DESCRIPTIONS OF SOIL TYPES AND MISCALLANEOUS UNITS

In this section, all of the soil types and other mapping units shown on the 42 soil map sheets with this bulletin are described in regard to their profiles, occurrence and land use.

The profile features given under each soil type heading are reasonably representative of the particular soil type. Additional information about the profiles of the soil types may be obtained by referring to the analyses set out in Appendix I. It should be appreciated, however, that the characteristics of each soil type lie within a range which is not always apparent from the type descriptions. The profiles at individual situations therefore, usually will depart in some respects from the described and analysed profiles.

Seven landscape patterns, each with its own distinctive topography and vegetation, can be recognized in the area. These have been designated units and are indicated by italics in the ensuing parts of this section. Each soil type occupies a definite place in the landscape pattern, consequently positional relationships occur between the soil types in each landscape unit. These aspects are dealt with in the section, "Landscape Units and Guide to Soil Types" which is also a help to the identification of the soil types in the field.

In the first section of this bulletin, the soil types are grouped in regard to suitability for particular irrigated crops. In this section, each soil type is considered individually and reference is made to present as well at to potential land use.

The 43 named soil types (Table 1) found in the surveyed area are dealt with in alphabetical order, followed by 11 unnamed soil types, two types of prior stream beds and a number of miscellaneous mapping units. Three of the soil types have been recorded previously in the adjoining Kerang Irrigation Area (Baldwin et al. 1939).

Barraport Sandy Clay Loam.

Profile

0 to 3 inches; grey-brown sandy clay loam; sharp junction with:
3 to 12 inches; brown medium clay; grades into:
12 to 42 inches; brown mottled with yellow-grey, light clay; light soft calcium carbonate.

Occurrence and Land Use.—This is a very minor soil type found on relatively high, gentle slopes of the undulating *mallee plain landscape unit*. The surface is often gilgaied. The soils which appear to be above irrigation supply level are cultivated for cereals.

Boort Clay.

Profile

0 to 4 inches; dark brownish grey (10YR 3/2)*[§] light or medium clay; moderate fine subangular blocky structure; trace calcium carbonate concretions; grades into:
4 to 36 inches; brownish yellow-grey (10YR 5/3), becoming diffusely mottled and yellowish with depth, heavy clay; weak coarse blocky structure; moderately hard dry, very friable moist; slight to light soft and concretionary calcium carbonate; grades into:
36 to 72 inches; diffusely mottled light brownish yellow (10YR 6/4) and brownish yellow-grey medium clay; calcium carbonate decreasing to slight with depth.

Occurrence.—Boort clay occurs in the *low woodland landscape unit* occupying areas of black box woodland between the Loddon River and the aeolian mallee fringe. Although low-lying, the soils are not generally subject to flooding; however, a few situations are within the influence of high floods from the Loddon River. The topography is flat, but sometimes has a gilgaied microrelief.

Land Use.—Boort clay is the most attractive of the heavy-textured soil types for irrigation. Cleared areas support good irrigated annual and perennial pastures. Soil salinity is low and, although the profile is heavy, penetration of irrigation water is satisfactory.

[§] Munsell colour notation of moist soil. Also see Appendix III.

Catumnal Loam.

Profile

0 to 6 inches; brown (7.5YR 3/3) loam:
6 to 9 inches; lighter brown (7.5YR 3/4) sandy loam. This horizon may be absent; at 6 to 9 in. sharp junction with:
9 to 21 inches; reddish brown (5YR 3/5) with dark staining on cleavage planes, medium clay; strong medium subangular blocky structure; friable moist; grades into:
21 to 54 inches; brown with light brown light clay; strong fine subangular blocky structure; very friable moist; light to medium soft and concretationary calcium carbonate; grades into:
54 to 72 inches; variable strata of mottled grey, yellow and rusty brown, light clay; slight or light calcium carbonate.

Occurrence —This soil type occupies the slightly higher levels of the *ridge and lake landscape unit* to the west of Boort. It is also associated with subdued lunettes in that area. The vegetation where uncleared is mainly grey box-casuarina woodland, with yellow box in some situations.

Land Use.—The soils have been cropped to cereals extensively and the volunteer pastures grazed by sheep. Catumnal loam has not been irrigated, but has favourable characteristics for irrigated pastures, such as reasonable depth of surface soil, low salinity, moderate permeability and good surface drainage.

Catumnal Clay Loam.

Catumnal clay loam is similar to Catumnal loam except that the surface soil consists of about 5 in. of light clay loam, and medium clay textures in the subsoil persist to about 54 in. Some of the soils have limestone rubble on the surface. This is denoted by inscription on the soil maps.

Occurrence and Land Use.—These are the same as for Catumnal loam.

Coombatook Sandy Loam.

Profile

0 to 6 inches; brownish grey or grey-brown (10YR 4/2) sandy loam; weak coarse granular structure; extremely friable dry and moist; sharp junction with:
6 to 8 inches; diffusely mottled light grey-brown and light grey sandy loam (may be weakly developed or absent); sharp junction with:
8 to 16 inches; yellow-grey (5Y 5/2) with black staining on ped faces, sandy clay or light clay; moderate medium columnar structure; hard and brittle dry, moderately sticky moist; grades into:
16 to 33 inches; yellow-grey, passing to brownish yellow-grey, (2.5Y 5/4) medium clay with sand on ped faces; moderate coarse blocky structure; very hard dry, sticky moist; light soft and concretionary calcium carbonate; grades into:
33 to 72 inches; brownish grey or variously mottled brown, yellow, grey, light clay passing to sandy clay; variable calcium carbonate, usually light or medium soft carbonate and concretions.

Coombatook Sandy Clay Loam.

Coombatook sandy clay loam is similar to Coombatook sandy loam except that the surface texture is slightly heavier and the subsoil which occurs at about 6 in. is often a medium clay.

Occurrence.—Coombatook sandy loam and Coombatook sandy clay loam both occupy flats, often extensive, between dunes of solonised brawn soils in the *ridge and lake landscape unit* north of Lake Meering. They also occupy marginal positions in the dune landscape where this adjoins low-lying alluvial cracking clays. The tree species are black box, belar, and occasionally, red gum.

Land Use.—The soils have been cropped to cereals to a limited extent in conjunction with the adjoining mallee rises. Some situations have been laid down to irrigated annual pasture, but restricted watersupply has limited development. The soils have reasonably favourable characteristics for irrigation, such as low to moderate inherent salinity, moderate permeability, flat microrelief, and are not subject to flooding.

Fernihurst Clay Loam.

Profile

0 to 3 inches; brown (5YR to 7.5YR 4/4) clay loam; weak platy structure; friable dry and moist; sharp junction with:
3 to 15 inches; dark reddish brown or dark brown (2.5YR to 5YR 3/4) heavy clay; moderate coarse prismatic structure; slightly friable dry and moist; grades into:
15 to 36 inches; yellowish brown (5YR 4/5) heavy clay; moderate coarse blocky structure; slight or light soft and concretionary calcium carbonate; slight gypsum below about 22 in.; grade into:
36 to 72 inches; yellowish brown (5YR 5/5) medium clay (occasionally light clay below 54 in.); black staining and very small black inclusions increasing with depth; slight or light calcium carbonate.

