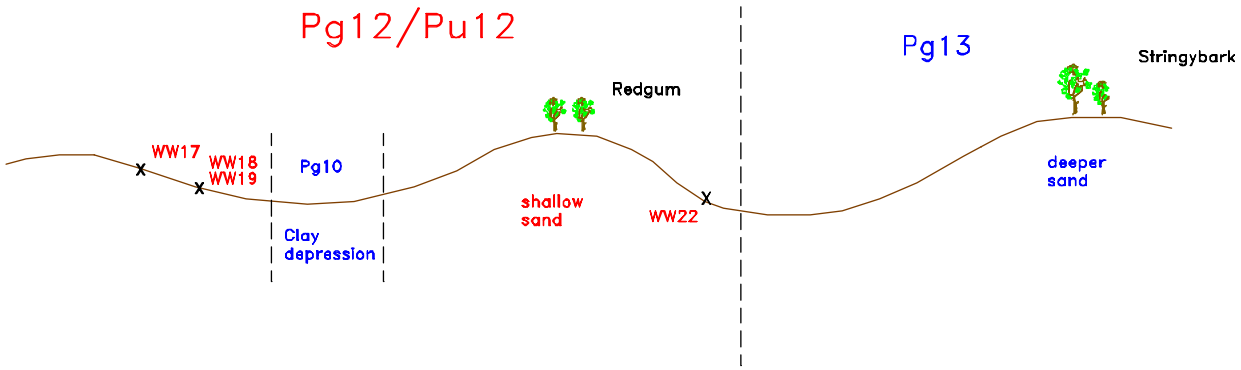
6.2.12 RED GUM PLAINS AND RISES - 12 LAND SYSTEM
Map units Pg12, Pu12



Landscape

The landscape of this land system consists mainly of gently undulating plains (Pg12), gently undulating plains (closer spaced undulations) (Pu12), with small rises and long gentle slopes. Small areas of low lying drainage depressions, or swales, with soils similar to the Southern cracking clay plains (Pg10) may occur between the rises. There are common indications of gilgai micro-relief, as the subsoils tend to shrink and swell at depth, but with little evidence of surface cracks. This land system is difficult to separate from the Yellow Gum plains and rises -11 land system (which has solodised solonetz as its representative soil type) as the landscape is similar and the solodised solonetz can occur in association with this soil type. The land system occurs mostly south of Edenhope, with some scattered distribution north of Edenhope. The land system is dissected with numerous lake systems mapped as Lake and Swamp Complex (Wg17) with a mix of cracking clay soils in the depressions and ferric sodosols or solodised solonetz on the rises and lunettes. Where the representative soil type (ferric sodosols) for this land system is perceived to be the most common, it has been mapped as Pg12/Pu12, although more detailed investigation will be required to ascertain which soil type is the most common in a specific area.

Native vegetation

The main tree species on this unit is Red gum, with some Yellow gums occurring in association with Red gums closer to Edenhope.

Soil types

The soils in this land system are similar to many of the soils in the shire - a strong textural contrast between the light topsoil and the sodic clay subsoil (sodosols). The distinguishing feature of the soil type on this land system is the presence of a gravel (ironstone) pan above the clay, consisting mainly of ferruginised iron nodules mixed with indurated sandstone and manganese nodules. These soils have been termed ferric sodosols in this report (see Plate 22).

The presence of the bleached horizon (A2) and the mottles in the subsoil indicates impeded internal soil drainage. The presence of manganese flecks and nod

Plate 22 Strong textural contrast between the topsoil and the subsoil with an 'ironstone' pan above the clay

ules in some of the profiles may indicate the presence of a seasonally perched watertable.

The subsoil is often sodic, therefore as well as having a high sodium percentage, it is often very dispersive, destroying the structure of the subsoil and resulting in the large columnar or prismatic structure occurring in the subsoil. Although there can often be secondary cracks in the large prisms or columns, it remains difficult for plant roots to penetrate deep into the subsoil.

Current land use

Land use on this land system is often restricted to grazing, although where there are large areas of clay plains between the rises, safflower is sown during summer.

Representative soil type for land units

Although there are three soil types described to represent the three land units, WW17 has been identified as the most representative soil type.

REPRESENTATIVE SOIL TYPE FOR THE RED GUM PLAINS AND RISES -12 - Pg12/Pu12 LAND UNITS

MAP UNIT: Pg12, Pu12 **Site No.:**WW17

Position in Landscape: Mid-slope **Grid Ref:** 509 913 E, 5902 743 N;
Aust. Soil Class.: Calcic, Mottled-Mesonatric, Yellow SODOSOL (confidence level 4)
Northcote Factual Key: Dy5.43 ***Great Soil Group:*** solodic

General Landscape Description:
The landscape is generally gently undulating (Pg12) with areas of gently undulating plains (closer spaced undulations) dissected with small clay plains (Pg10). This soil description has been used to represent the two land units.

