-textured lateritic krasnozems, more commonly in lower slope situations, there are some soils with reddish-brown fine sandy surface horizons with much pisolitic ferruginous gravel, overlying fairly abruptly a dark red clay subsoil containing fragments of weathering serpentinite, similar to that of the lateritic krasnozems. On the valley floor, there is a considerable variety of hydromorphic soils (Hydrosols), associated with swampy depressions carrying sedges, tea-trees etc; though they have been mapped with the Vulcan Association these are closely related to soils of the Supply Association.

SITE DESCRIPTION

Site Number: H256	Property Name:	Runoff: Slow	
Project Code: CSIRO	Property Owner:	Permeability: Moderately permeable	
Map Scale:	Nearest Town: BEACONSFIELD	Drainage: Rapidly drained	
Sheet No:	Describer: Geoff M. Dimmock	Elevation: 122 m	
Map Name:	Date Cored: 22 May 1963		
AMG Easting: 481401E	Rainfall: 940 mm	Soil Class: Vulcan Assoc	
AMG Northing: 5436975N	Air Temp (3pm):	Northcote PPF: Gn2.14	
Film No: 6964	Type of Site:	Great Soil Group: Red Earth	
Run No: 4	Type of Desc: Soil pit	Soil Taxonomy:	
Frame No:	Soil Samples: Yes	Land Capability:	
State: Tasmania	Soil Photos:	Geological Map:	

Location: 3.6KM SW of Beaconsfield, 4CH on 217degrees from corner of fences on 86degrees and 356degrees respectively.
Aust Classn: Haplic, Mesotrophic, Red, Ferrosol; (Confidence level 4)

Landform: Element level, flat, hillcrest; Pattern hills;
Land Surface: Limited clearing; Condition of surface soil self-mulching; Rock Outcrops 2-10% bedrock exposed, LA
Vegetation:
Substrate: serpentine, ferruginized;

HORIZON DESCRIPTIONS

A1	0	3	cm	Moist; black (5YR 2/1 moist); loam; weak ex fine (<2mm) granular structure; very weak (moist); few (2-10%) 6-20mm ferruginous nodules; many (20-50%) gravel coarse fragments; common fine (1-2mm) live roots; 6 field pH; .08 dSm-1; gradual (50-100mm) boundary;
B1	3	8	cm	Moist; reddish brown (5YR 4/4 moist); clay loam; weak very fine (2-5mm) subangular blocky structure; very weak (moist); few (2-10%) 6-20mm ferruginous nodules; many (20-50%) gravel coarse fragments; common fine (1-2mm) live roots; 6.3 field pH; .039 dSm-1; gradual (50-100mm) boundary;
B21	8	13	cm	Moist; dark red (2.5YR 3/6 moist); clay loam; weak very fine (2-5mm) subangular blocky structure; very weak (moist); few (2-10%) 6-20mm ferruginous nodules; few (2-10%) gravel coarse fragments; few coarse (>5mm) live roots; 6.3 field pH; .036 dSm-1; diffuse (>100mm) boundary;
B22	13	18	cm	Moderately moist; dark red (2.5YR 3/6 moist); clay loam; weak very fine (2-5mm) subangular blocky structure; weak (moist); few (2-10%) gravel coarse fragments; few fine (1-2mm) live roots; 6.5 field pH; .03 dSm-1; diffuse (>100mm) boundary;
B23	18	33	cm	Moderately moist; dark red (2.5YR 3/6 moist); light clay; weak very fine (2-5mm) subangular blocky structure; weak (moist); few (2-10%) gravel coarse fragments; few live roots; 6.5 field pH; .03 dSm-1; diffuse (>100mm) boundary;
B24	33	48	cm	Moderately moist; dark red (2.5YR 3/6 moist); medium clay; weak very fine (2-5mm) subangular blocky structure; weak (moist); rough-ped fabric; many (>5 per 100mm2) fine (1-2mm) macropores; few (<10%) clay skins; few (2-10%) gravel coarse fragments; few live roots; 6.3 field pH; .039 dSm-1; diffuse (>100mm) boundary;
B25	48	58	cm	Moderately moist; dark red (2.5YR 3/6 moist); medium clay; weak very fine (2-5mm) subangular blocky structure; weak (moist); many (>5 per 100mm2) fine (1-2mm) macropores; few (2-10%) gravel coarse fragments; 6.2 field pH; .039 dSm-1; diffuse (>100mm) boundary;
B26	58	74	cm	Moderately moist; dark red (2.5YR 3/6 moist); red (2.5YR 4/8) primary mottles; medium clay; weak very fine (2-5mm) subangular blocky structure; weak (moist); many (>5 per 100mm2) fine (1-2mm) macropores; few (2-10%) gravel coarse fragments; 6.2 field pH; .036 dSm-1; diffuse (>100mm) boundary;
B27	74	86	cm	Moderately moist; dark red (2.5YR 3/6 moist); red (2.5YR 4/8) primary mottles; medium clay; weak very fine (2-5mm) subangular blocky structure; weak (moist); few (2-10%) gravel coarse fragments; 6.2 field pH; .042 dSm-1; clear (20-50mm) boundary;
B28	86	104	cm	Moderately moist; dark red (2.5YR 3/6 moist); strong brown (7.5YR 4/6) primary mottles; yellowish brown (10YR 5/6) secondary mottles; medium clay; massive structure; strong (moist); few (2-10%) gravel coarse fragments; 6.2 field pH; .045 dSm-1;
B29	104	119+	cm	Dry; dark red (2.5YR 3/6 moist); strong brown (7.5YR 4/6) primary mottles; yellowish brown (10YR 5/6) secondary mottles; medium clay; massive structure; very strong (dry); many (20-50%) gravels (20-60mm) same as substrate material; 6 field pH; .045 dSm-1;

Profile Note: Vulcan Association (lateritic kraznozems); >119cm on haematite; surface outcrops of concretionary laterite. Field pH and EC have been copied from Lab data.

Figure 9. Type Profile for Vulcan Soil Association

VULCAN ASSOC Red Earth Gn2.14 serpentine H256/CSIRO/456 481401E 5436975N BEACONSFIELD

Sample Layer	Depths Upr cm	Depths Lwr cm	pH 1:5 H2O	PH 1:5 CaCl	EC 1:5 dS/m	Soluble Chloride mg/kg	Exchangeable Cations Ca meq	Mg meq	K meq	Na meq	Exch H meq	Exch Al meq	ECEC Sum meq	CEC Meas meq	TEB Sum meq	Base Sat %	ESP %	Ca/Mg Ratio
A1	0	3	6.0		.08 A	40 A	8.9	3.2	.38	.41 A	21.9 B		34.79		12.89	37	1.2 B	2.78
B1	3	8	6.3		.039 B	20 A	2.2	.8	.16	.13 A	7.4 B		10.69		3.29	31	1.2 B	2.75
B21	8	13	6.3		.036 B	10 A												
B22	13	18	6.5		.03 B	10 A	1.5	.77	.15	.12 A	5.4 B		7.94		2.54	32	1.5 B	1.95
B23	18	33	6.5		.03 B	10 A												
B24	33	48	6.3		.039 B	20 A	2.1	3	.24	.26 A	11.1 B		16.7		5.6	34	1.6 B	.70
B25	48	58	6.2		.039 B	20 A												
B26	58	74	6.2		.036 B	20 A												
B27	74	86	6.2		.042 B	30 A	1.4	4.9	.14	.48 A	13.8 B		20.72		6.92	33	2.3 B	.29
B28	86	104	6.2		.045 B	40 A												
B29	104	119	6.0		.045 B	50 A												

Sample Layer	Depths Upr cm	Depths Lwr cm	Loss Ign %	Organic Carbon %	Total N %	C/N Ratio	Avail N mg/kg	Air Dry Moi%	Grav Moi%	Total P %	Avail P mg/kg	Extract P mg/kg	Total K %	Avail K mg/kg	Extract K meq
A1	0	3	14.6	6.94 C	.248 A	28		3.8		.016 A					
B1	3	8	5.1	1.61 C	.059 A	27		1.8		.011 A					
B21	8	13	4.3	.88 C	.041 A	21		1.6							
B22	13	18	4.8	.76 C	.038 A	20		1.7							
B23	18	33	8.3	.99 C	.05 A	20		3.1							
B24	33	48	10.7					4							
B25	48	58	15.3					5.3							
B26	58	74	14.3					6.3							
B27	74	86	14.5					6.4							
B28	86	104	13					6.4							
B29	104	119	9.3					4.5							

Sample Layer	Depths Upr cm	Depths Lwr cm	<------Extractable--------> Cu	Mn	Zn	Fe	B mg/kg	Free Fe %	Extractable Al %	Si %	Total Fe %	Total S %	Avail SO4-S mg/kg	CaCO3 %	Dispersion GV %	Particle Size CS %	FS %	S %	C %
A1	0	3						6.51 A			13.8 C				65	17	37	24	11 C
B1	3	8						7.27 A			13.7 C				33	20	39	26	12 C
B21	8	13													17	16	44	30	11 B
B22	13	18													19	17	39	26	17 B
B23	18	33													15	12	30	19	39 B
B24	33	48						6.03 A			17.9 C				10	12	20	14	55 B
B25	48	58																	
B26	58	74																	
B27	74	86													12	7	12	15	64 B
B28	86	104																	
B29	104	119						6.01 A			20.1 C								

Table 10. Analytical data for Vulcan Soil Association Type Profile

2.1.9 Craythorne Soil Association (Cy) (278 ha)

This minor association of Krasnozems (Ferrosols) on basalt occupies the gently undulating to rolling top of the small plateau to the south of Rosevears at a general elevation of about 180m.

Practically all of the natural vegetation has been cleared but scattered blackwood *(Acacia melanoxylon)* and manna gum *(Eucalyptus viminalis)* indicate a probable sclerophyll forest. Poorly drained areas such as the floors of shallow drainage-ways on the plateau surface still carry dense thickets of swamp tea-tree *(Melaleuca ericifolia).*

The soils (Ferrosols) have deep and friable red gradational profiles with the surface 15cm or so darkened by organic matter. Textures are mainly clay loams at the surface grading to heavy clays in the B horizon. Structure is generally weak except for the surface, which often has a moderate medium granular structure. At depths sometimes in excess of 2.5m, the profile passes down into a C horizon of reddish clay and soft decomposing rock which may continue to at least 3.5m before reaching hard rock. "Floaters" of relatively fresh basalt may occur in small amounts throughout the profile.

The Craythorne soils are similar in practically all respects to the normal Kraznozems on basalt along the north-west coast of Tasmania, except that their B horizons lack the characteristic strong polyhedral structure. Profile H249, described below, is typical of the association.

A small remnant of the red basaltic soils occurs at about the same altitude as the main plateau and about 3km to the north-west. The soils of this remnant lack the depth and friability of the krasnozems, though they are similar in colour. They also contain much more decomposing basalt gravel.

Along a broad shallow drainage-way on the top of the main plateau there are numerous loose boulders of groundwater laterite scattered on the surface. These consist of irregular ferruginous pisolites. 5 to 10mm in diameter, in a very subordinate light grey sandy matrix, the whole mass being quite strongly cemented together by ferruginous material, but with many voids. Similar occurrences of groundwater laterite have been noted in several other widely scattered localities throughout the municipality (see Eastfield Association).

SITE DESCRIPTION

Site Number:	H249	Property Name:		Runoff:	Slow
Project Code:	CSIRO	Property Owner:		Permeability:	Moderately permeable
Map Scale:		Nearest Town:	LAUNCESTON	Drainage:	Well drained
Sheet No:		Describer:	Geoff M. Dimmock	Elevation:	193 m
Map Name:		Date Cored:	24 Apr 1963		
AMG Easting:	500014 E	Rainfall:	840 mm	Soil Class:	Craythorne Assoc.
AMG Northing:	5421755 N	Air Temp (3pm):		Northcote PPF:	Gn3.11
Film No:	55	Type of Site:		Great Soil Group:	Krasnozem
Run No:	1	Type of Desc:	Soil pit	Soil Taxonomy:	
Frame No:		Soil Samples:	Yes	Land Capability:	
State:	Tasmania	Soil Photos:		Geological Map:	

Location: 2.8KM SSW of Rosevears Muddy Creek.
Aust Classn: Haplic, Mesotrophic, Red, Ferrosol; (Confidence level 4)

Landform: Element gently inclined, plain; Pattern rolling plains <9m 10-32%, plateau;
Land Surface: Slope angle 3.5 %; Aspect 338; complete clearing - pasture but cultivation at some stage; Coarse Fragments common (10-20%) stones (60-200mm) basalt;
Vegetation:
Substrate: basalt;

HORIZON DESCRIPTIONS

A1	0	14	cm	Dry; dark reddish brown (5YR 3/3 moist); clay loam; moderate ex fine (<2mm) granular structure; strong (dry); few (2-10%) 2-6mm ferruginous nodules; few (2-10%) gravels (6-20mm) basalt; abundant fine (1-2mm) live roots; 5.9 field pH; .065 dSm-1; abrupt (5-20mm) smooth boundary;
B21	15	27	cm	Moderately moist; dark red (2.5YR 3/6 moist); medium clay; weak ex fine (<2mm) subangular blocky structure; subplastic; weak (moist); few (2-10%) gravels (6-20mm) basalt; common fine (1-2mm) live roots; 6 field pH; .039 dSm-1;
B22	27	46	cm	Moderately moist; dark red (2.5YR 3/6 moist); medium clay; weak ex fine (<2mm) subangular blocky structure; strong (moist); few (2-10%) gravels (6-20mm) basalt; few fine (1-2mm) live roots; 5.9 field pH; .036 dSm-1;
B23	46	66	cm	Moderately moist; dark red (2.5YR 3/6 moist); medium clay; massive structure; strong (moist); few (2-10%) gravels (6-20mm) basalt; few live roots; 6.1 field pH; .03 dSm-1;
B24	66	99	cm	Moderately moist; dark red (2.5YR 3/6 moist); medium clay; massive structure; firm (moist); few (2-10%) gravels (6-20mm) basalt; few live roots; 6.1 field pH; .024 dSm-1;
B25	104	135	cm	Moderately moist; dark red (2.5YR 3/6 moist); medium clay; massive structure; weak (moist); few (2-10%) gravels (6-20mm) basalt; 5.9 field pH; .027 dSm-1;
B26	135	155	cm	Moderately moist; dark red (2.5YR 3/6 moist); medium clay; massive structure; very weak (moist); 5.8 field pH; .024 dSm-1;
C	208	216+	cm	Moderately moist; red (2.5YR 4/6 moist); few (2-10%) white (N 8/0) primary mottles; medium clay; very weak (moist); 5.5 field pH; .024 dSm-1;

Profile Note: Craythorne Association; 27-66cm <10% charcoal also; 0-27cm worm activity + casts; 15-216cm fragments of w'd ba increasing. Field pH and EC have been copied from Lab data.

General Note: Isbell classification added by R.Tegg.