Occurrence.—Fernihurst clay loam which is one of the most extensive soil types in the surveyed area is a component of the *treeless plain landscape unit*. It occurs as a toposequence with Kinypanial clay loam and Towangurr clay loam, occupying the slightly higher and better drained positions on the almost flat landscape. Its other principal associate is Fernihurst friable clay. In the Mysia-Fernihurst area, gilgai puffs of Fernihurst friable clay are spaced erratically over the plain of dominantly Fernihurst clay loam. On the other hand, Fernihurst clay loam and Fernihurst friable clay are more intimately mixed as a gilgai complex on the plain to the west of the Loddon River and complexes o these two soil types are fairly common.

The ground cover consists of sparse native grasses, with barley grass in some situations.

Land Use.—Fernihurst clay loam provides rather poor grazing for sheep under dryland agriculture. Cropping is not extensive nowadays although it has been in the past.

Where irrigated, Fernihurst clay loam sup-ports annual pastures comprising subterranean clover, Wimmera rye grass and barley grass. Irrigated perennial pastures and lucerne pose greater difficulties because of the shallow surface soils and low permeability of the subsoils. The subsoils are moderately, and sometimes highly, saline and there is risk of salt troubles developing under irrigation, if drainage is unsatisfactory. Generally, however, the soils are not subject to prolonged inundation.

Fernihurst Friable Clay.

Profile

0 to 3 inches; yellowish grey-brown (10YR 4/3) light clay; strong fine subangular blocky structure; very friable dry and moist; trace fine concretions of calcium carbonate; grades into:
3 to 12 inches; yellowish grey-brown (10YR 5/4) heavy clay; strong medium subangular blocky structure, pronounced vertical cracks; friable; slight soft and fine concretionary calcium carbonate; grades into:
12 to 36 inches; yellowish grey-brown (10YR 5/4) heavy clay; moderate medium blocky structure; slightly friable; light soft calcium carbonate; grades into:
36 to 60 inches; as above but less calcium carbon-ate; sometimes slight gypsum below 48 in.

Occurrence.—Fernihurst friable clay represents the low friable mounds which occur more or less extensively with Fernihurst clay loam as a gilgai complex. Sometimes the mounds coalesce to form areas 1-2 ch in diameter. However, these areas are rarely large enough to define separately on the soil map and Fernihurst friable clay is nearly always shown in a complex with Fernihurst clay loam. Saffron thistles grow strongly on the friable mounds.

Land Use.—Fernihurst friable clay has no independent land use since it occurs inter-mingled with Fernihurst clay loam. It has much better attributes for irrigation, such as good permeability and low salinity, than Fernihurst clay loam, but the Fernihurst gilgai complex has the drawback that irregularities are prone to develop when it is laid out to irrigation. This is usual with most gilgai soils.

Janiember Clay.

Profile

0 to 3 inches; brownish grey (2.5Y 4/2) heavy clay; moderate medium subangular blocky structure; moderately friable; a few calcium carbonate concretions may or may not be present; grades into:
3 to 40 inches; grey, passing to yellowish grey, heavy clay; weak coarse blocky structure; slight fine concretions of calcium carbonate; grades into:
40 to 72 inches; brownish yellow-grey heavy clay; slight concretions of calcium carbonate.

Occurrence.—This is a grey gilgai soil type occupying broad areas of black box woodland. The type is very limited in extent with profile features very similar to those of Wandella clay.

Land Use.— Heavy-textured soils such as Janiember clay are suitable for irrigated pastures if satisfactory surface drainage can be provided. Like other gilgai soils irregularities tend to develop when the soils are first graded for irrigation.

Kerang Clay.

Profile

0 to 2 inches; grey (2.5Y 4/2) to grey-brown (10YR 4/2) clay loam; weak platy structure; hard and compact dry, friable moist; sharp junction with:

2 to 27 inches; dark yellowish grey (5Y 4/2) to dark grey-brown (10YR 4/2), becoming less dark and yellowish with depth, heavy clay; moderate medium prismatic, passing to coarse blocky, structure; very hard dry, moderately plastic moist; trace to slight calcium carbonate sometimes present in lower part of horizon; grades into:

27 to 40 inches; yellow-grey (5Y 5/4) to yellowish brown (10YR 5/4) medium clay; moderate medium subangular blocky structure; friable moist; slight to light gypsum; grades into:

40 to 72 inches; diffusely and variably mottled yellow-grey, yellow and brown, medium clay; slight soft and concretionary calcium carbonate variably present.

Occurrence.—Baldwin et al. (1939). have previously recorded Kerang clay in the Kerang Irrigation Area and described a grey and a grey-brown phase. These two colour phases have been recognised in the present soil survey, but they have not been separated on the published soil maps. The profile described above covers the average characteristics of both phases.

In the virgin state, Kerang clay has a gilgaied microrelief, although the "puffs " are not strongly developed. Since most of the soils have been cultivated, the microrelief generally is flat and, moreover, the shallow surface clay loam found on the "shelf" situations of the gilgaies has been obliterated. In most situations, therefore, Kerang clay has a heavy clay at the surface.

Kerang clay is the middle member of the Macorna—Kerang—Towangurr toposequence which is widespread in the *treeless plain landscape unit* to the north of Pyramid.

The commonest members of the vegetation, apart from sown species, are barley grass, wallaby grass, trefoils, dillon bush and halophytes such as seablite, samphire and trailing salt-bush.

Land Use.—Where the soils are not irrigated, sheep are grazed on the sparse native and volunteer pasture. Little dry-land cultivation is practised.

In spite of the adverse soil characteristics of inherently high subsoil salinity and heavy-texture, the soils are used more or less success-fully for the irrigation of annual pastures and sometimes for perennial pastures, given to dairying and fat lamb-raising. The high clay content of the soil profile is offset by its good structural qualities which allow reasonable in-filtration of irrigation water. However, the saturated permeability is low and the leaching of soils which become salt affected is difficult. Successful utilisation of Kerang clay depends on careful irrigation management including attention to drainage, as well as on an assured water-supply for the type of pasture grown.

Kinypanial Clay Loam.

Profile

0 to 3 inches; grey (2.5Y 5/2) to grey-brown (10YR 4/3) clay loam; weak platy to coarse blocky structure; hard dry; sharp junction with:

3 to 16 inches; dark yellowish grey (2.5Y 4/2) to dark grey-brown (7.5YR 3/2) heavy clay; moderate medium prismatic, passing to coarse blocky, structure; hard dry, slightly friable moist; grades into:

16 to 33 inches; yellow-grey (2.5Y 4/4) to drab greyish brown (7.5YR 4/4) medium clay; weak coarse blocky structure; slight to light soft and concretionary calcium carbonate; slight gypsum in lower part of horizon; grades into:

33 to 72 inches; variable, yellow-grey to diffusely mottled shades of brown, yellow and grey, medium clay; slight soft and concretionary calcium carbonate.

Occurrence and Land Use.—Kinypanial clay learn commonly occurs with Fernihurst clay loam, but at slightly lower levels, as a component of the *treeless plain landscape unit*, although a few situations carry black box. Kinypanial friable clay is a gilgai associate of Kinypanial clay loam and, like Fernihurst gilgai complex, these two soil types occur as complexes on the plain to the east of the Loddon River. Kinypanial clay loam has slightly greater problems of surface drainage, but otherwise the land use is the same as given for Fernihurst clay loam.

Kinypanial Friable Clay.