Soil Profile Morphology:

Topsoil
A1 0-15 cm Brown (7.5YR4/2) *loamy sand*, weakly structured to structureless, very weak consistence when dry, very few ferruginised iron nodules. pH 6.9. Clear transition to:

A21 15-40 cm Light brown (7.5YR6/4) *sand*, conspicuously bleached when dry, structureless, a few (5-10%) ferruginised iron nodules. pH 5.7. Clear transition to:

A22 40-47 cm Pink (7.5YR7/4) *sand*, conspicuously bleached when dry, structureless, very weak consistence when dry, a few (10-20%) ferruginised iron nodules (some areas there is a larger percentage of nodules). pH 6.1. Sharp transition to:

Subsoil
B21 47-85 cm Yellow (10YR7/8) *light clay* grading to *light medium clay* at depth, very coarse distinct dark red and light grey mottles and yellowish brown clay skins are abundant, some organic staining down ped faces, strong prismatic structure (peds 20-100

mm), breaking to strong blocky structure, (peds 20-50 mm), strong consistence when dry, complete dispersion when worked. pH6.3.

B22 85-135 cm Brownish yellow (10YR6/6) *medium heavy clay (sandy)* moderate prismatic structure, (peds >200 mm), very firm consistence when slightly moist, a few (2%) soft calcium carbonate segregations and hard carbonate/silica nodules, complete dispersion. pH 9.0.

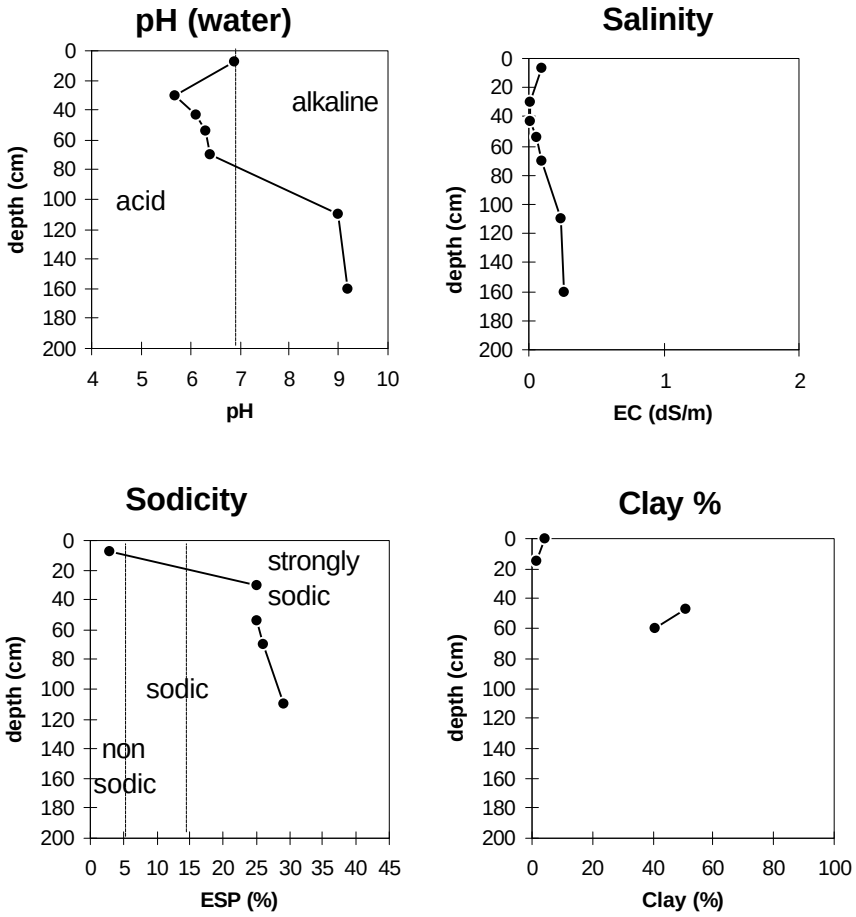
B23 135-190 cm Pale yellow (2.5Y7/4) *medium clay* with a few patches of light grey mottles, moderate prismatic structure, (peds >200 mm), breaking to strong blocky structure, (peds 20-50 mm), breaking to moderate polyhedral structure, (peds, 20-50 mm), a few (2%) manganese flecks and ferruginised iron nodules. pH 9.2.

Soil Profile Characteristics:

Horizon	pH	Salinity	Sodicity	Dispersion	Internal Drainage	Hydro-phobicity
Surface (A1 horizon)	slightly acid	low	non-sodic	-		nil
Subsoil (B21 horizon)	slightly acid	low	strongly sodic	nil[1]	imperfectly drained[#]	
Deeper subsoil (at 1 metre)	strongly alkaline	low	strongly sodic	complete		

1 complete dispersion after remoulding

most impeding horizon of the profile that will affect plant growth



Key Profile Features:

- Sandy topsoil
- Strong texture contrast between topsoil and subsoil
- Bleached A2 horizon
- Sodic subsoil
- Mottled subsoil
- Top of the subsoil is dispersive following cultivation when wet
- Ferric pan
- Slightly acidic A21 horizon
- Top of the subsoil slightly acidic
- Alkaline subsoil at depth (>85 cm)
- Plant Available Water Capacity (PAWC) is considered to be very low (estimated at 45 mm) for this site profile based on an Effective Rooting Depth (ERD) of 45 cm. Rooting depth will be restricted by subsoil conditions, such as; strongly sodic (Exchangeable Sodium Percentage >20%), high soluble salt levels (Chloride >0.1%), poor structure (eg. massive or very coarse, columnar or Prismatic), very high carbonate (lime) content (not applicable to all plant species) or hard rock.
- Organic staining down faces and clay skins of the B21 indicates that there is some shrinking and swelling of the soil