Figure 10 Type Profile for Craythorne Soil Association

CRAYTHORNE ASSOC Krasnozem Gn3.11 basalt H249/CSIRO/449 500014E 5421755 N LAUNCESTON

Sample Layer	Depths Upr cm	Depths Lwr cm	pH 1:5 H2O	PH 1:5 CaCl	EC 1:5 dS/m	Soluble Chloride mg/kg	Exchangeable Cations Ca meq	Mg meq	K meq	Na meq	Exch H meq	Exch Al meq	ECEC Sum meq	CEC Meas meq	TEB Sum meq	Base Sat %	ESP %	Ca/Mg Ratio
A1	0	14	5.9		.065 B	100 A	9.5	2.4	.23	.46 A	33.5 B		46.09		12.59	27	1.0 B	3.96
B21	15	27	6.0		.039 B	30 A	4.6	1.7	.06	.28 A	22.3 B		28.94		6.64	23	1.0 B	2.71
B22	27	46	5.9		.036 B	220 A	3.3	2.1	.04	.21 A	16.7 B		22.35		5.65	25	.9 B	1.57
B23	46	66	6.1		.03 B	30 A	2	2.9	.05	.22 A	13 B		18.17		5.17	28	1.2 B	.69
B24	66	99	6.1		.024 B	50 A	.87	2.5	.03	.2 A	9.9 B		13.5		3.6	27	1.5 B	.35
B25	104	135	5.9		.027 B	40 A												
B26	135	155	5.8		.024 B	30 A												
C	208	216	5.5		.024 B	30 A	.06	2.2	.01	.13 A	7.9 B		10.3		2.4	23	1.3 B	.03

Sample Layer	Depths Upr cm	Depths Lwr cm	Loss Ign %	Organic Carbon %	Total N %	C/N Ratio	Avail N mg/kg	Air Dry Moi%	Grav Moi%	Total P %	Avail P mg/kg	Extract P mg/kg	Total K %	Avail K mg/kg	Extract K meq
A1	0	14	21.2	6.4 C	.343 A	19		6.4		.056 A					
B21	15	27	16.5	2.82 C	.125 A	23		7.2		.028 A					
B22	27	46	16.3	1.75 C	.081 A	22		5.5							
B23	46	66	17	1.13 C	.055 A	21		6.5							
B24	66	99	18.4	.62 C	.03 A	21		4.1		.027 A					
B25	104	135	17.8					4.1							
B26	135	155	17.2					4							
C	208	216	14					4		.03 A					

Sample Layer	Depths Upr cm	Depths Lwr cm	<------Extractable--------> Cu	Mn	Zn	Fe	B mg/kg	Free Fe %	Extractable Al %	Si %	Total Fe %	Total S %	Avail SO4-S mg/kg	CaCO3 %	Dispersion GV %	Particle Size CS %	FS %	S %	C %
A1	0	14						9.79 A			13.6 C				1	3	15	22	46 C
B21	15	27						6.78 A			14.3 C				1	2	13	19	60 C
B22	27	46													1	2	11	16	67 C
B23	46	66													1	1	10	15	71 C
B24	66	99						7.41 A			15 C				1	2	9	17	71 C
B25	104	135																	
B26	135	155																	
C	208	216						9.16 A			12.3 C				0	1	12	33	54 C

Table 11 Analytical data for Craythorne Soil Association Type Profile

2.2 Soils Developed on Unconsolidated Sediments

2.2.1 Legana Soil Association (Le) (3925 ha)

Tertiary sediments formerly filling the Tamar valley to a height of at least 180m near Launceston and to lower levels downstream, have been largely removed by subsequent downcutting of the river and its tributaries. The remnants, mostly on dissected moderate slopes, but with smaller extents of flattish benches at various levels, constitute the parent materials from which the soils of the Legana Association have formed. This geological history accounts for the position of the Legana Association on both the lower slopes of the valley and the floors of some higher subsidiary fault troughs, separated by patches of Eastfield Association where the sediment cover has been completely stripped to expose the underlying dolerite. The benches are chiefly confined to the Legana and Rowella peninsulas where the levels most represented on each are at approximately 12m and 35m above sea level. Generally, the association occupies rolling topography and ranges in elevation from sea level to 180m.

Ferruginous zones containing platy gravel and large concretionary structure are common in the Tertiary sediments and outcrop in certain areas. There are also small outcrops of hard ferruginous sandstone associated with predominantly sandy soils in some of the higher troughs.

The native vegetation was originally a dry sclerophyll forest dominated by black peppermint *(Eucalyptus amygdalina)* and less commonly, manna gum *(E. viminalis),* with a fairly open ground cover of Bracken *(Pteridium esculentum),* native grasses and *Lomandra longifolia*. However, about three quarters of the area of Legana Association soils has been cleared and replaced by orchards and sown pastures. These soils are the most important orcharding soils of the municipality with approximately 40% of the total orchard area located on them.

The dominant soils are duplex Yellow Podzolics (Chromosols) with a strong lateritic influence. They occur characteristically on dissected slopes over the whole elevation range of the association. Profiles consist of a dark grey to dark grey-brown fine sandy loam or sandy loam surface overlying a pale but generally unbleached compact A2 horizon of fine sandy loam or sand texture, the lower part of which frequently contains hard irregular pisolitic ferruginous gravel. Between the A2 and the underlying clay B horizon, there is sometimes a yellower transitional A3/B1 horizon of slightly finer texture, in which the maximum development of ferruginous gravel occurs. Depth to the clay varies from 15cm to about 105cm, but is mostly less than about 40cm. Where the clay is shallowest, the A2 horizon with concomitant ferruginous gravel may be absent altogether; where deeper, the clay surface is often wavy, with gravel concentrated locally in the depressions but relatively scarce about the rises. The upper part of the B horizon often has a well-developed blocky structure and is predominantly yellowish-brown or olive-brown, occasionally with some darker staining on the surface of the aggregates. With depth, the clay becomes mottled with light grey and red with, in some instances, the characteristic "short" consistence of the mottled and pallid zone clays of a laterite profile. Small amounts of irregular or platy ferruginous gravel may occur throughout the clay horizon. A typical profile of this group - Profile H248 - is described on page 42.

Several of the soils of the Legana Association have morphological counterparts in established series of the Launceston Tertiary Basin (Midlands Graben), though their geomorphic relationships are not as clear-cut in the areas further south where the soils were first described (Stephens,

Baldwin and Hosking 1942; Nicolls 1958). The series so represented are Brickendon, Woodstock and Cressy, of which, in the Beaconsfield municipality, only the Brickendon-like soils and, to a lesser extent, the Woodstock-like soils, occupy a significant area.

The Brickendon-like soils are found chiefly on gently undulating or gently sloping sites, which may represent small terrace remnants. Elevations range from roughly 12m to 40m above sea level. Well-rounded siliceous gravels up to 8cm in diameter but mostly less than 2.5cm are common on the surface. The soils are typical duplex Lateritic Podzolics containing water-worn siliceous gravels and minor pisolitic and irregular ferruginous gravel. Profiles have a grey sand to sandy loam A1 horizon with usually small amounts of gravel, overlying an A2 of light grey very gravelly sand. Below this at a depth of about 45cm, there is an abrupt usually wavy boundary to the variously mottled yellowish-brown, red and grey weakly structured and friable clay B horizon, which may also contain slight to moderate amounts of siliceous gravel.

The Woodstock-like soils have been recognised in the Legana, Bell Bay and Rowella localities on fairly distinct terrace remnants, all within a relatively narrow range of altitude between 30m and 45m. Woodstock-like soils have also been recorded at elevations up to 75m on both sides of the Tamar. Nicolls (1957) observed one small area of such soils 6.5km north-east of George Town, which he regarded as being on an old land surface of comparable age to that of the higher levels in the Launceston Tertiary Basin. However the relationships of the soils at corresponding elevations on the western side of the Tamar are more doubtful. Profiles are gravelly duplex Lateritic Podzolics similar in morphology to the Brickendon-like soils above, but with predominantly ferruginous gravels, both pisolitic and irregular, instead of the water-worn siliceous types of the latter. Profile H248, described over the page is typical of this group of soils.

Very small extents of Cressy-like soils have been noted in the Kayena area on dissected slopes below the Woodstock-like soils of the 30m-35m terrace. The two thus show the same geomorphic relationships here as in the Longford-Cressy area (Stephens *et al. loc.cit.*). Profiles consist of a dark grey-brown granular loam to clay loam surface overlying at about 15cm a mottled yellowish-brown and red blocky or massive clay, which passes with depth into a mottled light grey, yellowish-brown and red friable "short" clay. Platy fragments of ferruginous gravel occur on the surface and throughout the profile.

Other minor soils in the association include gravelly Gleyed Podzolic soils and deep water-worn siliceous gravels in a red clayey matrix on some low terraces around Legana, gradational sandy Yellow Podzolic soils, Podzols on gravelly siliceous sands, sandy Red Earths, and various soils on mixed dolerite and Tertiary sediment parent materials.

SITE DESCRIPTION

Site Number:	H248	Property Name:		Runoff:	Moderately rapid
Project Code:	CSIRO	Property Owner:		Permeability:	Very slowly permeable
Map Scale:		Nearest Town:	LAUNCESTON	Drainage:	Poorly drained
Sheet No:		Describer:	Geoff M. Dimmock	Elevation:	38 m
Map Name:		Date Cored:	23 Apr 1963		
AMG Easting:	504124 E	Rainfall:	780 mm	Soil Class:	Legana Assoc
AMG Northing:	5421203 N	Air Temp (3pm):		Northcote PPF:	Dy5.61
Film No:	40	Type of Site:		Great Soil Group:	Lateritic Podzolic Soil
Run No:	2	Type of Desc:	Soil pit	Soil Taxonomy:	
Frame No:		Soil Samples:	Yes	Land Capability:	
State:	Tasmania	Soil Photos:		Geological Map:	

Location: .8KM NNE of Legana.
Aust Classn: Ferric, Petroferric, Brown, Chromosol; (Confidence level 4)

Landform: Element gently inclined, flat, flood-out; Pattern terrace;
Land Surface: Slope angle 3.5 %; Aspect 045; limited clearing;
Vegetation:
Substrate: unconsolidated material (unidentified), ferruginized;

HORIZON DESCRIPTIONS

A1	0	3	cm	Dry; very dark grey (10YR 3/1 moist); loamy sand; massive structure; very weak (dry); common (10-20%) 6-20mm ferruginous nodules; v few (<2%) subangular grit (2-6mm) quartz; many coarse (>5mm) live roots; 6.1 field pH; .048 dSm-1; clear (20-50mm) irregular boundary;
A1A2	3	9	cm	Dry; very dark grey (10YR 3/1 moist); loamy sand; massive structure; very weak (dry); common (10-20%) 20-60mm ferruginous nodules; few (2-10%) rounded gravels (6-20mm) quartz; many coarse (>5mm) live roots; 5.7 field pH; .027 dSm-1; diffuse (>100mm) boundary;
A21	9	18	cm	Dry; brown (10YR 5/3 moist); loamy sand; massive structure; loose (dry); abundant (>50%) 20-60mm ferruginous nodules; few (2-10%) rounded gravels (6-20mm) quartz; many coarse (>5mm) live roots; 5.4 field pH; .024 dSm-1; diffuse (>100mm) boundary;
A22	23	36	cm	Moderately moist; brown (10YR 5/3 moist); heavy loamy sand; massive structure; weak (moist); abundant (>50%) 20-60mm ferruginous nodules; few (2-10%) rounded gravels (6-20mm) quartz; weakly cemented; abundant coarse (>5mm) live roots; 5.8 field pH; .018 dSm-1; abrupt (5-20mm) wavy boundary;
B21	42	56	cm	Moderately moist; yellowish brown (10YR 5/6 moist); red (2.5YR 4/8) primary mottles; heavy clay; weak medium (20-50mm) angular blocky structure; strong (moist); v few (<2%) >60mm ferruginous nodules; 6.1 field pH; .039 dSm-1;
B22	56	71	cm	Moderately moist; yellowish brown (10YR 5/4 moist); red (2.5YR 4/8) primary mottles; light grey (2.5Y 7/1) secondary mottles; heavy clay; massive structure; weak (moist); v few (<2%) 20-60mm ferruginous nodules; 6.2 field pH; .039 dSm-1;
B23	71	86	cm	Moderately moist; yellowish brown (10YR 5/4 moist); light olive brown (2.5Y 5/4) primary mottles; strong brown (7.5YR 5/6) secondary mottles; heavy clay; massive structure; weak (moist); v few (<2%) 20-60mm ferruginous nodules; 6.1 field pH; .045 dSm-1;
B24	86	107	cm	Moderately moist; yellowish brown (10YR 5/4 moist); light brownish grey (2.5Y 6/2) primary mottles; red (2.5YR 4/8) secondary mottles; heavy clay; massive structure; weak (moist); v few (<2%) 20-60mm ferruginous nodules; few live roots; 6 field pH; .048 dSm-1;
C1	152	168	cm	Moderately moist; light grey (2.5Y 7/1 moist); yellowish brown (10YR 5/4) primary mottles; dark red (2.5YR 3/6) secondary mottles; heavy clay; weak (moist); v few (<2%) ferruginous nodules; few live roots; 5.3 field pH; .071 dSm-1;
C2	213	226+	cm	Moderately moist; light grey (2.5Y 7/1 moist); dark red (2.5YR 3/6) primary mottles; yellowish brown (10YR 5/4) secondary mottles; heavy clay; weak (moist); 4.9 field pH; .11 dSm-1;

Profile Note: Legana Association; Odd large lumps of concretionary laterite <150mm in clay horizon; worms active; >226cm on laterite boulders. Field pH and EC have been copied from Lab data.

General Note: Isbell classification added by R.Tegg.