Profile

0 to 6 inches; grey (2.5Y 4/2) heavy clay; strong medium subangular blocky structure; friable dry and moist; trace fine concretions of calcium carbonate; grades into:

6 to 20 inches; yellowish grey (2.5Y 5/3) heavy clay; strong medium subangular blocky structure; slight to light soft calcium carbonate; grades into:

20 to 60 inches; yellow-grey heavy clay; slight soft and concretionary calcium carbonate.

Occurrence and Land Use.—Kinypanial friable clay occurs in the same manner as described for Fernihurst friable clay, except that its associate is Kinypanial clay loam. Remarks concerning the land use of Fernihurst friable clay apply also to Kinypanial gilgai complex.

Loddon Silty Clay Loam.

Profile

0 to 6 inches; diffusely mottled dark brownish grey and yellowish grey-brown silty clay loam;

6 to 15 inches; mottled dark grey and yellow-grey silty heavy clay:

15 to 48 inches; yellow-grey, sometimes mottled, heavy clay; iron stained concretions of calcium carbonate.

Occurrence and Land Use.—Loddon silty clay loam is found on low areas adjacent to the Loddon River and is very subject to flooding. The vegetation is principally red gum and lignum. The type is of small extent and is not utilized agriculturally apart from rough grazing.

Loga Clay Loam.

Profile

0 to 4 inches; brownish grey or grey-brown (10YR 3/3) clay loam; weak medium subangular blocky structure; sharp junction with:

4 to 15 inches; yellowish grey-brown (2.5Y to 10YR 4/3) heavy clay; moderate medium blocky structure; very hard dry; grades into:

15 to 27 inches; greyish yellow-brown (10YR 5/4) heavy clay; slight soft and concretionary calcium carbonate.

27 to 60 inches; greyish yellow-brown medium clay, sometimes light clay reverting to heavier textures at depth; slight to light soft and variable concretionary calcium carbonate:

Variant.—Loam surface textures are shown on the soil map by the inscription light surface.

Occurrence.—Loga clay loam occurs in a toposequence with Mologa loam in the prior stream *woodland landscape unit*. It occupies the lower situations in the sequence, either as treeless low plain or black box woodland. Gilgaies may be present and the puffs, where sufficiently developed, are designated Loga friable clay.

Land Use.—A small amount of cereal-cropping and sheep-grazing on the native and volunteer pastures are the dry-farming pursuits.

The main disabilities of Loga clay loam for irrigation are low permeability and, in some situations, moderate salinity in the subsoils. However, satisfactory irrigated pastures are possible provided adequate surface drainage is provided.

Loga Friable Clay

Profile

0 to 6 inches; brownish yellow-grey (2.5Y to 10YR 4/4) heavy clay; strong fine subangular blocky structure; friable dry; trace fine concretions of calcium carbonate; grades into:

6 to 30 inches; brownish yellow-grey (10YR 4/4) heavy clay; strong medium blocky structure, large vertical cracks; slight soft and concretionary calcium carbonate; grades into:

30 to 60 inches; brownish yellow-grey, passing to greyish yellow-brown, medium clay; slight soft and concretionary calcium carbonate.

Occurrence.—Loga friable clay does not occur independently of Loga clay loam. Where the two types are shown as a complex, the microrelief is definitely undulating and is not attractive for layout to irrigation.

Lyndger Loam.

Profile

0 to 4 inches; brown (5YR 4/6) loam, sometimes clay loam; weak platy structure; compact dry, friable moist; at 3 to 5 in. sharp junction with:

4 to 18 inches; red-brown, passing to brown (2.5YR to 5YR 3/6), heavy clay; moderate coarse prismatic, passing to coarse blocky, structure; hard dry, plastic wet; grades into:

18 to 36 inches; brown (5YR 4/6) light or medium clay; moderate fine subangular blocky structure; very friable moist; slight soft and concretionary calcium carbonate; light gypsum below 24 in.; grades into:

36 to 72 inches; diffusely mottled brown, yellow, grey, light or medium clay; slight calcium carbonate concretions.

Variants.—Fine sandy clay sometimes replaces the light or medium clays between 36 and 72 in. In such cases, the inscription light deep subsoil is used on the soil map. Where light clay replaces heavy clay early in the profile, the inscription used is light *profile*.

Occurrence.—Lyndger loam is a widespread soil type in the prior *stream woodland landscape unit*. In the Boort area, it occurs on subdued rises probably representing the levees of weak prior streams and originally lightly timbered with grey box and casuarina. Yellow box occurs also on the light deep subsoil variant. East of the Loddon River, Lynger loam is not always clearly associated with the prior streams and it sometimes occurs on very low rises within treeless plain, or adjoining broad, black box depressions. Scattered grey box may be present on the rises.

Land Use.—The irrigation potential of Lyndger loam is variable due to differences in the depth of surface soil and in the permeability of the subsoil. Also, subsoil salinity is moderate to high in some situations. In general, annual Pastures are irrigated successfully on the occurrences in the Boort Irrigation Area, but problems of poor infiltration and salinity are some-times associated with occurrences in the Pyramid area.

Lyndger Fine Sandy Loam.

The profile of Lyndger fine sandy loam is similar to that given for Lyndger loam except that the surface is commonly 6 in. of fine sandy loam which is sometimes bleached in the lower 2 in.

Lyndger fine sandy loam has satisfactory profile characteristics for irrigated pastures, but is very limited in extent.

Macorna Clay.

Profile

0 to 2 inches; brown to greyish brown (5YR to 7.5YR 3/4) loam or clay loam; weak platy structure; friable; sharp transition to:

2 to 20 inches; dark red-brown to brown (2.5YR to 5YR 3/4), becoming less dark and more brown or yellowish brown with depth, heavy clay; strong medium subangular blocky, passing to moderate coarse blocky, structure; hard dry, friable or moderately plastic moist; trace calcium carbonate in lower part; grades into:

20 to 40 inches; yellowish brown, passing to diffusely mottled brown and yellow, medium clay; mode-rate medium subangular blocky structure; friable moist; light gypsum; grades into:

40 to 72 inches; diffusely and variably mottled brown, yellow, grey, medium clay; calcium carbonate variably present; decreasing gypsum.

Occurrence.—Macorna clay has been described previously by Baldwin et al. (1939) in the Kerang Irrigation Area, brown and red-brown phases being recorded. These two phases have been recognised in the present soil survey, but have not been separated on the published soil maps. The profile described above covers the average characteristics of both phases. References to gilgaies and vegetation made under Kerang clay apply also to Macorna clay.

Land Use.—The land use of Macorna clay is the same as that given for Kerang clay. Surface drainage is better, but the problem of shallow penetration of irrigation water is more frequent in Macorna clay. The latter restricts the use of Macorna clay for perennial pastures more than is the case with Kerang clay.

Marmal Loam.

Profile

0 to 5 inches; dull brown (5YR 3/3), slightly bleached in lower part, loam; weak coarse platy structure; very friable dry, slightly plastic moist; sharp transition to:

5 to 12 inches; brown (5YR 3/6) to dull brown (7.5YR 4/4) light or medium clay; moderate medium subangular blocky structure; friable dry, moderately plastic moist; grades into:

12 to 24 inches; dull brown (7.5YR 4/4) light or medium clay; moderate medium blocky structure; friable dry, moderately plastic moist; light soft and slight concretionary calcium carbonate; grades into:
24 to 60 inches; diffusely mottled brown and greyish yellow, light or medium clay; weak coarse blocky structure; light calcium carbonate.