Soil Restrictions and Management Prescriptions

Feature	Result	Management Prescription
Sandy topsoil	Poor plant available water holding capacity. Poor nutrient holding capacity. Increased risk of wind erosion. Potential for hydrophobicity.	*Dryland cropping* - minimum tillage and stubble retention, improve organic matter through maintenance of vegetative cover and growing green manure crops. Establish wind protection barriers. *Horticulture* - improve organic matter through maintenance of vegetative cover and growing green manure crops. Establish wind protection barriers. Increase frequency of fertiliser (eg side dressings) and irrigations.
Strong textural contrast between topsoil and subsoil (duplex)	Strong texture and structure difference between the topsoil and the subsoil. Can result in impeded internal drainage and restricted root growth	Improve organic matter through maintenance of vegetative cover and growing green manure crops. Reduce tillage. Mounding for orchards. Optimise plant growth through regular balanced fertiliser programme. Consider sub-surface drainage (if appropriate).
Bleached A_2 horizon	Indication of waterlogged condition (impeded internal drainage) within the topsoil. Poor soil structure (often massive). Low organic matter, water holding capacity and nutrition within the horizon.	*Dryland cropping* - include deep rooted crops in the rotation, minimum tillage and stubble retention. Apply gypsum if the topsoil is sodic. Optimise plant growth through a regular and balanced fertiliser programme. *Horticulture* - improve organic matter through maintaining optimum plant growth and growing green manure crops between the rows. Minimum tillage and surface vegetative cover. Apply gypsum if the topsoil is sodic. Optimise plant growth through a regular and balanced fertiliser programme. Install subsoil drainage (if appropriate).
Sodic clay subsoil	Poor water and air movement into the subsoil resulting in waterlogging (impeded internal drainage).	Gypsum applications if the subsoil is close to the surface and topsoil textures are light. *Dryland cropping* - include deep rooted crops in the rotation, minimum tillage and stubble retention.

	Poor root growth into the subsoil reducing the volume of the soil able to be exploited.	*Horticulture* - deep ripping with gypsum, install tile drainage (if appropriate).
Mottled subsoil	Indication of periodic waterlogging, particularly if grey and yellow mottles predominate.	Consider sub-surface drainage (if appropriate). Apply gypsum if subsoil is sodic and close to the surface.
Dispersion when reworked	Indication of soil sodicity. Soil structure collapses following tillage and wetting Results in poor soil structure that reduces water movement and plant root growth (see sodic subsoil) Increases water erosion hazard.	Do not cultivate wet soil (cultivate when moist.) Apply gypsum if growing high value crops.
Ferric pan	Restricted root penetration into the subsoil. Indication of period waterlogging.	Select shallow rooted species. Improve topsoil by increasing organic matter and nutrition. Ripping may assist if pan is continuous and close to the surface, include gypsum if subsoil is sodic. Consider subsoil drainage (if appropriate).
Acidic topsoil	Potential nutrient imbalance. Unsuitable for acid intolerant plants.	Apply lime.
Very low and low Plant Available Water Holding Capacity (PAWC)	Poor plant available water holding capacity. Indication of light soil texture or shallow effective plant rooting depth (ie presence of restrictive layers, salinity, pH or structure).	Improve organic matter through maintenance of vegetative cover and growing green manure crops. Increase effective rooting depth by reducing the effect of the restrictive layer.

Land Suitability Rating Table

LAND USE	SUITABILITY CLASS	MAJOR LIMITING COMPONENT
Wheat	2	Climate, landscape, soil
Canola	2	Climate, landscape, soil
Chickpeas	3	Climate, soil
Lentils	3	Climate, soil
White clover seed	2	Climate, landscape, soil
Lucerne for seed production	3	Soil
Viticulture	3	Soil
Apples	2	Climate, soil
Potatoes	3	Soil
Carrots	3	Soil
Onions	2	Landscape, soil
Sweet corn	3	Soil
Radiata Pine	2	Climate, landscape, soil
Blue Gum	2	Climate, landscape, soil

Land Suitability Assessment and Primary Limitations

Wheat	*Climate*	2	Slightly high rainfall
	Landscape	2	Wind erosion hazard
	Soil	2	Slightly impeded internal drainage
Canola	*Climate*	2	Slightly high rainfall
	Landscape	2	Wind erosion hazard
	Soil	2	Slightly impeded internal drainage
Chickpeas	*Climate*	3	High rainfall
	Landscape	2	Wind erosion hazard
	Soil	3	Sandy topsoil texture, impeded internal drainage
Lentils	*Climate*	3	High rainfall
	Landscape	2	Wind erosion hazard
	Soil	3	Sandy topsoil texture, impeded internal drainage
White clover seed	*Climate*	2	Slightly high rainfall
	Landscape	2	Wind erosion hazard
	Soil	2	Soil salinity, slightly impeded internal drainage