Figure 11. Type Profile for Legana Soil Association

LEGANA ASSOC Lateritic Podzolic Soil Dy5.61 unconsolidated material (unidentified) H248/CSIRO/448 504124E 5421203N LAUNCESTON

Sample Layer	Depths Upr cm	Depths Lwr cm	pH 1:5 H2O	PH 1:5 CaCl	EC 1:5 dS/m	Soluble Chloride mg/kg	Exchangeable Cations Ca meq	Mg meq	K meq	Na meq	Exch H meq	Exch Al meq	ECEC Sum meq	CEC Meas meq	TEB Sum meq	Base Sat %	ESP %	Ca/Mg Ratio
A1	0	3	6.1		.048 B	50 A	8.1	2.3	.28	.16 A	12.5 B		23.34		10.84	47	.7 B	3.52
A1A2	3	9	5.7		.027 B	20 A	1.9	.62	.1	.08 A	7.5 B		10.2		2.7	26	.8 B	3.06
A21	9	18	5.4		.024 B	10 A	.29	.24	.06	.08 A	6.3 B		6.97		.67	10	1.1 B	1.21
A22	23	36	5.8		.018 B	20 A	.23	.29	.05	.08 A	4.8 B		5.45		.65	12	1.5 B	.79
B21	42	56	6.1		.039 B	90 A	3.2	6	.13	.77 A	10.4 B		20.5		10.1	49	3.8 B	.53
B22	56	71	6.2		.039 B	60 A	3.6	7.3	.18	.4 A	9.6 B		21.08		11.48	54	1.9 B	.49
B23	71	86	6.1		.045 B	60 A												
B24	86	107	6.0		.048 B	100 A												
C1	152	168	5.3		.071 B	140 A												
C2	213	226	4.9		.11 B	230 A	.48	3.1	.08	.8 A	15.6 B		20.06		4.46	22	4.0 B	.15

Sample Layer	Depths Upr cm	Depths Lwr cm	Loss Ign %	Organic Carbon %	Total N %	C/N Ratio	Avail N mg/kg	Air Dry Moi%	Air Grav Moi%	Total P %	Avail P mg/kg	Extract Total P mg/kg	Total K %	Avail K mg/kg	Extract K meq
A1	0	3	8.8	4.35 C	.227 A	19		1.7		.008 A					
A1A2	3	9	3.7	1.74 C	.089 A	20		.7		.003 A					
A21	9	18	2.6	1.13 C	.049 A	23		.63							
A22	23	36	2.4	.72 C	.037 A	19		.63							
B21	42	56	12.2	.8 C	.09 A	9		7.9							
B22	56	71	13.3					5.2							
B23	71	86	13.2					5.9							
B24	86	107	13					5.7							
C1	152	168	12					5.4							
C2	213	226	11.6					5							

Sample Layer	Depths Upr cm	Depths Lwr cm	<-----Extractable--------> Cu	Mn	Zn	Fe	Free B mg/kg	Free Fe %	Extractable Al %	Extractable Si %	Total Fe %	Total S %	Avail SO4-S mg/kg	Dispersion CaCO3 %	Particle Size GV %	CS %	FS %	S %	C %
A1	0	3									.71 C				22	13	60	15	5 C
A1A2	3	9													31	15	63	15	5 C
A21	9	18													42	15	63	14	5 C
A22	23	36									1.69 C				61	19	59	14	7 B
B21	42	56									9.25 C				1	3	15	7	73 B
B22	56	71													0	1	10	5	81 B
B23	71	86																	
B24	86	107																	
C1	152	168																	
C2	213	226													0	2	12	10	73 B

Table 12. Analytical data for Legana Association Type Profile

2.2.2 **Beaconsfield Soil Association (Bc)** (1660 ha)

Soils of the Beaconsfield Association are developed on highly leached subangular siliceous sandy gravels, which form a gently undulating surface ranging in altitude from 140m south-west of Beaconsfield to about 27m near Kelso. The most extensive occurrences on either side of West Arm suggest that the forerunner of Anderson's Creek, whose drowned mouth is now West Arm, may have been responsible for cutting through a once continuous blanket of the gravels. This blanket may have extended as far west as the foot of the Asbestos Range across several older geological formations including the Cambrian ultrabasic complex, early Palaeozoic sediments (in particular, the highly siliceous Ordovician Cabbage Tree Conglomerate) and lower Tertiary clayey and gravelly sediments.

Isolated remnants of similar gravels are shown on the map near Deviot, NW of Sidmouth and east of Exeter, but their relationship to the main occurrence is not known. Similar deposits and soils also occur on the eastern side of the Tamar Valley, 6.5km north of Mt Direction.

The association carries a stunted sclerophyll forest vegetation in which black peppermint *(Eucalyptus amygdalina)* is the dominant species. Yacca *(Xanthorrhea australis)* is common in the understorey, and the ground cover consists of a great profusion of shrubby and heathy species which, however, are rather sparsely distributed with much bare ground between plants. Species in the ground cover include *Acacia botrycephala, A. suaveolens, Bossiaea cinerea, Aotus villosa, Dillwynia sp., Casuarina distyla, Banksia marginata, Leptospermum scoparium, Exocarpus sp., Amperea xiphoclada, Epacris impressa, Leucopogon australis, Pteridium esculentum* and *Lepidosperma squamatum*.

The gravels consist mainly of subangular vein quartz and quartzite ranging in size from 0.6cm to 7.5cm, with some larger cobbles up to 20cm in diameter scattered throughout. The probable source of the gravels is indicated by the similar lithology and the proximity to major occurrences of highly siliceous Precambrian and Ordovician sediments, together with their lack of significant rounding by transport. For the most part they are poorly sorted, but west of Beauty Point finer gravels and coarse sand occur towards the top of the sequence. They are usually more than one and a half metres thick but may range from 30cm to at least 12m.

In a number of exposures in gravel pits the gravels are seen to overlie a variety of substrates including sandy clays, clays with and without gravel, and white compact sands, some of which may show stratification within themselves. Some pale mottled clay substrates have a strongly developed prismatic structure in which the individual prisms are thickly coated with dark brown organic matter. In several areas, this prismatic clay is underlain by well-rounded and highly weathered soft quartzite gravels.

The soil surface carries a characteristic scatter of white subangular gravels. The usual profile on the thicker deposits has a very dark grey loamy sand surface up to 25cm thick with small amounts of fine subangular quartz gravel and bound together firmly by abundant roots, which passes gradually to a light grey or white loose sandy gravel; this horizon often becomes increasingly compact with depth. Below about 100cm there is occasionally developed a sporadic dark weakly to strongly cemented organic B horizon in the gravels. The "black peaty earth" underlying the gravels at (482100E 5439100N) and elsewhere, referred to by Green (1959, p. 12), is most likely a stronger development of this organic B horizon. Profile H255 represents a typical soil of the association.

Minor soils include some with a small proportion of water-worn gravels amongst the otherwise subangular siliceous gravelly A horizons, and some with sandy A horizons containing practically no gravel and a strongly cemented lower A_2 horizon similar to one of the minor groups of the York Town Association.

The deposits on which the Beaconsfield Association are developed are closely related stratigraphically to those forming the parent materials of the York Town soils, and where the associations adjoin, the Beaconsfield occupies the higher ground. There is, however, a general overlap in the overall range of elevations in the two associations. The boundary is usually a broad transition but in a few areas is marked by a distinct break of slope. The gravels in the surface soil horizons in the two associations are identical and in situations in the Beaconsfield Association where they overlie shallow clay substrates, soil profiles are indistinguishable from York Town. While some such profiles occur in the zone of overlap across the broad transition between the two associations, the distribution of others apparently bear no relationship to contiguity with areas of York Town or to altitude and it is concluded that they represent situations either where greater denudation of the gravel blanket has taken place, or where it was thin originally.

SITE DESCRIPTION

Site Number:	H255	Property Name:		Runoff:	Very slow
Project Code:	CSIRO	Property Owner:		Permeability:	Moderately permeable
Map Scale:		Nearest Town:	BEACONSFIELD	Drainage:	Rapidly drained
Sheet No:		Describer:	Geoff M. Dimmock	Elevation:	131 m
Map Name:		Date Cored:	22 May 1963		
AMG Easting:	481442 E	Rainfall:	940 mm	Soil Class:	Beaconsfield Assoc
AMG Northing:	5438578 N	Air Temp (3pm):		Northcote PPF:	Uc2.33
Film No:	6962	Type of Site:		Great Soil Group:	Podzol
Run No:	4	Type of Desc:	Soil pit	Soil Taxonomy:	
Frame No:		Soil Samples:	Yes	Land Capability:	
State:	Tasmania	Soil Photos:		Geological Map:	

Location: 2.9KM west of Beaconsfield.
Aust Classn: Class Undetermined, Humosequic, Aeric, Podosol; (Confidence level 4)

Landform:
Land Surface: Slope angle 4.5 %; Aspect 045; limited clearing; Coarse Fragments few (2-10%) gravels (20-60mm) quartz;
Vegetation:
Substrate: gravel;

HORIZON DESCRIPTIONS

A11	0	4	cm	Moist; black (10YR 2/1 moist); loamy sand; single grain structure; weak (moist); common (10-20%) angular gravels (6-20mm) quartz; abundant fine (1-2mm) live roots; 4.9 field pH; .051 dSm-1; clear (20-50mm) boundary;
A12	4	9	cm	Moist; very dark grey (10YR 3/1 moist); loamy sand; single grain structure; weak (moist); common (10-20%) angular grit (2-6mm) quartz; abundant fine (1-2mm) live roots; 4.3 field pH; .06 dSm-1; gradual (50-100mm) boundary;
A13	9	22	cm	Moist; dark grey (10YR 4/1 moist); loamy sand; single grain structure; weak (moist); common (10-20%) angular gravels (6-20mm) quartz; abundant coarse (>5mm) live roots; 4.4 field pH; .039 dSm-1; gradual (50-100mm) boundary;
A14A2	22	30	cm	Moist; grey (10YR 5/1 moist); sand; single grain structure; very weak (moist); many (20-50%) angular gravels (6-20mm) quartz; abundant medium (2-5mm) live roots; 4.4 field pH; .033 dSm-1; abrupt (5-20mm) wavy boundary;
A21	30	58	cm	Moderately moist; light grey (10YR 7/1 moist); single grain structure; loose (moist); profuse (>90%) angular gravels (20-60mm) quartz; few live roots; 5.2 field pH; .012 dSm-1;
A22	61	94	cm	Moderately moist; light grey (10YR 7/1 moist); massive structure; profuse (>90%) angular gravels (20-60mm) quartz; very strongly cemented massive silcrete; 5.8 field pH; .009 dSm-1;
B2hs	102	117	cm	Moderately moist; black (10YR 2/1 moist); very dark brown (10YR 2/2) primary mottles; greyish brown (10YR 5/2) secondary mottles; massive structure; many (20-50%) quartz coarse fragments; weakly cemented massive organic pan; few live roots; 4.2 field pH; .051 dSm-1;
C	122	140+	cm	Moderately moist; white (10YR 8/1 moist); sand; massive structure; abundant (50-90%) subangular gravels (20-60mm) quartz; weakly cemented massive silcrete; 5.6 field pH; .009 dSm-1;
Profile Note:				Beaconsfield Association; 22-94cm subangular qz also; 102-117cm vdb is pipes of w`d roots; om coating gv; 61-94cm + 122-140cm some lgb+c coating of gv. Field pH and EC have been copied from Lab data.
General Note:				Isbell classification added by R.Tegg.

Figure 12. Type Profile for Beaconsfield Soil Association

BEACONSFIELD ASSOC Podzol Uc2.33 gravel H255/CSIRO/455 481442E 5438518N BEACONSFIELD

Sample Layer	Depths Upr cm	Depths Lwr cm	pH 1:5 H2O	PH 1:5 CaCl	EC 1:5 dS/m	Soluble Chloride mg/kg	Exchangeable Cations Ca meq	Mg meq	K meq	Na meq	Exch H meq	Exch Al meq	ECEC Sum meq	CEC Meas meq	TEB Sum meq	Base Sat %	ESP %	Ca/Mg Ratio
A11	0	4	4.9		.051 B	20 A	7	1.9	.18	.19 A	19.8 B		29.07		9.27	32	.7 B	3.68
A12	4	9	4.3		.06 B	30 A	2.2	1.2	.11	.21 A	15.7 B		19.42		3.72	19	1.1 B	1.83
A13	9	22	4.4		.039 B	10 A												
A14A2	22	30	4.4		.033 B	10 A												
A21	30	58	5.2		.012 B	10 A	.06	.05	.01	.02 A	.4 B		.54		.14	26	3.7 B	1.20
A22	61	94	5.8		.009 B	10 A	.05	.05	.01	.03 A	.4 B		.54		.14	26	5.6 B	1.00
B2hs	102	117	4.2		.051 B	20 A												
C	122	140	5.6		.009 B	10 A												

Sample Layer	Depths Upr cm	Depths Lwr cm	Loss Ign %	Organic Carbon %	Total N %	C/N Ratio	Avail N mg/kg	Air Dry Moi%	Grav Moi%	Total P %	Avail P mg/kg	Extract P mg/kg	Total K %	Avail K mg/kg	Extract K meq
A11	0	4	11	5.93 C	.191 A	31		2.1		.004 A					
A12	4	9	8.2	5.56 C	.127 A	44		1.5		.002 A					
A13	9	22	4.5	2.57 C	.058 A	44		.72							
A14A2	22	30	2.9					.3							
A21	30	58	.28					.1							
A22	61	94	.14					.04							
B2hs	102	117	1.6	1.7 C	.058 A	29		.7							
C	122	140	.13					.17							

Sample Layer	Depths Upr cm	Depths Lwr cm	<-----Extractable--------> Cu	Mn mg/kg	Zn mg/kg	Fe mg/kg	B mg/kg	Free Fe %	Extractable Al %	Si %	Total Fe %	Total S %	Avail SO4-S mg/kg	CaCO3 %	Dispersion GV %	Particle Size CS %	FS %	S %	C %
A11	0	4									.14 C				27	30	49	8	3 C
A12	4	9													25	36	48	8	3 C
A13	9	22																	
A14A2	22	30																	
A21	30	58									.08 C				63	78	18	5	1 B
A22	61	94													25	42	41	17	2 B
B2hs	102	117									.09 C								
C	122	140																	

Table 13. Analytical data for Beaconsfield Soil Association Type Profile

2.2.3 York Town Soil Association (YT) (3924 ha)

The York Town Association of gravelly Yellow Podzolic soils and Podzols on Tertiary sediments is confined to the north of Middle Arm and the township of Beaconsfield. It occupies a gently sloping piedmont plain flanking the steeper slopes of the Asbestos Range and Cabbage Tree Hill and ranges in altitude from sea level to 85m with a very common level of around 30m-35m; this is probably related to the 30m-35m bench on the Rowella and Legana peninsulas (see Legana Association).

The landscape is gently to very gently undulating and is broken by numerous shallow drainage ways. As in the Beaconsfield Association, the soil surface is characteristically scattered with white subangular and sometimes water-worn quartz grit, gravel and occasional cobbles. The relationship between the soils of the York Town and Beaconsfield Associations has already been discussed under "Beaconsfield Association".

The native vegetation is a sclerophyll forest with black peppermint *(Eucalyptus amygdalina)* and stringybark *(E. obliqua)* the dominant species. There is commonly a fairly dense understorey of *Casuarina suberosa* with less common *Banksia marginata* and *Exocarpus cupressiformis* and a dense ground cover of bracken and heathy shrubs, including *Epacris impressa, Acacia botrycephala, A. suaveolens, Platylobium triangulare, Bossiaea cinerea*, as well *as Lomandra longifolia* and *Lepidosperma spp*. About 30% of the association has been cleared and planted in pasture or orchards.

The main soils are gravelly yellow podzolics *(Chromosols)* grading into podzols *(Podosols)* with increasing development of an organic B horizon immediately above the clay. The organic horizon ranges in thickness from almost nil to 15cm or more, but is usually less than 5cm. Profile H266, described over the page, is typical of the Yellow Podzolic group.

The subordinate water-worn quartz gravels which occur in some York Town profiles may be derived from weathering of gravelly strata within the Tertiary sediments; such horizons of water-worn gravels have been observed in several profiles as a separate stratigraphic layer beneath the yellow clay B horizon.

About two kilometres north-west of Beaconsfield along the Greens Beach Road (483300E 5440400N), there are large boulders of massive and pisolitic laterite on the surface. Associated with these is a variety of soil profiles, including some with red surface horizons containing much pisolitic ferruginous gravel overlying a bright red earthy clay subsoil. Others are similar to the Woodstock-like soils described under "Legana Association", having a light grey-brown sandy A2 horizon containing much pisolitic ferruginous gravel over a brown friable clay subsoil. In the same general area are smaller outcrops of iron-cemented gravels.

Other minor soils include sandy profiles without gravels having a very strongly indurated lower A2 horizon, and fine sandy Podzols with bands of fine subangular quartz gravel.