Occurrence.—The Marmal series is restricted to the *mallee plain landscape unit* to the west of Boort. The soils occur on level, or less frequently, on very gentle slopes, and in the natural state are timbered with species of mallee.

Land Use.—The soils are cultivated for cereals and the volunteer pastures are grazed by sheep.

The potential of the Marmal series for irrigation is good. Surface levels are satisfactory for irrigation layout, subsoil salinity is low or moderate and should not be a hazard under rational irrigation practices, and the permeability of the soil is considered to be satisfactory.

Marmal Clay Loam.

The profile of Marmal clay loam is slightly heavier than that described for Marmal loam. The surface soil is a clay loam, usually 4 in. deep, and is not bleached in the lower part. The subsoil textures are medium clay.

Occurrence and Land Use.—These are given under Marmal loam.

Minmindie Clay.

Profile
0 to 4 inches; dark grey-brown light clay; mode-rate fine subangular blocky structure; friable dry; grades into:
4 to 12 inches; yellowish grey-brown (10YR 4/3) medium clay; moderate medium subangular blocky structure; hard dry, friable moist; grades into:
12 to 45 inches; yellowish grey-brown (10YR 4/3), passing to yellowish brown, heavy clay; moderate coarse blocky structure; slight, increasing to light, calcium carbonate, slight concretions; grades into:
45 to 72 inches; diffusely mottled brownish yellow and light yellow-grey medium clay; slight calcium carbonate.

Occurrence.—The extent of Minmindie clay is very small. It occurs on very low rises in association with Boort clay in the *low woodland landscape unit*. Casuarina is the main tree species on the rises, with black box on the lower levels. The ground flora consists of danthonia, stipa and creeping salt bush. The micro-relief is slightly gilgaied with slightly calcareous puffs.

Land Use.—Minmindie clay has the same potential for irrigation as Boort clay.

Mologa Loam.

Profile
0 to 5 inches; brown (5YR 3/4) loam; hard dry, friable moist; sharp junction with:
5 to 24 inches; reddish brown (2.5 to 5YR 3/6), passing to brown (5YR 4/6), heavy clay; weak medium blocky structure; slight soft and variable concretionary calcium carbonate below 12 in.; grades into:
24 to 60 inches; brown, becoming diffusely mottled with brownish yellow, light clay; moderate medium subangular blocky structure, black staining on ped faces; slight to light calcium carbon-ate, variable concretions; grades into:
60 to 72 inches; light clay either continuing or reverting to heavier textures; decreasing calcium carbonate.

Variant.—The inscription light surface on the map denotes areas where the surface texture is fine sandy loam.

Occurrence.—Mologa loam is a member of that part of the *prior stream woodland landscape unit* which occurs extensively to the south of Pyramid. It occupies low rises and relatively high plain adjoining prior stream levees in the Yarrowalla–Mologa–Loga–Towangurr toposequence.

The original timber was grey box and casuarina, although some of the more northern occurrences appear always to have been either sparsely timbered or treeless.

Land Use.—Cultivation for wheat-growing and the grazing of sheep on volunteer pastures are the dry-farming pursuits. The soils support irrigated pastures satisfactorily, although probably they are more suited to annual than to perennial pastures. The subsoils are heavy-textured and only moderately permeable, consequently perennial pastures may suffer moisture stress in mid-summer. Faulty irrigation can lead to salinity since the subsoils are moderately saline, particularly in the more northern occurrences.

Myella Loam.

Profile

0 to 4 inches; grey-brown (10YR 4/3), slightly bleached in the lower part, loam or clay loam; hard dry, friable moist; slight ferruginous concretions; sharp junction with:

4 to 24 inches; yellowish grey-brown (10YR 4/3), passing to yellowish brown (7·5YR 4/4), medium clay; weak coarse blocky structure; very hard dry, sticky wet; grades into:

24 to 40 inches; brown (7·5YR 4/5) medium clay; slight soft and concretionary calcium carbonate; gypsum sometimes present; grades into:

40 to 60 inches; diffusely mottled brown and greyish yellow medium clay; slight soft and concretionary calcium carbonate.

Variant.—The inscription light deep subsoil on the soil map denotes light clay or lighter textures in the deep subsoil below 3 ft.

Occurrence.—Myella loam is restricted to the *prior stream woodland landscape unit* where it occurs west of the Loddon River to the south-east of Boort. It occurs on extensive low plain where the woodland is grey box and casuarina, and in shallow depressions where black box replaces grey box. The surface may be weakly gilgaied with scattered ferruginous concretions occurring on small clay "puffs".

Land Use.—This is mainly cereal-cropping and the grazing of sheep on native and volunteer pastures.

The potential of Myella loam for irrigated pastures is fair. Shallow surface and low permeability of the subsoils are the main
disadvantages. The subsoils inherently are moderately saline.

Mysia Loam.

Profile

0 to 6 inches; brown (5YR 3/4) loam passing to clay loam; moderate medium subangular blocky structure; friable dry and moist; sharp junction with:

6 to 14 inch; dark reddish brown (5YR 3/6) heavy clay; moderate coarse subangular blocky structure; hard dry; grades into:

14 to 30 inches; brown (5YR 4/6) heavy clay; moderate coarse blocky structure; hard dry; slight soft and concretionary calcium carbonate; grades into:

30 to 80 inches; diffusely mottled brown, yellow and yellow-grey, medium or light clay; moderate, medium blocky structure, black staining on ped faces; hard dry; slight calcium carbonate.

Variant.—Sometimes fine sandy clay or silty clay textures occur below 30 in. Such occurrences are indicated by the inscription light deep subsoil.

Occurrence.—Mysia loam with Myella loam are the principal soil types in the *prior stream woodland landscape unit* to the south-east of Boort. Mysia loam occupies very low rises and the better drained flat situations. The woodland, where remaining, is comprised of grey box, yellow box and casuarina.

Land Use.—The soils are cropped to cereals and sheep are grazed on the volunteer pastures. Irrigated pastures have not been established on Mysia loam, but its profile characteristics are favourable for irrigation. The depth of surface soil is reasonably good while the permeability of the subsoil is likely to be satisfactory. The salinity of the subsoils, while moderate, should not present a hazard with rational irrigation practices.

Mysia Fine Sandy Loam.

This is a very minor soil type which has the same profile as described for Mysia loam except that the surface soil is fine sandy loam and may be 7 or 8 in. deep. The light deep subsoil variant occurs also.

Occurrence and Land Use.—Mysia fine sandy loam occurs on relatively high land in the vicinity of Mysia. Murray pine was originally present in the woodland community. Land use is the same as for Mysia loam.

Pompapeil Sandy Loam.

Profile

0 to 6 inches;	brown sandy loam or loamy sand;
6 to 10 inches;	light brown sandy loam; sharp junction with:
10 to 20 inches;	reddish brown light clay quicklypassing to fine sandy clay and grading into:
20 to 30 inches;	brownish yellow fine sandy clay loam; slight soft calcium carbonate; grading into:
30 to 48 inches;	fine sandy loam, sometimes passing to sand. Light, sandy textures may continue below 48 in. or pass to clay strata.

Occurrence.—Pompapeil sandy loam is a minor soil type restricted to the *prior stream woodland landscape unit* in the south of the surveyed area. It occurs on the highest parts of the prior stream levees, usually in association with Yarrowalla fine sandy loam. Grey box, yellow box, and casuarina were the tree species originally present.