Lucerne for seed production	*Climate*	1	No major limitation
	Landscape	2	Wind erosion hazard
	Soil	3	Impeded internal drainage
Viticulture	*Climate*	1	No major limitation
	Landscape	1	No major limitation
	Soil	3	Impeded internal drainage
Apples	*Climate*	2	Slightly high mean maximum January temperature
	Landscape	1	No major limitation
	Soil	2	Slightly impeded internal drainage
Potatoes	*Climate*	2	Slightly high mean maximum January temperature
	Landscape	2	Wind erosion hazard
	Soil	3	Impeded internal drainage
Carrots	*Climate*	1	No major limitation
	Landscape	2	Wind erosion hazard
	Soil	3	Impeded internal drainage
Onions	*Climate*	1	No major limitation
	Landscape	2	Wind erosion hazard
	Soil	2	Topsoil texture, slightly alkaline topsoil pH, soil salinity, slightly impeded internal drainage
Sweet corn	*Climate*	2	Slightly low mean monthly temperature (October - March)
	Landscape	2	Wind erosion hazard
	Soil	3	Sandy topsoil
Radiata Pine	*Climate*	2*	Moderate to low, slightly high mean maximum January temperature
	Landscape	2	Wind erosion hazard
	Soil	2	Slightly impeded internal drainage
Blue Gum	*Climate*	2*	Moderate to low rainfall, slightly high mean maximum January temperature
	Landscape	2	Wind erosion hazard
	Soil	2	Slightly impeded internal drainage

* Some areas may have lower rainfall

ASSOCIATED SOIL TYPE FOR THE RED GUM PLAINS AND RISES -Pg12/Pu12 LAND UNITS

MAP UNIT: Pg12, Pu12 **Site No.:** WW18

Position in Landscape: Mid to lower slope **Grid Ref:** 506 727 E, 5903 850 N;
Aust. Soil Class.: Ferric (and Calcic), Mottled-Mesonatric, Grey SODOSOL (thick sandy surface)
Northcote Factual Key: Dg4.43 ***Great Soil Group:*** solodic

General Landscape Description:

The landscape that this soil type appears on is the gently undulating plains and gently undulating plains (closer spaced undulations) land units mainly south of Edenhope. The landscape generally has small rises with long gentle slopes leading to flat drainage depressions or swales in between the rises. The soils of this description are similar to those of WW17 that has been used to represent both land units.

Soil Profile Morphology:

Topsoil
A1 0-25 cm Brown (7.5YR4/2) *sand*, weak structure, weak consistence when dry. pH 5.5. Clear transition to:

A2 25-42 cm Light brown (7.5YR6/4) *sand*, conspicuously bleached when dry, structureless, many (some patches 80-100%) ferruginised iron nodules. pH 6.1. Abrupt transition to:

Subsoil
B21 42-50 cm Light grey (10YR7/2) *light clay;* very coarse prominent yellowish brown and dark red mottles are abundant, strong prismatic structure, (peds 50-100 mm), breaking to strong polyhedral structure, (peds 10-20 mm and 5-10 mm) smooth faced peds, some ferruginised iron nodules, strong consistence when dry, complete dispersion when worked. pH 7.3. Clear transition to:

B22 50-85 cm Brownish yellow (10YR6/6) *light medium clay*, dark red and brownish yellow mottles, strong prismatic structure, (peds 20-100) breaking to strong blocky structure,(peds 20-50 mm), some areas breaking further to strong polyhedral structure, (peds 5-20 mm), brown clay skins on ped faces, some ferruginised iron nodules, very firm consistence when slightly moist. pH 6.9.

B23 85-150 cm Brownish yellow (10YR6/6) *medium heavy clay (sandy)* with patches of yellow (10YR7/8) *sand* throughout, moderate prismatic structure, (peds >200 mm), complete dispersion. pH 6.5.

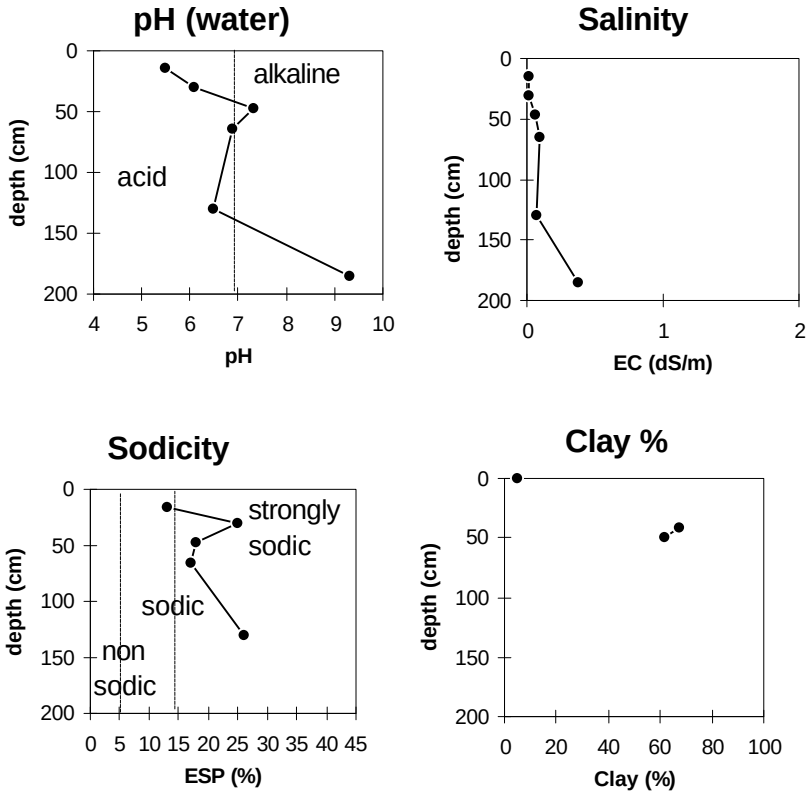
B24 150-200 cm+ Brownish yellow (10YR6/8) *light clay*, with light grey mottles, soft calcium carbonate and hard carbonate /silica nodules are common (10%). pH 9.3.