SITE DESCRIPTION

Site Number: H266	Property Name:	Runoff: Slow	
Project Code: CSIRO	Property Owner:	Permeability: Slowly permeable	
Map Scale:	Nearest Town: BEACONSFIELD	Drainage: Poorly drained	
Sheet No:	Describer: Geoff M. Dimmock	Elevation: 49 m	
Map Name:	Date Cored: 10 Apr 1964		
AMG Easting: 476472 E	Rainfall: 760 mm	Soil Class: Yorktown Assoc	
AMG Northing: 5447312 N	Air Temp (3pm):	Northcote PPF: Dy3.41	
Film No: 6956	Type of Site:	Great Soil Group: Yellow Podzolic Soil	
Run No: 3	Type of Desc: Soil pit	Soil Taxonomy:	
Frame No:	Soil Samples: Yes	Land Capability:	
State: Tasmania	Soil Photos:	Geological Map:	

Location: 6.5KM WSW of Kelso, 14M N of Badger Head Rd 4.8KM from t`off on Main Rd to Kelso.
Aust Classn: Bleached-Mottled, Mesotrophic, Brown, Chromosol; (Confidence level 4)

Landform:
Land Surface: Slope angle 5.5 %; Aspect 000; limited clearing; Coarse Fragments few (2-10%) quartz;
Vegetation:
Substrate: unconsolidated material (unidentified), ferruginized;

HORIZON DESCRIPTIONS

A11	0	3	cm	Moderately moist; black (10YR 2/1 moist); loamy sand; massive structure; very weak (moist); v few (<2%) subangular grit (2-6mm) quartz; abundant coarse (>5mm) live roots; 4.9 field pH; .092 dSm-1; gradual (50-100mm) boundary;
A12	3	10	cm	Moderately moist; very dark grey (10YR 3/1 moist); loamy sand; massive structure; weak (moist); v few (<2%) subangular gravels (20-60mm) quartz; abundant coarse (>5mm) live roots; 4.5 field pH; .08 dSm-1; gradual (50-100mm) irregular boundary;
A12A2	10	20	cm	Moderately moist; grey (10YR 5/1 moist); dark grey (10YR 4/1) primary mottles; sand; single grain structure; very weak (moist); common (10-20%) subangular gravels (20-60mm) quartz; common live roots; 4.8 field pH; .033 dSm-1; diffuse (>100mm) boundary;
A21	20	28	cm	Moderately moist; grey (10YR 5/1 moist); sand; single grain structure; very weak (moist); many (20-50%) subangular gravels (20-60mm) quartz; few live roots; 5.1 field pH; .015 dSm-1; gradual (50-100mm) boundary;
A22	28	39	cm	Moist; light grey (10YR 7/1 moist); sand; massive structure; common (10-20%) subangular gravels (20-60mm) quartz; weakly cemented massive other pan; 5.5 field pH; .012 dSm-1; abrupt (5-20mm) wavy boundary;
B21	39	51	cm	Moderately moist; yellowish brown (10YR 5/8 moist); greyish brown (2.5Y 5/3) primary mottles; heavy clay; strong coarse (50-100mm) prismatic parting to strong coarse (50-100mm) angular blocky structure; very firm (moist); fine (<5mm) cracks; v few (<2%) gravel coarse fragments; few fine (1-2mm) live roots; 5.4 field pH; .054 dSm-1; diffuse (>100mm) boundary;
B22	51	66	cm	Moderately moist; yellowish brown (10YR 5/8 moist); greyish brown (2.5Y 5/3) primary mottles; heavy clay; strong coarse (50-100mm) prismatic parting to strong coarse (50-100mm) angular blocky structure; very firm (moist); smooth-ped fabric; fine (<5mm) cracks; v few (<2%) subangular gravels (6-20mm) quartz; few fine (1-2mm) live roots; 5.6 field pH; .06 dSm-1;
B23	66	86	cm	Moderately moist; yellowish brown (10YR 5/8 moist); greyish brown (2.5Y 5/3) primary mottles; heavy clay; weak coarse (50-100mm) angular blocky structure; very firm (moist); fine (<5mm) cracks; v few (<2%) subangular gravels (20-60mm) quartz; few live roots; 5.7 field pH; .057 dSm-1;
B24	86	117	cm	Moderately moist; yellowish brown (10YR 5/8 moist); greyish brown (2.5Y 5/3) primary mottles; heavy clay; massive structure; very firm (moist); v few (<2%) subangular gravels (20-60mm) quartz; 5.6 field pH; .065 dSm-1;
BC	142	152	cm	Moderately moist; yellowish brown (10YR 5/8 moist); grey (10YR 5/1) primary mottles; red (2.5YR 4/8) secondary mottles; heavy clay; very firm (moist); v few (<2%) angular gravels (6-20mm) quartz; 5.4 field pH; .033 dSm-1;
C	180	185+	cm	Moderately moist; grey (10YR 5/1 moist); red (2.5YR 4/8) primary mottles; yellowish brown (10YR 5/8) secondary mottles; heavy clay; very firm (moist); few (2-10%) 6-20mm ferruginous concretions; few (2-10%) subangular gravels (20-60mm) quartz; 5.2 field pH; .063 dSm-1;
Profile Note:				Yorktown Association; >196cm on ferruginous cemented qz -conglomerate; 51-66cm smooth ped/slickensides; 39-117cm prominent vdb coatings on agg`s. Field pH and EC have been copied from Lab data.

Figure 13. Type Profile for York Town Soil Association

YORKTOWN ASSOC Yellow Podzolic Soil Dy3.41 unconsolidated material (unidentified) H266/CSIRO/466 476472E 5447312N BEACONSFIELD

Sample Layer	Depths Upr cm	Depths Lwr cm	pH 1:5 H2O	PH 1:5 CaCl	EC 1:5 dS/m	Soluble Chloride mg/kg	Exchangeable Cations Ca meq	Mg meq	K meq	Na meq	Exch H meq	Exch Al meq	ECEC Sum meq	CEC Meas meq	TEB Sum meq	Base Sat %	ESP %	Ca/Mg Ratio
A11	0	3	4.9		.092 B	40 A	6.6	1.8	.34	.3 A	20.1 B		29.14		9.04	31	1.0 B	3.67
A12	3	10	4.5		.08 B	40 A	3.4	1.1	.15	.31 A	15.6 B		20.56		4.96	24	1.5 B	3.09
A12A2	10	20	4.8		.033 B	10 A												
A21	20	28	5.1		.015 B	10 A												
A22	28	39	5.5		.012 B	10 A												
B21	39	51	5.4		.054 B	60 A	1.5	5.7	.37	.59 A	18 B		26.16		8.16	31	2.3 B	.26
B22	51	66	5.6		.06 B	70 A												
B23	66	86	5.7		.057 B	70 A	1.4	6.5	.38	.77 A	16.2 B		25.25		9.05	36	3.0 B	.22
B24	86	117	5.6		.065 B	70 A												
BC	142	152	5.4		.033 B	70 A	.4	2.8	.11	.54 A	9.6 B		13.45		3.85	29	4.0 B	.14
C	180	185	5.2		.063 B	80 A	.12	1.4	.05	.39 A	6.4 B		8.36		1.96	23	4.6 B	.09

Sample Layer	Depths Upr cm	Depths Lwr cm	Loss Ign %	Organic Carbon %	Total N %	C/N Ratio	Avail N mg/kg	Air Dry Moi%	Grav Moi%	Total P %	Avail P mg/kg	Extract P mg/kg	Total K %	Avail K mg/kg	Extract K meq
A11	0	3	11.9	6.68 C	.262 A	25		2		.005 A					
A12	3	10	7.8	4.42 C	.135 A	33		1.3		.003 A					
A12A2	10	20	3.1	1.5 C	.054 A	28		.48							
A21	20	28	1	.52 C	.021 A	25		.5							
A22	28	39	.2	.09 C	.004 A	23		.1							
B21	39	51	11.3	1.12 C	.063 A	18		3.7							
B22	51	66	13.6					4.5							
B23	66	86	13.4					5.3							
B24	86	117	12					4.4							
BC	142	152	7.3					3.2							
C	180	185	4.3					1.9							

Sample Layer	Depths Upr cm	Depths Lwr cm	<------Extractable--------> Cu mg/kg	Mn mg/kg	Zn mg/kg	Fe mg/kg	B mg/kg	Free Fe %	Extractable Al %	Si %	Total Fe %	Total S %	Avail SO4-S mg/kg	CaCO3 %	Dispersion GV %	Particle Size CS %	FS %	S %	C %
A11	0	3									.14 C				5	17	58	12	4 C
A12	3	10													14	21	58	12	3 C
A12A2	10	20																	
A21	20	28																	
A22	28	39									.08 C								
B21	39	51									5.88 C				2	5	14	1	77 B
B22	51	66																	
B23	66	86													1	2	7	2	88 B
B24	86	117																	
BC	142	152													1	11	29	5	54 B
C	180	185									2.78 C				3	12	43	12	33 B

Horizon	Depth cm	Method	Mineral Code & Range(%)
B23	66 - 86	XRD	Ka >80 Gt 10-20

Table 14 Analytical data for Yorktown Soil Association Type Profile

2.2.4 **Robigana Soil Association (Rg)** (2281 ha)

This is a heterogeneous association of soils linked only by their occurrence together on marine benches. The benches range in elevation from 3m to about 20m above present sea level, the levels at 3-5m, 6-9m and 12-15m being the most frequent. These correlate with the benches noted by Green (1959) at 3-5m, 8-9m and, as isolated remnants, at 20-25m, in a small part of the surveyed area. Edwards (1941) also, in the wider context of the north-west coast of Tasmania generally, recognised shorelines at 1-5m and 12-15m. The benches are developed sporadically along the whole length of the Tamar River from Riverside to its mouth near Greens Beach and also south-east of Badger Head.

The inland margins of the three more common benches, particularly of the lower two, are sometimes marked by shoreline deposits of shells and water-worn pebbles and stones. In addition, the 3-5m shoreline often lies at the foot of a sharp break of slope representing an ancient marine cliff, but the higher benches do not show this feature.

Much of the area was originally covered by swamp tea-tree *(Melaleuca ericifolia)* scrub, but 70% has now been cleared. Five per cent of the association is under orchards, the greatest concentration being on Robigana-Swan Pt peninsula.

Because there is little similarity between the soils of either the separate areas of the association, or frequently within the one locality, those of each general area will be described separately. The areas are: (a) Greens Beach-Kelso, Lyetta and Badger Head, (b) Ilfraville-York Town, (c) Rowella peninsula, (d) Robigana-Swan Point peninsula, and (e) Legana-Riverside.

(a) Greens Beach-Kelso, Lyetta and Badger Head

The greatest extent of the 3-5m bench is in the Greens Beach-Kelso area. It consists of broad flats on which in some parts are superimposed broad low sandy rises, with a heath vegetation. A minor proportion of the flats is sporadically underlain by the same basalt as outcrops along the shore.

The dominant soils of the flats and low sandy rises are Podzols (Podosols) with sandy A horizons overlying a thin sandy organic B horizon, beneath which at about 60cm depth is a mottled sandy clay or sandy clay loam subsoil. On the rises the A horizons tend to be deeper.

Soil profiles on the flats underlain by basalt are usually shallow with sandy A horizons, sometimes including a bleached A2 horizon, over a dark mottled blocky clay subsoil. The basalt usually occurs at a depth of 30cm to 45cm and is probably not the soil parent material. These soils are often strongly saline, as indicated by salt-tolerant grasses and other plants. In one profile, 1.7% total soluble salts were recorded in the top eight centimetres.

Other soils in the area include dark sandy loams overlying dark mottled sandy clay or clay subsoils, and profiles with a sandy surface overlying shell beds.

Around Lyetta, the terraces mainly range in elevation from 12-18m with only minor development of the 3-5m level. The higher levels are largely occupied by broad low basalt rises on which are developed dark soils with a medium-textured surface over a clay subsoil passing into decomposing basalt with depth (cf. Rowella Association). The presence of odd siliceous pebbles on the surface and throughout the profile, however, indicates that the parent materials of the soils

are mixed, even though basalt may be the larger contributor. In other instances the surface horizons may consist entirely of sandy material, sometimes containing water-worn siliceous gravels, resting unconformably on basalt, either in situ or as a layer of sub-rounded stones. Large masses of groundwater laterite incorporating basalt, siliceous pebbles and irregular nodules of ferruginous material, were observed in some drain sections.

(b) Ilfraville-York Town

This area comprises the prominent 9m bench on which much of the township of Ilfraville stands, and other areas, ranging in elevation from sea level to about 18m, along the southern and western shores of West Arm. A well-developed 3-5m bench near the mouth of Anderson's Creek is included. On the 9m bench most soils are sandy Podzols (Podosols), sometimes containing abundant subangular quartz gravel, or podzolic profiles with sandy A horizons over a prismatic clay B horizon having prominent organic staining on the faces of the prisms. Other soils are yellow podzolics with sandy A horizons often containing much subangular quartz gravel very similar to some of the profiles of the York Town Association.

(c) Rowella Peninsula

The terraces and connecting slopes on the north-western side of the Rowella peninsula range from 2m to about 15m above sea level and, in a number of instances, appear to be cut in the Tertiary clays of the adjoining higher Legana Association country to the south-east. These clays are characteristically mottled grey, strong brown and red, and contain large ferruginous concretions. A number of profiles examined in this area have such clays at depth. They are also well exposed around the shores of Ruffins Bay (492500E 5440000N), where a particularly strong development of the concretionary laterite occurs.

Some profiles in this area resemble Yellow Podzolic soils of the Legana Association. Others contain much water-worn quartz gravel throughout a profile with a brown sandy loam surface passing gradually to a dark yellowish-brown clay subsoil at about 40cm.

Near the lower boundary of the association in this area soils are deep mottled sands containing high total soluble salts throughout and with the summer water table at about 90cm.

(d) Robigana-Swan Point Peninsula

This area is represented almost entirely by the 6-9m bench, and on it the greater part of the orchards on the association are grown. The soils are mainly gravelly Yellow Podzolics sometimes with a thin secondary organic B horizon above the clay. The gravels are chiefly water-worn quartz.

(e) Legana-Riverside

The soils of these southernmost occurrences of the association, which are on terraces ranging from 3 to 7m above sea level, are mainly dark cracking granular clays becoming yellow mottled with depth. They strongly resemble the Talisker series of the Canola Association in the "Longford" quadrangle (Nicolls, 1958, *revised by Spanswick and Zund, 1999),* though they are probably more saline.

2.2.5 **Stockport Association (Sp)** (343 ha)

This minor association of predominantly medium to fine-textured soils occupies the floors of broad shallow drainage-ways or lagoons either within the Dalrymple Association or between this and the York Town Association in the extreme north of the municipality. Elevation ranges from 25m to 30m above sea level.

The original vegetation of the shallow drainage-ways consisted of various sedges and grasses with thickets of tea-trees (*Leptospermum scoparium* and *Melaleuca ericifolia*). About 90% of the total area has now been cleared, drained and sown to pasture. In some areas, relatively high salt in the surfaces appears to have hindered initial pasture establishment.

The typical soil profile has a dark crumbly silty clay loam or clay loam surface, 5-10cm thick, overlying a dark grey blocky or prismatic clay, which passes with depth into a mottled dark grey and olive-brown massive and plastic clay. The summer water table after drainage lies between 90 and 120cm.