Land Use.—Some areas of Pompapeil sandy loam are under irrigated pastures. It has potential for a variety of irrigated crops, including lucerne. Watertables are likely to develop in the light-textured deep subsoils, but the low natural salinity of the profile reduces the risk of salt problems.

Sylvaterre Sandy Clay Loam.

The profile of Sylvaterre sandy clay loam has not been examined in detail. In general terms it is described as dull brown sandy clay loam sharply separated from dull reddish brown heavy clay at about 5 in. Brown or yellowish brown medium clay with slight to light amounts of soft and concretionary calcium carbonate occurs at about 18 in. and continues to beyond 48 in.

Occurrence.—Sylvaterre sandy clay loam is a component of the *granite highland landscape unit* in the Pyramid–Mitiamo area. It occurs on colluvial and probably aeolian materials (parna) in shallow valleys, and on lower slopes where these merge with the treeless plain landscape unit.

The soils have been mostly cleared of the original tree cover of Murray pine, yellow box and casuarina.

Land Use—The agricultural pursuits are cereal-cropping and the grazing of sheep on native and volunteer pastures. The soils have satisfactory features for irrigated pastures, but most occurrences appear to be too high for irrigation supply by gravity methods.

Terrappee Clay Loam.

Profile

0 to 3 inches;	grey-brown **(**10YR 3/3) clay loam; sharp junction with:
3 to 20 inches;	diffusely mottled yellow-grey (10YR 4/2) and brownish yellow (10YR 4/6) heavy clay; slight, increasing with depth to light, soft calcium carbonate, slight concretions; grades into:
20 to 60 inches;	brownish yellow (10YR 5/6) medium clay; light calcium carbonate:
60 to 84 inches;	diffusely mottled yellow-grey and brownish yellow medium clay; pockets of calcium carbonate.

Occurrence.—This is a minor soil type occurring on flats and in shallow depressions in the *mallee plain landscape unit* to the west of Boort. Where remaining, the tree cover is mallee, yellow gum, stunted grey box and occasionally black box. The microrelief may be weakly gilgaied.

Land Use.—The soils are cultivated for cereals and sheep are grazed on the volunteer pastures. The potential of Terrappee clay loam for irrigated pastures is only fair. Shallow surface and low permeability are the principal drawbacks. Salinity is low to moderate.

Terricks Sandy Loam.

Profile

0 to 8 inches;	brown (5YR 3/3) sandy loam; friable dry; slight fine gravel; grades into:
8 to 12 inches;	diffusely mottled light brown and brown sandy loam; compact; slight fine gravel; cemented at junction with:
12 to 24 inches;	red-brown (2.5YR 3/4) heavy clay; weak prismatic structure with dark staining on cleavage planes; grades into:

24 to 60 inches; diffusely mottled red-brown (2.5YR 3/6) with yellowish brown and black flecking light or medium clay; weak fine subangular blocky structure; slight, passing to moderate, soft and concretionary calcium carbonate; grading at variable depths into:
60 to 72 inches; non-plastic light clay with much black flecking and inclusions; material cemented with calcium carbonate and iron oxide may be present; decomposing granite usually before 72 in.

Variant.—The surface depth of sandy loam varies from about 6 to about 18 in.

Occurrence.—Terricks sandy loam together with Terricks sandy clay loam occur on the upper and intermediate slopes of the *granite highland landscape unit*.

Land Use.—Part of the Terricks area is forest reserve and here the timber is principally Murray pine and yellow box forest. Casuarina is also an original tree species. Elsewhere, most of the highland has been cleared for cultivation of wheat and the grazing of sheep.

Generally only poor grazing on native species is practicable, although some situations are reserved for forestry purposes. Intermittent irrigation of pastures is practised in a few places, but in the main the low situation precludes irrigation use. The gilgai microrelief and clearing costs are other disabilities. Salinity is low in the upper part of the soil profile.

Shallow Phase
Decomposing granite rock occurs within 36 in. of the surface.

Terricks Sandy Clay Loam

Profile
0 to 5 inch; brown (5YR 3/4) sandy clay loam, sometimes bleached in the lower part; fine sub-angular blocky structure; friable dry; slight fine gravel; sharp junction with:
5 to 20 inches; red-brown (2.5YR 3/6) heavy clay; weak coarse subangular blocky structure; very hard dry; grades into:
20 to 36 inches; brown (2.5YR 4/7) medium clay; moderate medium blocky breaking to fine sub-angular blocky structure;
36 to 72 inches; clay continuing to decomposing granite; material cemented with calcium carbonate and iron oxide may be present.

Occurrence and Land Use.—These aspects are given under Terricks sandy loam.

Towangurr Clay Loam

Profile
0 to 4 inches; grey (2.5YR 5/2) with rusty brown streaks and bleached variably in the lower part, clay loam; ferruginous concretions may be present; sharp junction with:
4 to 12 inches; diffusely mottled grey and yellowish grey (10YR 4/2) with rusty brown streaks, heavy clay; moderate medium, prismatic structure with pronounced vertical cracking; hard dry, plastic moist; grades into:
12 to 20 inches; yellowish grey (10YR 4/2) heavy clay; weak prismatic structure; slight calcium carbonate; grades into:
20 to 72 inches; yellow-grey (2.5Y 5/4) heavy clay, occasionally passing to light clay; slight calcium carbonate.

Occurrence.—Towangurr clay loam and Towangurr clay are the soils of the shallow, intermittent waterways that comprise the drainage network of the district. In the *prior stream landscape unit* most of the drainage lines are timbered with black box and some of them extend into rather extensive, shallow depressions. Some of the drainage lines in the treeless plain landscape unit are treeless, but others are timbered with black box or red gum.

Land use.—Most of the soils are utilised only for grazing purposes, although some irrigation of pasture is practised on the more extensive situations of Towangurr clay loam. However, the soils are not attractive for irrigation because of the risk of prolonged inundation. Low permeability of the profile and, frequently, a gilgai microrelief are other disadvantages.

Towangurr Clay
The profile of Towangurr clay compared with that of Towangurr clay loam is a heavy clay degree heavier in the surface, always continues below 48 in. Also, while rusty organic staining in the upper part of the profile is more pronounced due to more frequent and prolonged inundation.

Land Use.—Most situations in which Towangurr clay occurs can be used more appropriately for drainage structures than for irrigation development.

Tragowel Clay

Profile

0 to 12 inches; slightly yellowish grey (2.5Y 4/2), heavy clay; strong or moderate fine, passing to medium, subangular blocky structure; friable dry, moderately plastic moist; trace fine concretions of calcium carbonate; grades into:

12 to 48 inches; yellowish grey (2.5Y 4/3) heavy clay; moderate coarse blocky structure; slight soft and concretionary calcium carbonate; grades into:

48 to 80 inches; diffusely mottled yellowish grey and greyish yellow, becoming more yellowish with depth, heavy clay; slight calcium carbonate.

Occurrence.—Baldwin et al. (1939) record self-mulching flooded and woodland phases of Tragowel clay in the Kerang Irrigation Area. Tragowel clay as described in this bulletin corresponds to the *self-mulching phase*. Soils similar to the flooded phase have been placed in either the Towangurr or Wandella series, while soils like the woodland phase have not been found in the present area.

Tragowel clay occurs extensively in low situations carrying lignum along the Loddon River. It is very subject to flooding from that stream or its distributaries which finger out on both sides of the river. The surface is rather strongly gilgaied, but there is little difference between the profiles on different parts of the gilgai complex.