Soil Profile Characteristics:

Horizon	pH	Salinity	Sodicity	Dispersion	Internal Drainage	Hydro-phobicity
Surface (A1 horizon)	strongly acid	very low	-	-		nil
Subsoil (B21 horizon)	slightly alkaline	very low	strongly sodic	slight[1]	imperfectly drained[#]	
Deeper subsoil (at 1 metre)	slightly acid	very low	strongly sodic	complete		

1 complete dispersion after remoulding

most impeding horizon of the profile that will affect plant growth



Key Profile Features:

- Sandy topsoil
- Strong texture contrast between the topsoil and subsoil
- Bleached A2 horizon
- Sodic subsoil
- Mottled subsoil
- Subsoil dispersive when worked when wet
- Ferric 'ironstone' pan
- Acidic topsoil
- Plant Available Water Capacity (PAWC) is considered to be high (estimated at 190 mm) for this site profile based on an Effective Rooting Depth (ERD) of 85 cm. Rooting depth will be restricted by subsoil conditions, such as; strongly sodic (Exchangeable Sodium Percentage >20%), high soluble salt levels (Chloride >0.1%), poor structure (eg. massive or very coarse, columnar or prismatic), very high carbonate (lime) content (not applicable to all plant species) or hard rock.

Soil Restrictions and Management Prescriptions

Feature	Result	Management Prescription
Sandy topsoil	Poor plant available water holding capacity. Poor nutrient holding capacity. Increased risk of wind erosion. Potential for hydrophobicity.	*Dryland cropping* - minimum tillage and stubble retention, improve organic matter through maintenance of vegetative cover and growing green manure crops. Establish wind protection barriers. *Horticulture* - improve organic matter through maintenance of vegetative cover and growing green manure crops. Establish wind protection barriers. Increase frequency of fertiliser (eg side dressings) and irrigations.
Strong textural contrast between topsoil and subsoil (duplex)	Strong texture and structure difference between the topsoil and the subsoil. Can result in impeded internal drainage and restricted root growth	Improve organic matter through maintenance of vegetative cover and growing green manure crops. Reduce tillage. Mounding for orchards. Bed formation for vegetables. Optimise plant growth through regular balanced fertiliser programme. Consider sub-surface drainage (if appropriate).
Bleached A_2 horizon	Indication of waterlogged condition (impeded internal drainage) within the topsoil. Poor soil structure (often massive). Low organic matter, water holding capacity and nutrition within the horizon.	*Dryland cropping* - include deep rooted crops in the rotation, minimum tillage and stubble retention. Apply gypsum if the topsoil is sodic. Optimise plant growth through a regular and balanced fertiliser programme. *Horticulture* - improve organic matter through maintaining optimum plant growth and growing green manure crops between the rows. Minimum tillage and surface vegetative cover. Apply gypsum if the topsoil is sodic. Optimise plant growth through a regular and balanced fertiliser programme. Install subsoil drainage (if appropriate).
Sodic clay subsoil	Poor water and air movement into the subsoil resulting in waterlogging (impeded internal	Gypsum applications if the subsoil is close to the surface and topsoil textures are light. *Dryland cropping* - include deep rooted crops in the rotation, minimum

	drainage). Poor root growth into the subsoil reducing the volume of the soil able to be exploited.	tillage and stubble retention. *Horticulture* - deep ripping with gypsum, install tile drainage (if appropriate).
Mottled subsoil	Indication of periodic waterlogging, particularly if grey and yellow mottles predominate.	Consider sub-surface drainage (if appropriate). Apply gypsum if subsoil is sodic and close to the surface.
Dispersion when reworked	Indication of soil sodicity. Soil structure collapses following tillage and wetting Results in poor soil structure that reduces water movement and plant root growth (see sodic subsoil) Increases water erosion hazard.	Do not cultivate wet soil (cultivate when moist.) Apply gypsum if growing high value crops.
Ferric pan	Restricted root penetration into the subsoil. Indication of period waterlogging.	Select shallow rooted species. Improve topsoil by increasing organic matter and nutrition. Ripping may assist if pan is continuous and close to the surface, include gypsum if subsoil is sodic. Consider subsoil drainage (if appropriate).
Acidic topsoil	Potential nutrient imbalance. Unsuitable for acid intolerant plants.	Apply lime.