Occasionally profiles occur with a sandy clay loam surface over a sandy clay subsoil. Included also are minor low north-west-trending sandy ridges with Podzol soils of the Dalrymple Association and carrying a heath vegetation.

2.2.6 **Dalrymple Soil Association (Da)** (7667 ha)

Soils of this association are sandy Podzols and Humus Podzols (Podosols) formed on an ancient siliceous sand plain, which has subsequently undergone considerable redistribution by wind. The association is confined to the north western side of the Tamar, the northern part of the area east of the large bay between Badger and West Heads and behind the belt of recent calcareous sands of the Kelso association. The sands mantle to a considerable depth the lower slopes of the dolerite hills near Green's Beach, thinning out with increasing altitude. On the eastern side of the Tamar they mantle older formations such as dolerite, basalt and quartzite which in some places occur as outcrops. On the summits of these ridges and of West Head, the mantle is seldom more than 5cm thick, with very numerous rocky outcrops of dolerite protruding. In such situations where the mantle is thin, the normally grey sands are stained reddish-brown by iron weathering from the underlying dolerite.

Generally the sand cover on the slopes is thinner and is underlain by deep mottled clays. In the wetter hollows and depressions along drainage lines the soils are dark organic soils with sandy loam to clay surface textures with clay subsoils. The heavier textured surface soils tend to crack in the drier months.

The topography of the sand plain is gently to very gently undulating with the undulations disposed roughly east-west, though no distinct dune form is evident. On the eastern side of the Tamar, Nicolls (1957) found that the sands also formed hairpin shaped "blow-out dunes". A considerable area of the sands to the south-west of Green's Beach lies on a gently to very gently undulating plain at an altitude of approximately 30m. There is a striking similarity between this sand plain and others occurring in north-eastern Tasmania, particularly at Waterhouse, where the Tomahawk association (Hubble 1946) at the same altitude carries similar vegetation and practically identical soils. A further point of similarity is the presence of numerous shallow swampy depressions and lagoons associated with the surface of the sandplains.

On the Green's Beach-Kelso road about 1.5km north-west of Kelso, the lower edge of the sand plain terminates abruptly in a steep cliff against the 3-5m marine bench upon which Kelso stands. The top of the cliff is from 9-12m above sea level and slopes up gently to the main level at 30m. That the edge of the 3-5m bench against the sand plain cliff is an old shoreline is indicated by the presence of water-worn pebbles and sometimes marine shells at the break of slope.

The vegetation varies from an open heathy plain to open sclerophyll forest. In the former, Yacca *(Xanthorrhoea australis)* is often prominent with little or no stem development as in the Tomahawk association at Waterhouse. Other associated species are *Epacris impressa*, *Aotus villosa, Casuarina palludosa, Banksia marginata* and the sedges *Lepidosperma squamatum* and *Hypolaena fastigiata*. In the sclerophyll forest the main species is black peppermint *(Eucalyptus amygdalina)* which may reach 10m in height. The understorey may consist of local thickets of *Banksia marginata* and *Leptospermum scoparium,* often with a dense ground cover of Bracken, various epacrids and leguminous shrubs (eg *Aotus villosa, Bossiaea cinerea*).

The normal Podzol profile (Podosol) consists of an A1 horizon of dark grey coherent sand, speckled with organic matter, passing gradually to a light grey loose sandy A2 horizon. The boundary to the underlying organic B horizon is abrupt and extremely irregular, with long tongues of A2 separating column-like masses of organic B, typical of sand podzols generally. The outer shells to these columns of organic B are very dark brown or black and usually more strongly

cemented than the interiors. With depth the whole B horizon becomes increasingly cemented and variously mottled dark brown, strong brown and white. In Profile H252 the organic B was underlain by pale loose sand and this in turn by another organic B horizon, almost black and very strongly cemented, and responsible for perching a water table in the pale horizon above. This composite profile probably represents at least two distinct cycles of deposition and soil formation, as is common in sand dunes. The phenomenon of two organic B horizons has been observed elsewhere in the area and also at Waterhouse (Hubble 1946, p.28).

Profile H252, described on the next page, is typical of the association.

SITE DESCRIPTION

Site Number: H252	Property Name:	Runoff:	Very slow
Project Code: CSIRO	Property Owner:	Permeability:	Moderately permeable
Map Scale:	Nearest Town: BEACONSFIELD	Drainage:	Rapidly drained
Sheet No:	Describer: Geoff M. Dimmock	Elevation:	30 m
Map Name:	Date Cored: 26 Apr 1963		
AMG Easting: 478179 E	Rainfall: 790 mm	Soil Class:	Dalrymple Assoc
AMG Northing: 5449938 N	Air Temp (3pm):	Northcote PPF:	Uc2.33
Film No: 6959	Type of Site:	Great Soil Group:	Podzol
Run No: 4	Type of Desc: Soil pit	Soil Taxonomy:	
Frame No:	Soil Samples: Yes	Land Capability:	
State: Tasmania	Soil Photos:	Geological Map:	

Location: 1.8KM SW of Greens Beach.
Aust Classn: Fragic, Humic/Alsilic, Semiaquic, Podosol; (Confidence level 4)

Landform: Element level, flat, backplain; Pattern level plain <9m <1%, sand plain;
Land Surface: No effective disturbance; Erosion minor or present, wind; Water Table Depth -2.5 m;
Vegetation:
Substrate: sand;

HORIZON DESCRIPTIONS

A11	0	3	cm	Moderately moist; very dark grey (10YR 3/1 moist); grey (10YR 5/1 dry); sand; single grain structure; weak (moist); abundant live roots; 6.1 field pH; .033 dSm-1; diffuse (>100mm) boundary;
A12	3	9	cm	Moderately moist; very dark grey (10YR 3/1 moist); sand; single grain structure; weak (moist); common coarse (>5mm) live roots; 5.3 field pH; .033 dSm-1; diffuse (>100mm) boundary;
A13	9	25	cm	Moderately moist; very dark grey (10YR 3/1 moist); sand; single grain structure; weak (moist); common coarse (>5mm) live roots; 5 field pH; .021 dSm-1; diffuse (>100mm) boundary;
A14A2	25	51	cm	Moderately moist; greyish brown (10YR 5/2 moist); sand; single grain structure; very weak (moist); common live roots; 5.3 field pH; .009 dSm-1; diffuse (>100mm) boundary;
A21	51	76	cm	Dry; grey (10YR 6/1 moist); light grey (10YR 7/1 dry); sand; single grain structure; loose (dry); few live roots; 5.4 field pH; .006 dSm-1; diffuse (>100mm) boundary;
A22	76	99	cm	Dry; grey (10YR 6/1 moist); light grey (10YR 7/1 dry); sand; single grain structure; loose (dry); few live roots; 5.4 field pH; .006 dSm-1; abrupt (5-20mm) boundary;
B21h	99	106	cm	Dry; very dark brown (10YR 2/2 moist); dark brown (10YR 3/3) primary mottles; sand; massive structure; weakly cemented massive organic pan; 4.8 field pH; .021 dSm-1; gradual (50-100mm) boundary;
B22h	106	135	cm	Dry; very dark brown (10YR 2/2 moist); dark brown (10YR 3/3) primary mottles; strong brown (7.5YR 5/8) secondary mottles; sand; single grain structure; loose (dry); moderately cemented massive broken organic pan; few live roots; 5.2 field pH; .018 dSm-1; diffuse (>100mm) boundary;
B23h	135	168	cm	Moderately moist; very dark brown (10YR 2/2 moist); prominent brownish yellow (10YR 6/8) primary mottles; white (10YR 8/1) secondary mottles; sand; single grain structure; loose (moist); moderately cemented massive broken organic pan; 5.4 field pH; .021 dSm-1; gradual (50-100mm) boundary;
B24h	175	190	cm	Moist; strong brown (7.5YR 5/8 moist); light yellowish brown (2.5Y 6/4) primary mottles; white (10YR 8/1) secondary mottles; sand; single grain structure; loose (moist); moderately cemented massive broken ortstein; 5.3 field pH; .015 dSm-1; abrupt (5-20mm) boundary;
C1	196	216	cm	Moist; pale yellow (2.5Y 7/4 moist); light grey (2.5Y 7/2) primary mottles; white (10YR 8/1) secondary mottles; sand; weak structure; loose (moist); weakly cemented ortstein; few live roots; 5.3 field pH; .012 dSm-1; clear (20-50mm) boundary;
C2	223	241	cm	Wet; light grey (10YR 7/1 moist); dark greyish brown (10YR 4/2) primary mottles; sand; weak structure; loose (moist); 5.9 field pH; .009 dSm-1;
C3	279	297+	cm	Wet; black (10YR 2/1 moist); very dark brown (10YR 2/2) primary mottles; brown (7.5YR 5/2) secondary mottles; sand; massive structure; weakly cemented continuous; 5.7 field pH; .018 dSm-1;

Profile Note: Dalrymple Association; 106-216cm horizons variable from loose to moderately cemented (darker material). Field pH and EC have been copied from Lab data.

General Note: Isbell classification added by R.Tegg.

Figure 14. Type Profile for Dalrymple Association

DALRYMPLE ASSOC Podzol Uc2.33 sand H252/CSIRO/452 478179E 5449938N BEACONSFIELD

Sample Layer	Depths Upr cm	Depths Lwr cm	pH 1:5 H2O	PH 1:5 CaCl	EC 1:5 dS/m	Soluble Chloride mg/kg	Exchangeable Cations Ca meq	Mg meq	K meq	Na meq	Exch H meq	Exch Al meq	ECEC Sum meq	CEC Meas meq	TEB Sum meq	Base Sat %	ESP %	Ca/Mg Ratio
A11	0	3	6.1		.033 B	10 A	3.1	.49	.11	.06 A	4.1 B		7.86		3.76	48	.8 B	6.33
A12	3	9	5.3		.033 B	10 A	2.1	.47	.1	.09 A	5.2 B		7.96		2.76	35	1.1 B	4.47
A13	9	25	5.0		.021 B	10 A												
A14A2	25	51	5.3		.009 B	10 A												
A21	51	76	5.4		.006 B	10 A												
A22	76	99	5.4		.006 B	10 A	.05	.05	.01	.02 A	.2 B		.33		.13	39	6.1 B	1.00
B21h	99	106	4.8		.021 B	10 A												
B22h	106	135	5.2		.018 B	10 A												
B23h	135	168	5.4		.021 B	20 A	.06	.05	.01	.02 A	12 B		12.14		.14	1	.2 B	1.20
B24h	175	190	5.3		.015 B	10 A												
C1	196	216	5.3		.012 B	10 A												
C2	223	241	5.9		.009 B	10 A												
C3	279	297	5.7		.018 B	10 A	.18	.14	.04	.06 A	19.8 B		20.22		.42	2	.3 B	1.29

Sample Layer	Depths Upr cm	Depths Lwr cm	Loss Ign %	Organic Carbon %	Total N %	C/N Ratio	Avail N mg/kg	Air Dry Moi%	Grav Moi%	Total P %	Avail P mg/kg	Extract P mg/kg	Total K %	Avail K mg/kg	Extract K meq
A11	0	3	3	1.57 C	.072 A	22		.7		.003 A					
A12	3	9	3.6	1.48 C	.067 A	22		.69		.002 A					
A13	9	25	1.5	.79 C	.024 A	33		.31							
A14A2	25	51	.51					.08							
A21	51	76	.24					.1							
A22	76	99	.19	.04 C	.004 A	10		.04							
B21h	99	106	1.5	.59 C	.025 A	24		.53							
B22h	106	135	1.4	.45 C	.016 A	28		.6							
B23h	135	168	2.4	.74 C	.023 A	32		1.3							
B24h	175	190	1.1					.8							
C1	196	216	.41					.25							
C2	223	241	.23					.2							
C3	279	297	4	1.33 C	.003 A	443		2.5							

Sample Layer	Depths Upr cm	Depths Lwr cm	<------Extractable--------> Cu	Mn	Zn	Fe	B mg/kg	Free Fe %	Extractable Al %	Si %	Total Fe %	Total S %	Avail SO4-S mg/kg	CaCO3 %	Dispersion GV %	Particle Size CS %	FS %	S %	C %
A11	0	3									.1 C				0	38	57	1	2 C
A12	3	9													0	38	56	1	1 C
A13	9	25																	
A14A2	25	51																	
A21	51	76																	
A22	76	99									.15 C				0	33	66	1	0 B
B21h	99	106									.09 C								
B22h	106	135									.4 C								
B23h	135	168									.32 C				0	53	42	1	2 B
B24h	175	190									.21 C								
C1	196	216																	
C2	223	241																	
C3	279	297									.32 C				0	16	73	3	4 B

Table 15. Analytical data for Dalrymple Association Type Profile

2.2.7 Kelso Soil Association (Kl) *(1299 ha)*

This association comprises weakly podsolised calcareous sands occurring in three localities adjacent to the coast. The Greens Beach-Kelso area, behind the long stretch of beach extending from Badger Head to West Head and a narrow belt along the coast on the eastern side of the Tamar, except at Five Mile Bluff and near Stony Head where there are some sand drifts. In the Greens Beach-Kelso area, the soils are associated with a well-developed system of stabilised beach ridges parallel to the coast. The second occurrence, behind Badger Head Beach, is on a series of roughly east-west trending elongate-blowout dunes, extending inland for upwards of a 1.5km. Most of the dunes have been stabilised with coastal scrub, mainly *Acacia sophorae*, tea-trees and *Leucopogon richei*, but a number of sand blows are still active probably through firing since European occupation.

The parent material of the soils is a siliceous sand containing 7 to 14% $CaCO_3$ in the form of minute shell fragments. Generally, the soils show only weak profile development, the degree of which increases with distance from the coast. Near the coast, the only evidence is a thin horizon of organic accumulation at the surface, but further inland, leaching of carbonate from the A horizon has taken place together with the formation of a weak A2 horizon and a thin, dark brown extremely irregular incipient organic B. This is underlain by the normal slightly calcareous sand of the parent material, but some secondary segregations of carbonate mainly as calcified roots do occur in this zone.

Profile H253, described on the next page, was sampled near Greens Beach on the crest of one of the older ridges farthest from the coast and the profile is therefore relatively well-developed for this association. The soils of this area are practically identical in morphology and composition to the Lackrana series of the east coast of Flinders Island (Dimmock 1957).

The Kelso soils adjacent to Badger Head Beach show buried A horizons and truncated older profiles, indicating more than one period of sand movement. The sands have also buried ancient swamp deposits consisting of thin peats and organic sandy clays; these sometimes contain partly humified tea-tree stumps.