Land Use.—Apart from grazing activities on native and volunteer pasture species, Tragowel clay successfully supports irrigated perennial and annual pastures, and summer fodder crops in some situations. The soil profile, although heavy, has an attractive structure with good infiltration characteristics. In general salt con-tents are low, but this is not invariably the case, and some subsoils are appreciably saline. The general topography and gilgai microrelief are often difficult for irrigation supply and layout, while flooding is a serious hazard.

Whilst Tragowel clay is regarded as a good soil type for irrigation, the factors mentioned limit the extent to which it can be utilized for this purpose.

Whilst the profile characteristics of the Terricks series are satisfactory for the irrigation of a variety of crops, their irrigation potential is low because of situation above gravity water-supply level.

Tumnal Clay Loam.

Profile

0 to 6 inches; grey-brown (10YR 3/2), variably bleached in lower part, clay loam; moderate medium platy structure; sharp junction with:

6 to 24 inches; grey-brown, becoming yellowish (7·5 to 10YR 4/3), heavy clay; moderate sub-angular blocky structure; friable moist; grades into:

24 to 54 inches; yellowish grey-brown (10YR 3/3), becoming diffusely mottled, medium clay; slight soft and concretionary calcium carbonate; grades into:

54 to 72 inches; slightly mottled brown with yellow-grey medium clay; slight to light soft and concretionary calcium carbonate.

Occurrence.—Tumnal clay loam is a minor soil type occurring in association with the Catumnal series in the *ridge and lake complex* to the west of Boort. It occupies slight depressions and low flats. The tree cover where remaining is black box.

Land Use.—The present land use is the same as given for Catumnal loam. Tumnal clay loam has not been irrigated. Its main disabilities are poor permeability and indifferent surface drainage.

Wandella Clay.

Shelf Profile

0 to 3 inches; grey (10YR 6/3) to dark grey (5Y 3/1), slight rusty mottling, medium clay; strong medium blocky structure; more or less friable dry, very plastic moist; slight soft and concretionary calcium carbonate; grades into:

3 to 20 inches; yellowish grey (2·5Y 5/2) heavy clay; moderate medium blocky structure; hard dry, very plastic moist; slight soft and concretionary calcium carbonate; grades into:

20 to 60 inches; yellow-grey (2·5Y 6/4), becoming diffusely mottled with yellow, brown or grey, heavy clay; moderate coarse blocky structure; hard dry, very plastic moist; soft and concretionary calcium carbonate.

Wandella clay is a gilgaied soil type and the profile on puff situations has smaller structural peds than described above, and is more friable. Such situations resemble Tragowel clay.

Occurrence.—The *low woodland landscape unit* west of the Loddon River to the north of Boort consists mainly of Wandella clay. The soils are subject to intermittent inundation from the Loddon and its distributaries, but were probably flooded much more in the past than at the present time. Besides occurring in drainage ways and on extensive areas of low-lying black box woodland, Wandella clay comprises the soils of some terminal drainage basins. Lignum and red gum are other major components of the native vegetation.

Woolappee Clay Loam.

Profile

0 to 3 inches; brown (7·5YR 3/4) clay loam; moderate coarse blocky structure; occasional pea-sized ferruginous concretion on surface; sharp junction with:

3 to 12 inches; dark brown (5YR 3/4) heavy clay; moderate coarse blocky structure; very plastic moist, slightly sticky wet; occasional ferruginous concretion; grades into:

12 to 30 inches; brown (5Y 4/6) medium clay; moderate medium blocky structure; slight, increasing to light, soft and concretionary calcium carbonate; occasional ferruginous concretion; grades into:

30 to 65 inches; bright brown light clay; decreasing calcium carbonate; grades into:

66+ inches; at variable depths mottled red-brown, red and yellow decomposing soft sandstone.

Occurrence.—A relatively minor soil type, Woolappee clay loam is situated in broad depressions between rises in the *ridge and lake landscape* unit where the soils consist mainly of the Woolshed series. It also occurs at the base of some slopes of Wychitella loam.

The tree species originally were mallee, yellow box, and casuarina.

Land Use.—Woolappee clay loam occurs in an area given to cereal-cropping and the grazing of sheep on native and volunteer pastures. It has not been irrigated. It has a reasonable potential for irrigated pastures. The surface is rather shallow, but the permeability of the subsoil should be satisfactory and salinity is low.

Woolshed Sandy Loam

Profile

0 to 8 inches; brown (7.5YR 3/3), slightly bleached in lower part, sandy loam; sharp junction with: 8 to 18 inches; red-brown (2.5 to 5YR 3/6) light clay or sandy clay; weak medium or coarse blocky structure; grades into:

18 to 50 inches; brown (5YR 4/7) light or sandy clay; strong medium subangular blocky structure; slight or light soft and concretionary calcium carbonate; grades into:

50 to 84 inches; brown, or mottled yellow, brown and red light clay; slight or light ferruginous concretions; soft sandstone may occur within this depth.

Variant.—The inscription light profile refers to profiles in which sandy clay texture occurs from 8 to 50 in.

Occurrence.—Woolshed sandy loam occurs on the crests and gentle to moderate slopes of the relatively high land in the *ridge and lake landscape unit* to the west of Boort. Grey box is found on some situations and mallee on others.

Land Use.—The soils are cultivated for wheat-farming in association with sheep-raising.

Topography would appear to limit the utilisation of the soils for irrigation, although profile characteristics of low salinity, adequate depth of surface soil, and moderate to high permeability are favourable for irrigation agriculture.

Woolshed Loam

The profile of Woolshed loam has the same general characteristics described for Woolshed sandy loam, except that the surface texture is sandy clay loam or loam.

Occurrence and Land Use.—Woolshed loam usually occurs below Woolshed sandy loam in the topography. Its land use is the same.

Wychitella Loam

Profile

0 to 3 inches; red-brown (2.5YR 3/4) loam, occasionally sandy loam or sandy clay loam; weak coarse platy structure; variable amounts of iron-impregnated angular fragments of sand-stone in and on the surface; grades into:

3 to 6 inches; red-brown stony clay loam; much ironstone; sharp junction with:
6 to 18 inches; red-brown (10R to 2.5YR 3/6) medium clay; moderate fine subangular blocky structure; extremely friable moist; grades into:
18 to 42 inches; red-brown or brown light clay; much ferruginous and calcareous, cemented, fragmentary sandstone; grades into:
42+ inches; decomposed sandstone (grey or yellow sand with red-brown clay inclusions) becoming cemented with depth.

Occurrence.—The soils of the Wychitella series comprise the ironstone *gravelly landscape unit* which adjoins the Waranga Western Channel to the south-west of Boort. This is a relatively minor unit, but the presence of iron-stone gravel and bright red-brown colours gives the unit a distinctive appearance. The landscape is gently undulating with Wychitella loam occupying the crests of rises and upper slopes, and Wychitella clay loam the lower slopes and depressions between rises. The tree species on the Wychitella series are mallee, stunted yellow box and occasionally grey box and casuarina.

Land Use.—The presence of large amounts of ironstone gravel in the topsoil has not hindered the cultivation of these soils for wheat-growing.

The irrigation potential of the Wychitellk series is estimated as being good. Favourable characteristics are proximity to irrigation supply, low salinity and good permeability Disabilities are stoniness some situations, and possibly a seepage hazard on some lower slopes, due to restriction of downward movement of water by underlying sandstone.