Land Suitability Rating Table

LAND USE	SUITABILITY CLASS	MAJOR LIMITING COMPONENT
Wheat	2	Climate, landscape, soil
Canola	2	Climate, landscape, soil
Chickpeas	3	Climate, soil
Lentils	3	Climate, soil
White clover seed	2	Climate, landscape, soil
Lucerne for seed production	3	Soil
Viticulture	3	Soil
Apples	2	Climate, soil
Potatoes	3	Soil
Carrots	3	Soil
Onions	2	Landscape, soil
Sweet corn	3	Soil
Radiata Pine	2	Climate, landscape, soil
Blue Gum	2	Climate, landscape, soil

Land Suitability Assessment and Primary Limitations

Wheat	*Climate*	2	Slightly high rainfall
	Landscape	2	Wind erosion hazard
	Soil	2	Slightly impeded internal drainage
Canola	*Climate*	2	Slightly high rainfall
	Landscape	2	Wind erosion hazard
	Soil	2	Slightly impeded internal drainage
Chickpeas	*Climate*	3	High rainfall
	Landscape	2	Wind erosion hazard
	Soil	3	Sandy topsoil texture, impeded internal drainage
Lentils	*Climate*	3	High rainfall
	Landscape	2	Wind erosion hazard
	Soil	3	Sandy topsoil texture, impeded internal drainage
White clover seed	*Climate*	2	Slightly high rainfall
	Landscape	2	Wind erosion hazard
	Soil	2	Slightly impeded internal drainage

Lucerne for seed production	*Climate*	1	No major limitation
	Landscape	2	Wind erosion hazard
	Soil	3	Impeded internal drainage
Viticulture	*Climate*	1	No major limitation
	Landscape	1	No major limitation
	Soil	3	Impeded internal drainage
Apples	*Climate*	2	Slightly high mean maximum January temperature
	Landscape	1	No major limitation
	Soil	2	Slightly impeded internal drainage
Potatoes	*Climate*	2	Slightly high mean maximum January temperature
	Landscape	2	Wind erosion hazard
	Soil	3	Impeded internal drainage
Carrots	*Climate*	1	No major limitation
	Landscape	2	Wind erosion hazard
	Soil	3	Impeded internal drainage
Onions	*Climate*	1	No major limitation
	Landscape	2	Wind erosion hazard
	Soil	2	Topsoil texture, slightly impeded internal drainage
Sweet corn	*Climate*	2	Slightly low mean monthly temperature (October - March)
	Landscape	2	Wind erosion hazard
	Soil	3	Sandy topsoil
Radiata Pine	*Climate*	2*	Moderate to low rainfall, slightly high mean maximum January temperature
	Landscape	2	Wind erosion hazard
	Soil	2	Slightly impeded internal drainage
Blue Gum	*Climate*	2*	Moderate to low rainfall, slightly high mean maximum January temperature
	Landscape	2	Wind erosion hazard
	Soil	2	Slightly impeded internal drainage

* Some areas may have lower rainfall

ASSOCIATED SOIL TYPE FOR THE RED GUM PLAINS AND RISES -12 -Pg12/Pu12 LAND UNITS

MAP UNIT: Pg12, Pu12 **Site No.:** WW19

Position in Landscape: Lower slope
Aust. Soil Class.: Ferric (and Calcic), Mottled-Mesonatric, Brown SODOSOL
Northcote Factual Key: Dy3.43 ***Great Soil Group:*** solodic

General Landscape Description:

This soil type generally occurs south of Edenhope on the gently undulating plains and the gently undulating plains (closer spaced undulations). The landscape commonly consists of low rises with long gentle slopes leading to drainage depressions or swales in between the rises. This soil type is similar to WW17 that has been used to represent the land units.

Soil Profile Morphology:

Topsoil

A1 0-10 cm Very dark greyish brown (10YR3/2) *sandy loam*; moderate subangular blocky structure, (peds 20-50 mm, breaking to 5-10 mm), firm consistence when dry, very few subrounded ferruginised iron nodules. pH 6.0. Abrupt transition to:

A21 10-30 cm Dark greyish brown (10YR4/2) *loamy sand*; sporadically bleached, a few orange mottles, structureless, very firm consistence when dry , very few ferruginised iron nodules. pH 6.4. Abrupt but wavy transition to:

Pan 30-45 cm Uncemented discontinuous nodular ferricrete and manganiferous pan. pH 6.8.

A22 45-50 cm Yellowish brown (10YR5/4) *clayey sand*, conspicuously bleached, massive structure, weak to very weak consistence when dry, ferruginised iron and manganese nodules are abundant (70%). pH 6.8. Abrupt transition to:

Subsoil

B21 50-75 cm Light olive brown (2.5Y5/3) *heavy clay*, faint yellow and distinct red mottles are common, strong prismatic structure, (peds >200 mm), breaking to strong polyhedral structure, (peds 20-50 mm), very strong consistence when dry, a few manganese nodules and flecks. pH 6.8. Diffuse transition to:

B22 75-120 cm Olive yellow (10YR6/6) *heavy clay*, structure same as horizon above, dispersive when worked. pH 8.0. Diffuse transition to:

B23 120-170+ cm Olive yellow (10YR6/6) *heavy clay*, red mottling is common in patches, other mottling is associated with ferruginised sandstone, structure similar to above. pH 8.8