SITE DESCRIPTION

Site Number:	H253	Property Name:		Runoff:	Very slow
Project Code:	CSIRO	Property Owner:		Permeability:	Moderately permeable
Map Scale:		Nearest Town:	BEACONSFIELD	Drainage:	Rapidly drained
Sheet No:		Describer:	Geoff M. Dimmock	Elevation:	6 m
Map Name:		Date Cored:	27 Apr 1963		
AMG Easting:	479531 E	Rainfall:	790 mm	Soil Class:	Kelso Assoc
AMG Northing:	5451489 N	Air Temp (3pm):		Northcote PPF:	Uc4.24
Film No:	6959	Type of Site:		Great Soil Group:	Calcareous Sand
Run No:	4	Type of Desc:	Soil pit	Soil Taxonomy:	
Frame No:		Soil Samples:	Yes	Land Capability:	
State:	Tasmania	Soil Photos:		Geological Map:	

Location: 1.2KM east of Greens Beach.
Aust Classn: Class Undetermined, Humic, Semiaquic, Podosol; (Confidence level 4)

Landform: Element gently inclined, ridge, beach ridge; Pattern rolling plains <9m 10-32%, beach ridge plain;
Land Surface: Slope angle 10.5 %; no effective disturbance except grazing by hoofed animals; Water Table Depth -4.1 m;
Vegetation:
Substrate: calcareous sand;

HORIZON DESCRIPTIONS

A1	0	5	cm	Dry; very dark grey (10YR 3/1 moist); dark greyish brown (10YR 4/2 dry); sand; single grain structure; very weak (dry); abundant fine (1-2mm) live roots; 7 field pH; .098 dSm-1; gradual (50-100mm) boundary;
A21j	5	15	cm	Dry; dark greyish brown (10YR 4/2 moist); pale brown (10YR 6/3 dry); sand; single grain structure; very weak (dry); abundant fine (1-2mm) live roots; 6.7 field pH; .033 dSm-1; diffuse (>100mm) boundary;
A22	15	23	cm	Moderately moist; dark greyish brown (10YR 4/2 moist); pale brown (10YR 6/3 dry); sand; single grain structure; very weak (moist); common fine (1-2mm) live roots; 6 field pH; .018 dSm-1; diffuse (>100mm) boundary;
B11	23	33	cm	Moderately moist; yellowish brown (10YR 5/4 moist); light yellowish brown (10YR 6/4 dry); sand; single grain structure; loose (moist); few coarse (>5mm) live roots; 6.6 field pH; .015 dSm-1; diffuse (>100mm) boundary;
B12	33	48	cm	Moderately moist; yellowish brown (10YR 5/4 moist); light yellowish brown (10YR 6/4 dry); sand; single grain structure; loose (moist); few fine (1-2mm) live roots; 8.5 field pH; .06 dSm-1; diffuse (>100mm) boundary;
B13	48	58	cm	Moderately moist; light yellowish brown (10YR 6/4 moist); sand; single grain structure; loose (moist); few live roots; 8.7 field pH; .063 dSm-1; abrupt (5-20mm) irregular boundary;
B2h	60	65	cm	Moderately moist; brown (10YR 4/3 moist); brown (10YR 5/3 dry); sand; single grain structure; loose (moist); few live roots; 8.8 field pH; .065 dSm-1; gradual (50-100mm) irregular boundary;
C1	76	102	cm	Moderately moist; brown (10YR 5/3 moist); very pale brown (10YR 7/3 dry); sand; single grain structure; loose (moist); 9.2 field pH; .054 dSm-1; diffuse (>100mm) boundary;
C2	102	129	cm	Moderately moist; pale brown (10YR 6/3 moist); sand; single grain structure; loose (moist); many (20-50%) 20-60mm calcareous concretions; 9.3 field pH; .051 dSm-1; diffuse (>100mm) boundary;
C3	129	173	cm	Moderately moist; pale brown (10YR 6/3 moist); sand; single grain structure; loose (moist); few (2-10%) 20-60mm calcareous tubules; 9.4 field pH; .048 dSm-1;
C4	376	404+	cm	Moderately moist; light brownish grey (2.5Y 6/3 moist); sand; single grain structure; loose (moist); 9.3 field pH; .051 dSm-1;

Profile Note: Kelso Association; At 183cm <2% rounded <25mm dolerite pebble encountered. Field pH and EC have been copied from Lab data.

General Note: Isbell classification added by R.Tegg.

Figure 15. Type Profile for Kelso Soil Association

KELSO ASSOC Calcareous Sand Uc4.24 calcareous sand H253/CSIRO/453 479531E 5451489N BEACONSFIELD

Sample Layer	Depths Upr cm	Depths Lwr cm	pH 1:5 H2O	PH 1:5 CaCl	EC 1:5 dS/m	Soluble Chloride mg/kg	Exchangeable Cations Ca meq	Mg meq	K meq	Na meq	Exch H meq	Exch Al meq	ECEC Sum meq	CEC Meas meq	TEB Sum meq	Base Sat %	ESP %	Ca/Mg Ratio
A1	0	5	7.0		.098 B	60 A	3.6	1.1	.44	.22 A	2.4 B		7.76		5.36	69	2.8 B	3.27
A21j	5	15	6.7		.033 B	20 A	1.2	.18	.1	.07 A	1.3 B		2.85		1.55	54	2.5 B	6.67
A22	15	23	6.0		.018 B	10 A												
B11	23	33	6.6		.015 B	10 A	.61	.05	.01	.03 A	.6 B		1.3		.7	54	2.3 B	12.20
B12	33	48	8.5		.06 B	10 A												
B13	48	58	8.7		.063 B	10 A												
B2h	60	65	8.8		.065 B	10 A												
C1	76	102	9.2		.054 B	10 A												
C2	102	129	9.3		.051 B	10 A												
C3	129	173	9.4		.048 B	10 A												
C4	376	404	9.3		.051 B	10 A												

Sample Layer	Depths Upr cm	Depths Lwr cm	Loss Ign %	Organic Carbon %	Total N %	C/N Ratio	Avail N mg/kg	Air Dry Moi%	Grav Moi%	Total P %	Avail P mg/kg	Extract P mg/kg	Total K %	Avail K mg/kg	Extract K meq
A1	0	5	3.3	1.47 C	.105 A	14		.71		.009 A					
A21j	5	15	1.1	.5 C	.028 A	18		.26		.005 A					
A22	15	23	.82					.17							
B11	23	33	.5					.04							
B12	33	48	.9					.16							
B13	48	58	1.2	.21 C	.013 A	16		.07							
B2h	60	65	1.7	.32 C	.017 A	19		.1							
C1	76	102	3.6					.03							
C2	102	129	3.9					.06							
C3	129	173	3.3					.11							
C4	376	404	4.2					.11							

Sample Layer	Depths Upr cm	Depths Lwr cm	<-----Extractable--------> Cu	Mn	Zn	Fe	B mg/kg	Free Fe %	Extractable Al %	Si %	Total Fe %	Total S %	Avail SO4-S mg/kg	CaCO3 %	Dispersion	Particle Size GV %	CS %	FS %	S %	C %
A1	0	5									.28 C					0	12	82	1	2 C
A21j	5	15														0	14	84	1	1 B
A22	15	23																		
B11	23	33														0	22	77	1	1 B
B12	33	48																		
B13	48	58									.14 C									
B2h	60	65									.14 C									
C1	76	102																		
C2	102	129																		
C3	129	173												6.5 B		0	11	81	1	1 C
C4	376	404									.3 C									

Table 16. Analytical data for the Kelso soil Association Type Profile

2.2.8 Supply Soil Association (Su) (1572 ha)

The alluvial parent materials of this association of hydromorphic soils (Hydrosols) are mainly on present-day floodplains but some older terrace alluvium is included. The chief occurrences are along the Supply River, and Middle Arm Creek, with smaller areas near Holwell, along Ecclestone Road and along Four Springs Creek. In addition, narrow strips along many smaller streams have been mapped with other associations. Elevation ranges from 15 to 310m above sea level.

There are some remnants of the original vegetation along parts of the Supply River, which includes trees such as swamp gum (*Eucalyptus ovata*), Blackwood (*Acacia melanoxylon*), silver wattle (*A. dealbata*), dogwood (*Pomaderris apetala*) and various tea-trees, with a dense ground cover of reeds and sedges. About 80% has now been cleared and drained and pastures have been established on it. In a few areas, the river channel has been straightened and levee banks built.

The soils generally have gradational profiles with a very dark grey medium-textured surface (silt loam, silty clay loam or fine sandy clay loam), usually with well-developed fine granular structure, which passes gradually by about 30-45cm depth to a massive, distinctly mottled dark grey and yellowish-brown clay, silty clay or fine sandy clay. Some profiles show strong gleying as greenish colours in the deeper subsoil, indicating continuous waterlogging. In two profiles the summer water table was observed at about 90cm.

A representative profile of the alluvium of the Supply River floodplain is given on the next page in Profile H263.

Included also with the association is a small area of black cracking clay surrounding a small raised peat bog about 0.5km south of Winkleigh PO.

On some valley floors there are very low rises often only a metre or so above the general level, carrying soils similar to those on the adjacent valley sides. These rises are erosional rather than depositional features, but because of their small extent and close association with the alluvium, they have been mapped in the same soil association.

CSIRO Soil Surveys (1949-70)

SITE DESCRIPTION

Site Number:	H263	Property Name:		Runoff:	Very slow
Project Code:	CSIRO	Property Owner:		Permeability:	Very slowly permeable
Map Scale:		Nearest Town:	QUAMBY	Drainage:	Poorly drained
Sheet No:		Describer:	Geoff M. Dimmock	Elevation:	50 m
Map Name:		Date Cored:	8 Apr 1964		
AMG Easting:	491138 E	Rainfall:	910 mm	Soil Class:	Supply Assoc
AMG Northing:	5428904 N	Air Temp (3pm):		Northcote PPF:	Dy3.11
Film No:	42	Type of Site:		Great Soil Group:	Humic Gley
Run No:	7	Type of Desc:	Soil pit	Soil Taxonomy:	
Frame No:		Soil Samples:	Yes	Land Capability:	
State:	Tasmania	Soil Photos:		Geological Map:	

Location: 4.8KM west of Exeter property "Spring Valley", 89M NW from gate along Rdthen 21M NE of paddock fence.
Aust Classn: Class Undetermined, Haplic, Supratidal, Hydrosol; (Confidence level 4)

Landform: Element level, flat, supratidal flat; Pattern gently undulating plains <9m 1-3%, flood plain;
Land Surface: Complete clearing - pasture but cultivation at some stage; Water Table Depth -.91 m;
Vegetation:
Substrate: unconsolidated material (unidentified);

HORIZON DESCRIPTIONS

A11	0	5	cm	Moist; very dark greyish brown (10YR 3/2 moist); clay loam; moderate very fine (2-5mm) granular structure; weak (moist); few (2-10%) rounded gravels (20-60mm) quartzite; abundant fine (1-2mm) live roots; 5.7 field pH; .092 dSm-1; diffuse (>100mm) boundary;
A12	5	10	cm	Moist; very dark greyish brown (10YR 3/2 moist); heavy clay loam; moderate very fine (2-5mm) granular structure; weak (moist); few (2-10%) subangular gravels (6-20mm) quartz; abundant fine (1-2mm) live roots; 5.9 field pH; .057 dSm-1; diffuse (>100mm) boundary;
A13	10	18	cm	Moist; very dark greyish brown (10YR 3/2 moist); light clay; moderate very fine (2-5mm) granular structure; very weak (moist); few (2-10%) subangular quartz coarse fragments; abundant fine (1-2mm) live roots; 5.9 field pH; .054 dSm-1; gradual (50-100mm) irregular boundary;
A14	18	27	cm	Moderately moist; very dark greyish brown (10YR 3/2 moist); dark grey (10YR 4/1) primary mottles; light clay; weak medium (20-50mm) subangular blocky structure; strong (moist); many (20-50%) stratified charcoal coarse fragments; few live roots; 6.2 field pH; .042 dSm-1; diffuse (>100mm) boundary;
B21g	27	46	cm	Moderately moist; dark grey (10YR 4/1 moist); medium (5-15mm) dark yellowish brown (10YR 4/4) primary mottles; strong brown (7.5YR 5/8) secondary mottles; heavy clay; weak medium (20-50mm) subangular blocky structure; strong (moist); few (2-10%) subangular quartz coarse fragments; few fine (1-2mm) live roots; 6.3 field pH; .042 dSm-1; diffuse (>100mm) boundary;
B22g	46	66	cm	Moist; dark grey (10YR 4/1 moist); distinct strong brown (7.5YR 5/8) primary mottles; heavy clay; massive structure; slightly plastic, normal plasticity; few (2-10%) subangular quartz coarse fragments; few fine (1-2mm) live roots; 6.2 field pH; .045 dSm-1; diffuse (>100mm) boundary;
B23g	66	89	cm	Moist; dark grey (10YR 4/1 moist); distinct strong brown (7.5YR 5/8) primary mottles; heavy clay; massive structure; slightly plastic, normal plasticity; v few (<2%) subangular quartz coarse fragments; 6.1 field pH; .048 dSm-1; diffuse (>100mm) boundary;
B24g	89	109+	cm	Wet; dark grey (10YR 4/1 moist); distinct strong brown (7.5YR 5/8) primary mottles; heavy clay; massive structure; slightly sticky; v few (<2%) subangular quartz coarse fragments; 6.1 field pH; .045 dSm-1;
Profile Note:				Supply Association (gleyed soil); 10-18cm <10% <12mm charcoal also; 10-109cm rounded quartzite also; 18-27cm <10% sa+rounded qz+qu also. Field pH and EC have been copied from Lab data.
General Note:				Isbell classification added by R.Tegg.

Figure 16. Type Profile for Supply Soil Association

SUPPLY ASSOC Humic Gley Dy3.11 unconsolidated material (unidentified) H263/CSIRO/463 491138E 5428904N QUAMBY

Sample Layer	Depths Upr cm	Lwr cm	pH 1:5 H2O	PH 1:5 CaCl	EC 1:5 dS/m	Soluble Chloride mg/kg	Exchangeable Cations Ca meq	Mg meq	K meq	Na meq	Exch H meq	Exch Al meq	ECEC Sum meq	CEC Meas meq	TEB Sum meq	Base Sat %	ESP %	Ca/Mg Ratio
A11	0	5	5.7		.092 B	120 A	10.6	3.4	.37	.5 A	18.7 B		33.57		14.87	44	1.5 B	3.12
A12	5	10	5.9		.057 B	70 A	10.3	3.3	.2	.49 A	17.7 B		31.99		14.29	45	1.5 B	3.12
A13	10	18	5.9		.054 B	70 A	9.3	3.4	.2	.59 A	17.6 B		31.09		13.49	43	1.9 B	2.74
A14	18	27	6.2		.042 B	70 A												
B21g	27	46	6.3		.042 B	60 A	7.1	3.3	.16	.56 A	6.6 B		17.72		11.12	63	3.2 B	2.15
B22g	46	66	6.2		.045 B	60 A												
B23g	66	89	6.1		.048 B	70 A	6.5	3.8	.18	.68 A	7 B		18.16		11.16	61	3.7 B	1.71
B24g	89	109	6.1		.045 B	70 A												

Sample Layer	Depths Upr cm	Lwr cm	Loss Ign %	Organic Carbon %	Total N %	C/N Ratio	Avail N mg/kg	Air Dry Moi%	Grav Moi%	Total P %	Avail P mg/kg	Extract P mg/kg	Total K %	Avail K mg/kg	Extract K meq
A11	0	5	11.4	4.64 C	.361 A	13		3.4		.037 A					
A12	5	10	9.2	3.51 C	.263 A	13		3.1		.029 A					
A13	10	18	8.6	3.3 C	.256 A	13		3							
A14	18	27	6.3					3.3							
B21g	27	46	4.3					2.5							
B22g	46	66	4.2					2.6							
B23g	66	89	4					2.6							
B24g	89	109	4					2.6							

Sample Layer	Depths Upr cm	Lwr cm	<------Extractable--------> Cu mg/kg	Mn mg/kg	Zn mg/kg	Fe mg/kg	B mg/kg	Free Fe %	Extractable Al %	Si %	Total Fe %	Total S %	Avail SO4-S mg/kg	CaCO3 %	Dispersion Particle Size GV %	CS %	FS %	S %	C %
A11	0	5									1.58 C				1	4	29	27	31 C
A12	5	10													1	5	29	26	32 C
A13	10	18													1	5	29	27	34 C
A14	18	27																	
B21g	27	46													1	10	29	21	39 B
B22g	46	66																	
B23g	66	89									2.41 C				1	9	28	20	40 B
B24g	89	109																	

Table 17. Analytical data for the Supply Soil Association Type Profile

2.2.9 **Tamar Soil Association (Tm)** (462 ha)

Saline waterlogged soils about a metre above the high water mark along the Tamar estuary make up this minor association. It is restricted to two areas: a nearly continuous strip running from the south-eastern side of the Legana peninsula to Launceston, and a narrow strip on the north-western side of the Rowella peninsula.