Shallow Phase
The underlying sandstone occurs within 36 inches of the surface.

Wychitella Clay Loam.

Wychitella clay loam differs from Wychitella loam only in the heavier texture of the surface. A similar shallow phase has been recorded. Occurrence and land use are as given for Wychitella loam.

Yando Clay.

Profile
0 to 3 inches; yellowish grey-brown (10YR 4/4) heavy clay; strong medium subangular blocky structure; friable dry and moist; slight concretions of calcium carbonate; grades into:
3 to 18 inches; yellowish grey-brown (10YR 4/4) heavy clay; moderate coarse blocky structure; friable moist; slight concretions of calcium carbonate; grades into:
18 to 54 inches; yellowish grey-brown (10YR 5/4) heavy clay; moderate coarse blocky structure; slight soft and concretionary calcium carbonate; grades into:
54 to 72 inches; diffusely mottled yellowish grey-brown and brownish yellow heavy clay; slight calcium carbonate.

Occurrence and Land Use.—Yando clay is a minor soil type occurring in association with Tragowel clay and Kerang clay in the *treeless plain landscape unit* adjoining the Loddon River. It is a gilgaied soil type with a friable surface and structured profile similar to that of Tragowel clay, but it occupies fractionally higher situations and is grey-brown instead of grey; it closely resembles Fernihurst friable clay. Its present and potential land use are the same as given for Tragowel clay.

Yarrowalla Fine Sandy Loam.

Profile
0 to 6 inches; brown (5YR 4/6) fine sandy loam, sometimes bleached in lower part; moderate medium platy structure; compact dry, friable moist; at 4 to 8 in. sharp junction with:
6 to 24 inches; red-brown (2·5 to 5YR 3/6) medium moderate clay passing to brown (7.5YR 4/6) light clay; moderate medium subangular blocky structure; hard dry, plastic wet; grades into:
24 to 36 inches; diffusely mottled brown and yellow fine sandy clay; moderate fine subangular blocky, finely vesicular, structure; slightly hard dry, very friable moist; slight soft and concretionary calcium carbonate; gypsum occasionally present; grades into:
36 to 84 inches; fine sandy clay persisting or passing to lighter fine sandy textures, sometimes reverting to clay between 48 and 84 in.; decreasing calcium carbonate.

Occurrence.—Yarrowalla fine sandy loam is a member of the *prior stream woodland landscape unit* and is the principal soil type found on the levees of the prior stream channels. It occurs mainly in the south of the surveyed area, particularly in the Parishes of Calivil and Pompapeil. The woodland species where still standing are grey box, yellow box and casuarina.

***Land Use*.**—Cereal-cropping in association with the grazing of sheep is much less wide-spread than formerly. Irrigation of annual and perennial pastures for dairying and fat lamb-raising is practised fairly extensively and successfully. Reasonable surface depth, low salinity, and moderate subsoil permeability are characteristics of Yarrowalla fine sandy loam which make it one of the most attractive soil types in the area for the irrigation of a variety of crops. On the other hand, light textures in the deep subsoil are conducive to the formation of watertables and to seepage from channels. These risks are greatest in the shallow phase.

Shallow Phase
In the shallow phase, the clay subsoil always passes to fine sandy clay or lighter textures before 24 in. from the surface, and usually before 18 in.

Yarrowalla Loam

Apart from a slightly heavier (loam) and shallower surface (4 in.) , the profile of Yarrowalla loam is similar to that described for Yarrowalla fine sandy loam. Also, a shallow phase with the same significance has been recorded.

Occurrence and Land Use.—Yarrowalla loam replaces Yarrowalla fine sandy loam on the levees of the prior streams as they become weaker passing to the north. It also occurs on some near-flood plain situations adjoining levees of Yarrowalla fine sandy loam. It has the same land use and irrigation potential as Yarrowalla fine sandy loam, apart from restrictions arising from a shallow surface in some localities.

Unnamed Soil Types

The following soil types are all of small extent and, in some cases, the profile descriptions given below are based on only a few observations. The unnamed types do not correspond in any way to unnamed soil types with the same distinguishing letters in other soil survey publications

Types A, B, C, D, E, F, G and H are all found in the *ridge and lake landscape unit*, to the west of the Loddon River. The first six types are components of the Coombatook soil association, and are soils of the mallee fringe formed on aeolian materials where these meet the riverine plain. Types A, B and C are brown soils in increasing order of heaviness of the profile, while Types D, E and F are grey-brown soils in increasing order of heaviness. Type H occurs in association with the Woolshed series between Lake Boort and the lunettes around Woolshed Swamp, while Type G is an associate of the Catumnal series.

Type J is a soil of the *treeless plain unit*, while Types K and L are components of the Terricks association in the *granite highland landscape unit*.

Type A.
0 to 10 inches; brown sand.
10 to 18 inches; brown sandy clay.
18 to 30 inches; brown and light brown sandy clay loam; light calcium carbonate.
30 to 48 inches; as above with decreasing calcium carbonate.

Occurrence.—Type A occurs on the tops of sandy ridges carrying Murray pine, belar and mallee species.

Type B.
0 to 6 inches; brown or greyish brown sandy loam.
6 to 20 inches; red-brown to dull brown light clay or sandy clay; slight calcium carbonate from 16 in.
20 to 30 inches; brown and light brown light clay or sandy clay; light soft and concretionary calcium carbonate.
30 ti 48 inches; mottled brown and red-brown with slight yellow and grey, light clay or sandy clay; slight calcium carbonate.

Occurrence.—This soil type is found on the intermediate and lower slopes of ridges and carries Murray pine, belar and mallee.

Type C.
0 to 8 inches; brown or greyish brown loam or sandy clay loam.
8 to 20 inches; dull brown light or medium clay; slight calcium carbonate.
20 to 42 inches; brown and light brown light clay; light soft calcium carbonate.
42+ inches; brown and light brown, sometimes with yellow-grey mottling, medium clay; light soft and concretionary calcium carbonate.

Occurrence.—Type C occurs on low rises and the lower gentle slopes of the more pronounced rises. Mallee and Murray pine are the principal tree species, although black box occurs at lower levels joining Type F.

Type D.
0 to 6 inches dark grey-brown sandy loam.
6 to 18 inches; greyish brown sandy loam, sandy clay loam or sandy clay.
18 to 36 inches; mottled brown, yellow, red sandyclay or light clay; slight calcium carbonate.
36 to 48 inches; brown and light brown Iight clay; light calcium carbonate.

Occurrence.—Type D occurs on flats carrying black box and some Murray pine between sandy ridges.

Type E.
0 to 9 inches; grey-brown or brownish grey sandy loam.
9 to 12 inches; light grey-brown sand or sandy loam.
12 to 30 inches; mottled grey, yellow-grey and yellow light clay or sandy clay.
30 to 40 inches; mottled yellow and yellow-grey light clay; light calcium carbonate.
40 to 48 inches; mottled yellow-grey and brown light clay; variable soft and concretionary calcium carbonate.

Occurrence.—This soil type is found on flat situations carrying black box, belar and Murray pine below sand ridges.

Type F.
0 to 8 inches; grey-brown clay loam or sandy clay loam.
8 to 24 inches; diffusely mottled greyish yellow and yellow-grey medium clay.
24 to 40 inches; brownish grey light or medium clay; light soft calcium carbonate.
40 to 48 inches; as above with decreasing calcium carbonate.