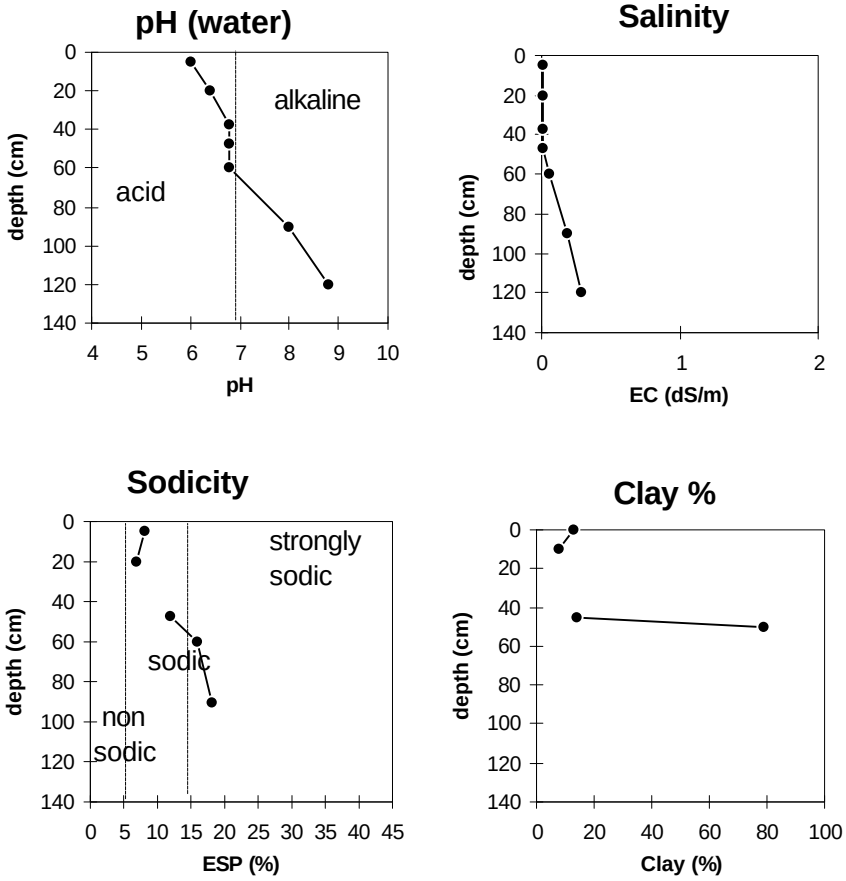
Very few patches of soft calcium carbonate segregations occur throughout the B horizons.

Soil Profile Characteristics:

Horizon	pH	Salinity	Sodicity	Dispersion	Internal Drainage	Hydro-phobicity
Surface (A1 horizon)	moderately acid	very low	-	-		nil
Subsoil (B21 horizon)	slightly acid	very low	strongly sodic	nil[1]	Imperfectly drained[#]	
Deeper subsoil (at 1 metre)	moderately alkaline	low	strongly sodic	strong		

1 moderate dispersion after remoulding

most impeding horizon of the profile that will affect plant growth



Key Profile Features:

- Strong texture contrast between topsoil and subsoil
- Bleached A2 horizon
- Sodic subsoil
- Mottled subsoil
- Ferric 'ironstone' pan
- Acid topsoil
- Plant Available Water Capacity (PAWC) is considered to be high (estimated at 150 mm) for this site profile based on an Effective Rooting Depth (ERD) of 75 cm. Rooting depth will be restricted by subsoil conditions, such as; strongly sodic (Exchangeable Sodium Percentage >20%), high soluble salt levels (Chloride >0.1%), poor structure (eg. massive or very coarse, columnar or prismatic), very high carbonate (lime) content (not applicable to all plant species) or hard rock.

Soil Restrictions and Management Prescriptions

Feature	Result	Management Prescription
Strong textural contrast between topsoil and subsoil (duplex)	Strong texture and structure difference between the topsoil and the subsoil. Can result in impeded internal drainage and restricted root growth	Improve organic matter through maintenance of vegetative cover and growing green manure crops. Reduce tillage. Mounding for orchards. Bed formation for vegetables. Optimise plant growth through regular balanced fertiliser programme. Consider sub-surface drainage (if appropriate).
Bleached A_2 horizon	Indication of waterlogged condition (impeded internal drainage) within the topsoil. Poor soil structure (often massive). Low organic matter, water holding capacity and nutrition within the horizon.	*Dryland cropping* - include deep rooted crops in the rotation, minimum tillage and stubble retention. Apply gypsum if the topsoil is sodic. Optimise plant growth through a regular and balanced fertiliser programme. *Horticulture* - improve organic matter through maintaining optimum plant growth and growing green manure crops between the rows. Minimum tillage and surface vegetative cover. Apply gypsum if the topsoil is sodic. Optimise plant growth through a regular and balanced fertiliser programme. Install subsoil drainage (if appropriate).
Sodic clay subsoil	Poor water and air movement into the subsoil resulting in waterlogging (impeded internal drainage). Poor root growth into the subsoil reducing the volume of the soil able to be exploited.	Gypsum applications if the subsoil is close to the surface and topsoil textures are light. *Dryland cropping* - include deep rooted crops in the rotation, minimum tillage and stubble retention. *Horticulture* - deep ripping with gypsum, install tile drainage (if appropriate).
Mottled subsoil	Indication of periodic waterlogging, particularly if grey and yellow mottles predominate.	Consider sub-surface drainage (if appropriate). Apply gypsum if subsoil is sodic and close to the surface.
Ferric pan	Restricted root	Select shallow rooted species.

	penetration into the subsoil. Indication of period waterlogging.	Improve topsoil by increasing organic matter and nutrition. Ripping may assist if pan is continuous and close to the surface, include gypsum if subsoil is sodic. Consider subsoil drainage (if appropriate).