The typical salt marsh vegetation includes such species as samphire, *Phragmites*, various salt-tolerant grasses, reeds and sedges, as well as scattered clumps of swamp tea-tree *(Melaleuca ericifolia)*. Some previous attempts at drainage and development of the soils have been made near Launceston, but most have now been abandoned.

Two groups of soils were recognised:

(a) Dark organic clays overlying a gley horizon of dark greenish-grey sticky clay below the shallow water table. This group is characteristic of the southern occurrence.
(b) Dark highly organic sandy loams overlying light coloured stratified sands and sandy clays, with increasing bright yellow mottling in the water table zone below about 60cm. These soils were noted in the northern area.

Although not shown as Tamar Association on the map, logically the extensive mud flats exposed at low tide along the upper reaches of the river Tamar could be considered with it, since the alluvium is similar. The grass *Spartina townsendii* was introduced to these flats about 1940 with the object of trapping silt.

2.3 Soils Developed on Complexes of Basalt or Dolerite with Unconsolidated Sediments

2.3.1 Ecclestone Soil Association (Ec) (1062 ha)

This association is a complex of Lateritic Krasnozems and stony Grey-brown Podzolic soils on dolerite, together with Lateritic Podzolic and other soils on Tertiary sediments (cf Legana Association). The Grey-brown Podzolic soils are common to both the Ecclestone and Eastfield Associations, so that boundaries between these two associations are ill-defined. In the Ecclestone the Lateritic Krasnozems and Legana-like soils occupy about half the total area, whereas in the Eastfield, soils other than the Grey-brown Podzolics are of only minor extent. The Ecclestone association is confined to narrow ranges of elevation – 120 to 210m in the southern, and 40 to 100m in the northern occurrence.

In those parts of the association occupied mainly by Lateritic Krasnozems and Lateritic Podzolic soils, the topography ranges from gently undulating to easy rolling, and subdued outcrops of laterite, sometimes forming small pavements, are fairly common, eg along Ecclestone Road near 504500E 5414500N. Where Eastfield soils are dominant, the landscape is typically hilly with very common dolerite outcrops.

The Ecclestone Association appears to represent remnants of an old erosion surface, possibly a continuation of the Woodstock surface (Nicolls 1960, revised by Spanswick & Zund, 1999*).* This would account both for the subdued topography and for the complex of (1) Legana-like soils on a thin discontinuous cover of the Tertiary sediments, (2) Lateritic Krasnozems (Ferrosols) where the erosion surface was developed across dolerite, and (3) younger Grey-brown Podzolic soils (Chromosols) formed on fresh dolerite exposed by discontinuous stripping of the older soils of the surface.

The pattern of soils in the smaller northern area is a complex mainly of the stony Grey-brown Podzolic soils on dolerite and Yellow Podzolics on Tertiary sediments, with only very minor Lateritic Krasnozems. Soft highly weathered dolerite similar to the parent material of the Lateritic Krasnozems of the main area occurs in one or two sections, but the associated soil profiles are more closely related to the Yellow Podzolics. Small outcrops of pisolitic laterite are also present.

The original vegetation was a dry sclerophyll forest similar to that on the Eastfield association. Only about 20% of this had been cleared up to 1956. Subsequently, however, considerable development of the main area of the association has taken place, and the proportion of cleared land is probably now about 60%.

The Lateritic Krasnozems are red, deep and generally well-structured soils with gradational profiles containing ferruginous gravels in the A and B horizons. Field textures are clay loams at the surface grading through medium clay in the B horizon to heavy clay in the BC horizon at about 90cm. Below this depth, increasing amounts of soft decomposing dolerite occur, passing ultimately to a C horizon essentially of weathering rock. Profile H261, described on the next page is typical of these soils.

Correlation

The Lateritic Krasnozem of the Ecclestone Association may correlate with the Archer Lateritic Variant identified within the Archer Association on the Quamby Reconnaissance Soil Map. However no analytical data is available for the Archer Lateritic Variant to determine if they do infact correlate. More work is required on the lateritic krasnozems on dolerite.

CSIRO Soil Surveys (1949-70)

SITE DESCRIPTION

Site Number:	H261	Property Name:		Runoff:	Slow
Project Code:	CSIRO	Property Owner:		Permeability:	Moderately permeable
Map Scale:		Nearest Town:	LAUNCESTON	Drainage:	Well drained
Sheet No:		Describer:	Geoff M. Dimmock	Elevation:	183 m
Map Name:		Date Cored:	6 Apr 1964		
AMG Easting:	505585 E	Rainfall:	780 mm	Soil Class:	Ecclestone Assoc
AMG Northing:	5414403 N	Air Temp (3pm):		Northcote PPF:	Gn3.12
Film No:	43	Type of Site:		Great Soil Group:	Krasnozem
Run No:	2	Type of Desc:	Soil pit	Soil Taxonomy:	
Frame No:		Soil Samples:	Yes	Land Capability:	
State:	Tasmania	Soil Photos:		Geological Map:	

Location: 6.5KM WNW of Launceston GPO, on Ecclestone Rd 3.6KM from West Tamar H`way t`off, 4M N of Rd + 1.2M from fence.
Aust Classn: Class Undetermined, Mesotrophic, Red, Ferrosol; (Confidence level 4)

Landform:
Land Surface: Slope angle 7.0 %; Aspect 180; limited clearing; Condition of surface soil self-mulching;
Vegetation:
Substrate: dolerite, ferruginized;

HORIZON DESCRIPTIONS

A1	0	4	cm	Moderately moist; dark brown (7.5YR 3/2 moist); clay loam; moderate ex fine (<2mm) granular structure; very weak (moist); common (10-20%) gravels (20-60mm) same as substrate material; abundant fine (1-2mm) live roots; 6.2 field pH; .077 dSm-1; clear (20-50mm) boundary;
AB	4	9	cm	Moist; dark reddish brown (5YR 3/3 moist); clay loam; moderate very fine (2-5mm) granular structure; very weak (moist); common (10-20%) 2-6mm ferruginous nodules; few (2-10%) gravels (20-60mm) same as substrate material; abundant coarse (>5mm) live roots; 6.5 field pH; .051 dSm-1; diffuse (>100mm) boundary;
B1	9	18	cm	Moist; reddish brown (5YR 4/3 moist); light clay; moderate ex fine (<2mm) granular structure; weak (moist); few (2-10%) ferruginous nodules; v few (<2%) gravels (20-60mm) same as substrate material; common live roots; 6.5 field pH; .033 dSm-1; diffuse (>100mm) boundary;
B21	18	30	cm	Moist; red (2.5YR 4/6 moist); medium clay; moderate very fine (2-5mm) subangular blocky structure; weak (moist); common (10-20%) <2mm ferruginous nodules; common (10-20%) gravels (20-60mm) same as substrate material; few live roots; 6.5 field pH; .024 dSm-1; diffuse (>100mm) boundary;
B22	30	43	cm	Moist; red (2.5YR 4/6 moist); medium clay; moderate very fine (2-5mm) subangular blocky structure; weak (moist); common (10-20%) <2mm ferruginous nodules; v few (<2%) gravels (20-60mm) same as substrate material; few fine (1-2mm) live roots; 6.6 field pH; .024 dSm-1; diffuse (>100mm) boundary;
B23	43	58	cm	Moist; red (2.5YR 4/6 moist); very few (<2%) yellowish brown (10YR 5/8) primary mottles; medium clay; weak very fine (2-5mm) subangular blocky structure; weak (moist); prominent clay skins; v few (<2%) <2mm ferruginous nodules; v few (<2%) gravels (20-60mm) same as substrate material; few fine (1-2mm) live roots; 6.5 field pH; .03 dSm-1; diffuse (>100mm) boundary;
BC1	58	76	cm	Moist; red (2.5YR 4/8 moist); few (2-10%) yellowish brown (10YR 5/8) primary mottles; white (10YR 8/1) secondary mottles; medium clay; weak very fine (2-5mm) subangular blocky structure; weak (moist); prominent clay skins; few fine (1-2mm) live roots; 6.5 field pH; .036 dSm-1; diffuse (>100mm) boundary;
BC2	76	96	cm	Moist; red (2.5YR 4/8 moist); many (20-50%) yellowish brown (10YR 5/8) primary mottles; white (10YR 8/1) secondary mottles; medium clay; massive structure; weak (moist); prominent clay skins; 6.4 field pH; .036 dSm-1; diffuse (>100mm) boundary;
BC3	99	112	cm	Red (2.5YR 4/8 moist); strong brown (7.5YR 5/8) primary mottles; white (10YR 8/1) secondary mottles; medium clay; prominent clay skins; 6.2 field pH; .03 dSm-1;
C	193	208+	cm	Brownish yellow (10YR 6/6 moist); fine (<5mm) distinct white (10YR 8/1) primary mottles; red (2.5YR 4/8) secondary mottles; few (<10%) prominent clay skins; 4.6 field pH; .054 dSm-1;

Profile Note: Ecclestone Association (lateritic kraznozem; Fe segregations pisolitc; 193-208cm bauxitised w`d dr; 99-112cm c and soft w`d dr; 58-96cm 10YR58+10yr81 w`d dr. Field pH and EC have been copied from Lab data.

General Note: Isbell classification added by R.Tegg.

Figure 17. Type Profile for Ecclestone Soil Association

ECCLESTONE ASSOC Krasnozem Gn3.12 dolerite H261/CSIRO/461 505585E 5414403N LAUNCESTON

Sample Layer	Depths Upr cm	Depths Lwr cm	pH 1:5 H2O	PH 1:5 CaCl	EC 1:5 dS/m	Soluble Chloride mg/kg	Exchangeable Cations Ca meq	Mg meq	K meq	Na meq	Exch H meq	Exch Al meq	ECEC Sum meq	CEC Meas meq	TEB Sum meq	Base Sat %	ESP %	Ca/Mg Ratio
A1	0	4	6.2		.077 B	40 A	15.6	3.9	.77	.32 A	32.9 B		53.49		20.59	38	.6 B	4.00
AB	4	9	6.5		.051 B	50 A	9.9	3.7	.56	.23 A	21.9 B		36.29		14.39	40	.6 B	2.68
B1	9	18	6.5		.033 B	30 A	4.5	1.3	.3	.16 A	12.9 B		19.16		6.26	33	.8 B	3.46
B21	18	30	6.5		.024 B	20 A												
B22	30	43	6.6		.024 B	20 A	2	1.4	.1	.18 A	8.1 B		11.78		3.68	31	1.5 B	1.43
B23	43	58	6.5		.03 B	20 A												
BC1	58	76	6.5		.036 B	200 A												
BC2	76	96	6.4		.036 B	20 A	.73	4.5	.04	.88 A	9.9 B		16.05		6.15	38	5.5 B	.16
BC3	99	112	6.2		.03 B	20 A												
C	193	208	4.6		.054 B	40 A	.08	2.5	.02	2.1 A	11 B		15.7		4.7	30	13.4 B	.03

Sample Layer	Depths Upr cm	Depths Lwr cm	Loss Ign %	Organic Carbon %	Total N %	C/N Ratio	Avail N mg/kg	Air Dry Moi%	Grav Moi%	Total P %	Avail P mg/kg	Extract P mg/kg	Total K %	Avail K mg/kg	Extract K meq
A1	0	4	21.1	9.47 C	.398 A	24		6.3		.024 A					
AB	4	9	15.6	5.78 C	.238 A	24		5		.017 A					
B1	9	18	12.2	2.63 C	.115 A	23		3.7		.013 A					
B21	18	30	11.6	1.49 C	.073 A	20		3.6							
B22	30	43	12.2	.92 C	.047 A	20		3.9							
B23	43	58	15.8	.64 C	.033 A	19		3.4							
BC1	58	76	17.8					4.5							
BC2	76	96	18.2					5.3							
BC3	99	112	16.4					6							
C	193	208	12.2					4.6							

Sample Layer	Depths Upr cm	Depths Lwr cm	<-----Extractable--------> Cu	Mn	Zn	Fe	B mg/kg	Free Fe %	Extractable Al %	Si %	Total Fe %	Total S %	Avail SO4-S mg/kg	CaCO3 %	Dispersion GV %	Particle Size CS %	FS %	S %	C %
A1	0	4						6.33 A			9.07 C				18	8	29	19	25 C
AB	4	9													15	9	29	20	30 C
B1	9	18													10	12	28	22	34 C
B21	18	30													16	12	26	19	37 C
B22	30	43						9.58 A			15.6 C				15	19	20	18	43 B
B23	43	58																	
BC1	58	76																	
BC2	76	96													0	2	9	9	82 B
BC3	99	112						2.47 A											
C	193	208									4.13 C				0	5	29	18	46 C

Table 18. Analytical data for Ecclestone Soil Association

2.3.2 **Rosevears Soil Association (Rv)** (434 ha)

This is an association of small area occupying very uneven terrain chiefly surrounding the 180m basalt plateau remnant south of Rosevears and around Brady's Lookout. In this area the basalt overlies Tertiary clayey sediments which are very prone to slumping and as a result the landscape is characteristically hummocky.

The soils around the plateau edges are therefore very heterogeneous. Some consist of apparently intact remnants of Krasnozems (Ferrosols) which have dropped to lower elevation from the plateau top (eg near 501400E 5421300N). Others consist of shallow brown soils on basalt like those in the Rowella Association, including Lithosols (Rudosols) on the bevelled upper plateau edges and on ledges and in pockets down the sides of the steep flanking rocky cliffs. Some soils are formed on nearly pure Tertiary clayey sediments (Legana Association), as well as a wide range of soils developed on mixtures of all of the above. In particular, along the backslopes of some of the slump benches, drainage has been ponded and the soils show strong hydromorphic characteristics (Hydrosols), as prominent mottling within the profile. The poor drainage is also reflected in the strong growth of rushes on the surface.

In several instances within the association, soil profiles apparently derived from basalt, but possibly from dolerite, showed the development of a bleached A2 horizon containing pisolitic ferruginous gravel, overlying an olive-brown or dark reddish-brown stiff clay subsoil. In Tasmania, podzolic soils have not been recorded previously on basalt.