Occurrence.—Type F, like Type E, occupies flat situations adjoining the sand ridges. The tree cover is mainly black box.

Type G.
0 to 6 inches; brown sandy loam.
6 to 21 inches; red-brown medium clay; moderate coarse blocky structure; slight calcium carbonate in the lower part.
21 to 36 inches; brown light clay; moderate fine subangular blocky structure; slight or light soft and concretionary calcium carbonate.
36 to 54 inches; light clay, sometimes with a sandy influence; decreasing calcium carbonate.

Occurrence.—This soil type is associated with Catumnal loam and Catumnal clay loam and occurs on low rises carrying mallee and occasional stunted yellow box.

Type H.
0 to 12 inches; grey-brown sandy clay loam; a few ferruginous sandstone aggregates on the surface; at 6 to 15 inches passes to:
12 to 36 inches; dark brown, passing to brown, medium clay, slight to light calcium carbonate below 18 in.
36 to 48 inches; continuing as above or yellow-grey medium clay.

Occurrence – Thpe H is found only in the vicinity of Woolshed Swamp on relatively low situations carrying black box, stunted yellow and casuarina.

Type J.
0 to 1 inch; brownish grey clay loam.
1 to 24 inches; dark grey-brown, passing to yellowish brown, heavy clay; at variable depths grading into:
24 to 36 inches; mottled brown, red-brown, yellow clay; crumbles readily; slight gypsum.
36 to 48 inches; as above, or greyish yellow mediumclay; slight calcium carbonate; slight gypsum.

Occurrence.—This soil type is like Kerang clay except for the presence of a mottled crumbly clay in the deep subsoil. It occurs on plain, either treeless or carrying a few black box, in the vicinity of Lake Lyndger.

Type K.
0 to 10 inches; grey-brown clay loam passing to light clay; friable; calcium carbonate varying from slight to light, concretions on surface; grades into:
10 to 40 inches; yellowish brown, grey-brown or yellow-grey medium clay; friable, usually light to medium soft and concretionary calcium carbonate; a few rounded ferruginous concretions; gypsum variably present.
40 to 72 inches; weakly mottled greyish yellow and brown medium clay; slight or light calcium carbonate.

Occurrence.—Type K is a grey-brown calcareous soil, usually adjoining or intermingled with Sylvaterre sandy clay loam in the *granite highland landscape unit*. The surface is billowy rather than gilgaied and the profile varies in friability; the profile described represents the more friable type found on the higher parts of the microrelief.

Type L.

Three low-lying situations in the *granite highland landscape unit* are shown on the soil map as Type L. A representative soil profile applicable to all three areas cannot be given, but a common feature is that the soils are grey friable clays with more or less calcium carbonate below 12 in. One occurrence is highly gypseous between 24 and 48 in.

Soils of the Prior Stream Beds.

The soils in this group are found in the beds of the more or less continuous depressions running through the higher parts of the *prior stream woodland landscape unit*. These represent the courses of the old non-functional streams which are defined on the Soil Association Map in the folder at the back of the bulletin.

The soils vary considerably, not only along and across the stream beds, but also with depth. The changes are too frequent to show on the soil maps, consequently the prior stream depressions are separated only into two broad types, based mainly on differences in the permeability of their soils. The depression types are essentially the same as those recorded in the Goulburn Valley (Skene and Poutsma 1962), Deakin (Skene 1963), and Rochester–Echuca (Skene and Harford 1964) areas.

Type 1.

This is a well-drained depression and water normally moves away rapidly through and over the soil. The surface soil is commonly brown or grey-brown loam or sandy loam. This overlies sandy, light, or medium clay which passes to lighter textures (sandy clay loam, sandy loam, sand) in the deep subsoil.

Watertables are present in the highly permeable deep subsoils where irrigation is practised on adjoining soils.

Type 2.

These depressions tend to have impeded drainage and water may lie on the surface for extended periods. The approximate profile is grey, rusty stained, clay loam or light clay, sometimes with ferruginous concretions, passing to medium or heavy clay. Textures usually become lighter in the deep subsoil between 24 and 48 in.

Since Type 2 depressions are liable to hold water for prolonged periods, they are not satisfactory for irrigation.

Miscellaneous Units.

A number of features in which the soils have not been identified, or have been examined only cursorily, are shown on the soil map. These are described below.

Swamp Soils.

This is a category of mapping units designated Sw 1, 2, 3, 4 and 5 used to cover low areas intermittently inundated with drainage from surrounding country, or flood waters from district streams. The situations concerned are drainage ways and terminal depressions, land-locked depressions, and old lake-beds, the soils of which do not conform to named depression soil types such as Wandella clay, Towangurr clay loam and Towangurr clay. Black box and red gum are the trees usually present on units Swl, 2, 3 and 4, but Sw5 is often treeless.

The swamp units are numerous to the west of the Loddon River and extend from south to north of the surveyed area. Only Sw4 occurs east of the Loddon, most of the depression soils there being classified in the Towangurr series.

Sw1.—Grey heavy clay overlies mottled fine sandy clay before 48 in. from the surface.

Sw2.—The surface is grey loam or clay loam and the subsoil is yellow-grey heavy clay. Mottled clay with calcium carbonate occurs between 24 and 48 in.

Sw3.—This unit is similar to Sw2 but has a clay surface texture.

Sw4.—The soils of this unit are massive clays to a depth of 48 in., hard when dry, sticky when wet. The surface colour varies from light to dark grey according to the amount of vegetative growth and the degree of inundation. The subsoil may be bluish grey, yellow-grey or light grey. Calcium carbonate may be present, usually below 24 in.

Sw5.—This unit takes in the soils of the more pronounced terminal drainage basins which are now more or less defunct. The soils vary with the nature of the lake-bed sediments. Commonly the surface is a somewhat friable grey clay loam or light clay. This passes to heavier textures by 12 in. Mottled colours are usual in the deep subsoil and ferruginous

concretions may be present. Calcium carbonate occurs in the profile, sometimes from the surface. Some situations are saline.

Land Use.—The Swl, 2, 3 and 4 units have limited agricultural value and are mainly used for grazing purposes when not inundated. Some of the Sw5 situations where flooding or salinity is not a hazard have been cultivated for cereal crops, others have been laid out to irrigated pastures. The potential of all of the swamp soil units for irrigation must be regarded as low—that of the Sw4 unit is negligible.

Skeletal Soils.
This unit describes the occurrences of granite which outcrop through Terricks sandy loam, usually the shallow phase, in the *granite highland landscape unit*. Only shallow sandy loam is present and the occurrences have no agricultural value.

Sand Rises.
The soils on several low sandy rises have not been classified. These situations are indicated by inscription on the soil maps. They are agriculturally unimportant and have the land use of the adjoining soil type.

Unclassified High Land.
The soils on a considerable amount of high land, most of which appears to be above gravity water-supply level, have not been classified. Most of the unclassified land is associated with the *ridge and lake landscape unit* west of the Loddon River. Many situations represent the lunette formations on the east side of lakes and major swamps, but some are dune ridges. Suitable inscriptions on the soil maps denote the unclassified areas.

River and Creek Frontage.
These units define non-agricultural areas immediately adjoining the Loddon River and Serpentine Creek. All are of small extent and support red gum. The soils have not been examined.