From remnants of the original vegetation on the steep edges around the plateau, the association appears to have carried a sclerophyll forest dominated by manna gum *(Eucalyptus viminalis)* and black peppermint *(E. amygdalina).*

2.3.3 **Rowella Soil Association (Rw)** (415 ha)

The Rowella Association is a complex of grey sandy podzolic soils on Tertiary sediments with subdominant shallow Non-calcic Brown soils on basalt. It has been mapped only on the Rowella peninsula. The boundary with the Legana Association there is poorly defined because some soils on Tertiary sediments are common to both.

The pattern of distribution of soils in the Rowella Association is best explained by the geological history of its parent materials. The basalts originally occupied a deeply dissected valley landscape cut in the early Tertiary sediments by the ancestral River Tamar. The present river has since cut through the basalt to varying degrees to re-expose the underlying sediments, almost completely stripping the basalt from the upper and middle parts of the valley, but less completely from the lower parts. The eastern half of the Rowella peninsula, where the Rowella Association has been mapped, is typical of this latter situation. The dissection here has produced a rolling to hilly landscape in which the basalt has been left as scattered remnants on the valley sides at elevations ranging from sea level to 70m in close association with the sediments. Outcrops of basalt are fairly common, particularly around the steeper breaks of slope and on low knolls forming the higher parts of the association.

The original vegetation was an open sclerophyll forest of manna gum *(Eucalyptus viminalis)* with an understorey of blackwood (*Acacia melanoxylon)* and prickly box *(Bursaria spinosa),* and some local thickets of swamp tea-tree *(Melaleuca ericifolia),* but has now been cleared almost entirely.

The dominant soils of the association are the grey sandy podzolic soils on the Tertiary sediments already described under “Legana Association". The sub-dominant shallow Non-calcic Brown Soils on basalt have shallow brown duplex profiles, generally stony throughout with fine sandy loam A horizons overlying abruptly at about 20cm a clay B horizon, which passes down into a C horizon of clay and mealy decomposing basalt at about 45cm. Hard rock usually lies at depths between 60 and 90cm. An example of these soils is described on the next page as profile H267.

Minor soils consist of brown very shallow lithosols associated with some basalt outcrops, and soils formed on mixed parent materials.

CSIRO Soil Surveys (1949-70)

SITE DESCRIPTION

Site Number :	H267	Property Name:		Runoff:	Slow
Project Code:	CSIRO	Property Owner:		Permeability:	Slowly permeable
Map Scale:		Nearest Town:	QUAMBY	Drainage:	Moderately well drained
Sheet No:		Describer:	Geoff M. Dimmock	Elevation:	32 m
Map Name:		Date Cored:	11 Apr 1964		
AMG Easting:	491097 E	Rainfall:	830 mm	Soil Class :	Rowella Assoc
AMG Northing:	5443270 N	Air Temp (3pm):		Northcote PPF:	Dr2.12
Film No:	38	Type of Site:		Great Soil Group:	Non-calcic Brown Soil
Run No:	7	Type of Desc:	Soil pit	Soil Taxonomy:	
Frame No:		Soil Samples:	Yes	Land Capability:	
State:	Tasmania	Soil Photos:		Geological Map:	

Location: 2.4KM NW of Rowella P.O. on property "Blackwood Hills", 44M on bearing 157.5degrees from fence (on 18degrees).
Aust Classn: Humose, Eutrophic, Brown, Ferrosol; (Confidence level 4)

Landform: Element upper slope,
Land Surface: Slope angle 4.5 %; Aspect 000; complete clearing - pasture but never cultivated; Coarse Fragments few (2-10%) basalt; Rock Outcrops <2% bedrock exposed, Basalt;
Vegetation:
Substrate: basalt;

HORIZON DESCRIPTIONS

A11	0	5	cm	Moist; very dark brown (7.5YR 2/2 moist); fine sandy loam; moderate ex fine (<2mm) granular structure; very weak (moist); few (2-10%) gravels (20-60mm) basalt; abundant fine (1-2mm) live roots; 5.6 field pH; .259 dSm-1; diffuse (>100mm) boundary;
A12	5	10	cm	Moist; very dark brown (7.5YR 2/2 moist); fine sandy loam; moderate ex fine (<2mm) granular structure; very weak (moist); common (10-20%) gravels (20-60mm) basalt; abundant fine (1-2mm) live roots; 5.6 field pH; .161 dSm-1; diffuse (>100mm) boundary;
A13	10	19	cm	Moist; very dark brown (7.5YR 2/2 moist); heavy fine sandy loam; moderate very fine (2-5mm) subangular blocky structure; very weak (moist); many (20-50%) gravels (20-60mm) basalt; common live roots; 5.9 field pH; .095 dSm-1; abrupt (5-20mm) irregular boundary;
B21	22	30	cm	Moist; brown (7.5YR 4/4 moist); yellowish red (5YR 4/6) primary mottles; heavy clay; moderate fine (5-10mm) subangular blocky structure; weak (moist); abundant (50-90%) stones (60-200mm) basalt; few live roots; 6.3 field pH; .057 dSm-1; gradual (50-100mm) boundary;
BC	30	43	cm	Moist; yellowish red (5YR 4/6 moist); heavy clay; weak fine (5-10mm) subangular blocky structure; weak (moist); abundant (50-90%) gravel coarse fragments; 6.5 field pH; .057 dSm-1; diffuse (>100mm) boundary;
C	43	63+	cm	6.9 field pH; .045 dSm-1;

Substrate Note: Mealy w`d BA @ <90% (GV+stones) and a few pockets of clay

Profile Note: Rowella Association; 30-43cm increasing mealy w`d ba gv; 22-43cm dark surfaces on aggregates. Field pH and EC have been copied from Lab data.

General Note: Isbell classification added by R.Tegg.

Figure 18. Type Profile for Rowella Soil Association

ROWELLA ASSOC Non-calcic Brown Soil Dr2.12 basalt H267/CSIRO/467 491097E 5443270N QUAMBY

Sample Layer	Depths Upr cm	Depths Lwr cm	pH 1:5 H2O	PH 1:5 CaCl	EC 1:5 dS/m	Soluble Chloride mg/kg	Exchangeable Cations Ca meq	Mg meq	K meq	Na meq	Exch H meq	Exch Al meq	ECEC Sum meq	CEC Meas meq	TEB Sum meq	Base Sat %	ESP %	Ca/Mg Ratio
A11	0	5	5.6		.259 B	200 A					21.3 B							
A12	5	10	5.6		.161 B	160 A					21.6 B							
A13	10	19	5.9		.095 B	120 A												
B21	22	30	6.3		.057 B	110 A	21.2	10.3	.59	.56 A	14.3 B		46.95		32.65	69	1.2 B	2.06
BC	30	43	6.5		.057 B	90 A	20.5	12.3	.31	.73 A	12.5 B		46.34		33.84	73	1.6 B	1.67
C	43	63	6.9		.045 B	70 A												

Sample Layer	Depths Upr cm	Depths Lwr cm	Loss Ign %	Organic Carbon %	Total N %	C/N Ratio	Avail N mg/kg	Air Dry Moi%	Grav Moi%	Total P %	Avail P mg/kg	Extract P mg/kg	Total K %	Avail K mg/kg	Extract K meq
A11	0	5	15	6.88 C	.543 A	13		5		.071 A					
A12	5	10	12.5	5.4 C	.421 A	13		4.6		.06 A					
A13	10	19	10.6	4.53 C	.298 A	15		5							
B21	22	30	10.7	2.41 C	.192 A	13		7.7		.063 A					
BC	30	43	10					8.5							
C	43	63	6.7					6.7		.169 A					

Sample Layer	Depths Upr cm	Depths Lwr cm	<------Extractable--------> Cu	Mn	Zn	Fe	B mg/kg	Free Fe %	Extractable Al %	Si %	Total Fe %	Total S %	Avail SO4-S mg/kg	Dispersion CaCO3 %	Particle Size GV %	CS %	FS %	S %	C %
A11	0	5						4.49 A			5.07 C				1	4	42	19	21 C
A12	5	10													1	5	43	19	21 C
A13	10	19																	
B21	22	30						7.83 A			8.46 C				6	5	32	16	44 C
BC	30	43													7	7	33	14	42 B
C	43	63						5.77 A			7.78 C								

Table 19. Analytical data for the Rowella Soil Association Type Profile

2.4 Miscellaneous Units

2.4.1 Miscellaneous Soils on Quartzite & Schist foothills of the Mathinna beds (M8) (6763 ha)

A surface of low relief, at an elevation around 60-90 metres above sea level extends inland from the coastal sand plain and the dolerite hills. With the exception of a few small isolated clearings it still carries a sclerophyll forest. Its rocks are not well exposed but are probably mostly quartzite and schist. Both waterworn quartz gravels and angular quartz are common at the surface. The soils are mostly shallow grey sandy loams over yellowish clays, resembling the Lyndhurst soils of Waterhouse Estate (Hubble 1946).

2.4.2 Miscellaneous Soils on Slate and Schist of the Mathinna beds (M9)

(1006 ha)

Near Lefroy are low hills of slate and schist, the soils of which were not examined. The boundary with the soils of the above unit (M8) is shown approximately on the map with a dashed line.

2.4.3 Miscellaneous Soils under urban or Industrial Development (M10)

(1458 ha)

This unit combines the Soils of Basalt Benches (III) and Soils of River Terraces IV originally mapped by Nicolls (1957). This unit contains very disturbed soils with much of the area now under urban or industrial development.

The river terraces extend between Bell Bay and George Town. Around Bell Bay they end abruptly in a short scarp fronting the river, and measured near the oil wharf as *40m* above river level (which here approximates sea level). At this scarp are exposed lateritic profiles with strongly cemented grey fine sandy A horizons over a very irregular horizon of ferruginous gravel with occasional ironstone boulders, which in turn overlies mottled grey and yellow-brown clay. The strongly compacted A horizon was encountered elsewhere on the terrace. In one gravel pit the profile showed 60cm of sand and waterworn quartz gravel overlying yellowish clays. It is possible that to the north-east of George Town dissected remnants of this terrace underlie the windblown sands.

Basalt outcrops along the Tamar River at George Town and at Bell Bay, its base lying well below sea level. At George Town it forms a small plain generally about 6m above sea level, which has been cleared for early settlement. Basalt also forms a bench crossed by the aerodrome road eight kilometres north-east of George Town. On the George Town plain the soils are shallow and stony, dark loam to clay loam at the surface overlying sticky clay which merges into weathered basalt at depths around 60cm. Surface cracking of dry soils is common. In places there is a thin cover of windblown sand.

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APPENDICES

Appendix 1

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 solum.

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.

m strongly cemented horizon.

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 2

Analytical Methods for CSIRO sites

The following analytical methodology, taken from Graley (1961), is assumed to be similar for the sites analysed by CSIRO Division of Soils on this map.

The methods of analyses used were essentially those of Piper (1942) but with the following modifications:

pH was determined using a glass electrode and the system described by Raupach (1954).

Phosphorus is reported as "total" P dissolved by four hours boiling with concentrated hydrochloric acid. It was determined by a colorimetric method using butanol to extract the ammonium phosphomolybdate prior to its reduction with stannous chloride to the blue complex.

"Free" ferric oxide was determined using a modification by Haldane (1956) of Jeffries' method.

Particle size distribution was determined on a number of samples by the International pipette method and on others by the rapid plummet balance method (Marshall, 1956) after dispersion of the soil using "calgon" (Hutton, 1955). Use of the pipette method is indicated in the tabulated data by quoting the results of the silt and clay fractions to one decimal place and of the plummet method to the nearest whole number. Coarse and fine sands are quoted to the nearest whole number for both methods.

Exchangeable metal cations were extracted by leaching with normal ammonium chloride and the leachate examined by titration with E.D.T.A for calcium and magnesium (Bond and Tucker, 1954 and Hutton, 1954) and by the "Eel" flame photometer for potassium and sodium (Stace and Hutton, 1958).

Exchangeable hydrogen has been determined by both the paranitro phenol (to pH 7.0) and meta-nitrophenol (to pH 8.4) methods of Piper (1942) but the total exchangeable cations recorded are the sum of the metal ions and exchangeable hydrogen to pH 8.4.

Values are reported for fractionation of the coarse and fine sands from certain samples. These were determined by sieving through *12.5cm* sieves with hand shaking for twenty minutes.

Appendix 3

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

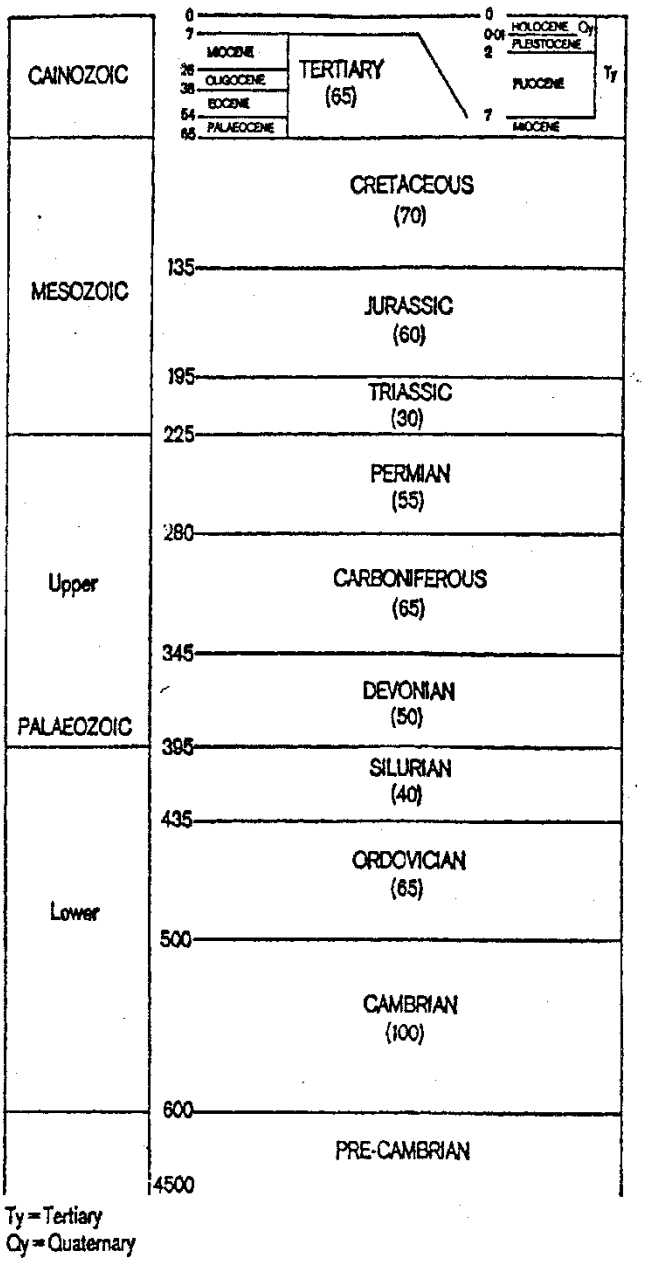
	Slightly	Moderately	Strongly	Extremely
pH range	6.5-6.0	5.9-5.3	5.2-4.5	<4.5

This table has been taken from Doyle (1993) p115

Appendix 4

Geological Timeline

Timeline describes geological periods in millions of years.



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Appendix 6

Index Map of the Reconnaissance Soil Surveys of Tasmania