Land Suitability Rating Table

LAND USE	SUITABILITY CLASS	MAJOR LIMITING COMPONENT
Wheat	2	Climate, soil
Canola	2	Climate, soil
Chickpeas	3	Climate, soil
Lentils	3	Climate, soil
White clover seed	3	Soil
Lucerne for seed production	3	Soil
Viticulture	3	Soil
Apples	2	Climate, soil
Potatoes	3	Soil
Carrots	3	Soil
Onions	2	Landscape, soil
Sweet corn	3	Soil
Radiata Pine	2	Climate, soil
Blue Gum	2	Climate, soil

Land Suitability Assessment and Primary Limitations

Wheat	*Climate*	2	Slightly high rainfall
	Landscape	1	No major limitation
	Soil	2	Slightly impeded internal drainage, subsoil texture
Canola	*Climate*	2	Slightly high rainfall
	Landscape	1	No major limitation
	Soil	2	Slightly impeded internal drainage
Chickpeas	*Climate*	3	High rainfall
	Landscape	1	No major limitation
	Soil	3	Impeded internal drainage
Lentils	*Climate*	3	High rainfall
	Landscape	1	No major limitation

	Soil	3	Impeded internal drainage
White clover seed	*Climate*	2	Slightly high rainfall
	Landscape	1	No major limitation
	Soil	3	Impeded internal drainage
Lucerne for seed production	*Climate*	1	No major limitation
	Landscape	1	No major limitation
	Soil	3	Impeded internal drainage
Viticulture	*Climate*	1	No major limitation
	Landscape	1	No major limitation
	Soil	3	Impeded internal drainage
Apples	*Climate*	2	Slightly high mean maximum January temperature
	Landscape	1	No major limitation
	Soil	2	Slightly impeded drainage
Potatoes	*Climate*	2	Slightly high mean maximum January temperature
	Landscape	2	Wind erosion hazard
	Soil	3	Impeded internal drainage
Carrots	*Climate*	1	No major limitation
	Landscape	2	Wind erosion hazard
	Soil	3	Impeded internal drainage
Onions	*Climate*	1	No major limitation
	Landscape	2	Wind erosion hazard
	Soil	2	Slightly impeded internal drainage
Sweet corn	*Climate*	2	Slightly low mean monthly temperature (October - March)
	Landscape	1	No major limitation
	Soil	3	Sandy topsoil
Radiata Pine	*Climate*	2*	Moderate to low rainfall, slightly high mean maximum January temperature
	Landscape	1	No major limitation
	Soil	2	Slightly impeded internal drainage
Blue Gum	*Climate*	2*	Moderate to low rainfall, slightly high mean maximum January temperature
	Landscape	1	No major limitation
	Soil	2	Slightly impeded internal drainage

* Some areas may have lower rainfall

ASSOCIATED SOIL TYPE FOR THE RED GUM PLAINS AND RISES -12 Pg12/Pu12 LAND UNITS

MAP UNIT: Pg12, Pu12	**Site No.:** WW22

Position in Landscape: Lower slope	***Aust. Soil Class.:*** Ferric ? Red CHROMOSOL (confidence level 4)

General Landscape Description:

This soil type occurs throughout the southern section of the Shire. This particular site is in the eastern boundary of the Shire to give spatial perspective of this soil type. The soil type is variable with an A2 horizon sometimes present. The common characteristic is the presence of a ferricrete and manganiferous pan above the clayey B horizon. This soil type differs from WW17, WW18 and WW19 as it is better drained, lacking the bleached A2 horizon and the mottled subsoil that is indicative of impeded internal drainage. The subsoil is also better structured, allowing for more root movement through the clay subsoil, if they can penetrate through the gravel pan. As the majority of the soils on these land units have impeded internal drainage WW17 has been used to represent the land units.

Soil Profile Morphology:

Topsoil

A11 0-30 cm Brown (10YR4/3) *sand* (organic) stuctureless, very weak consistence when dry. pH 5.8.

Pan 30-45 cm Uncemented discontinuous nodular ferricrete and manganiferous pan. Brown (7.5YR4/3) *sand*, stuctureless, very weak consistence when dry, ferruginised iron and manganese nodules are abundant. pH 6.1.

Subsoil

B21 45-150+ cm Dusky red (2.5YR4/4) *light medium clay*, strong polyhedral structure, (peds 10-20 mm), breaking to strong subangular blocky structure (peds 2-10 mm). pH 6.7.

Soil Profile Characteristics:

Horizon	pH	Salinity	Sodicity	Dispersion	Internal Drainage	Hydro-phobicity
Surface (A1 horizon)	moderately acid	very low	-	-	moderately well drained	low
Subsoil (B21 horizon)	slightly acid	low	-	nil[1]		

1 compete dispersion after remoulding

Key Profile Features:

- Sandy topsoil
- Topsoil hydrophobic
- Strong texture contrast between topsoil and subsoil
- Ferric (ironstone) pan
- Acidic topsoil
- Slightly acidic subsoil
- Red subsoil indicates reasonable drainage

Soil Restrictions and Management Prescriptions

Feature	Result	Management Prescription
Sandy topsoil	Poor plant available water holding capacity. Poor nutrient holding capacity. Increased risk of wind erosion. Potential for hydrophobicity.	*Dryland cropping* - minimum tillage and stubble retention, improve organic matter through maintenance of vegetative cover and growing green manure crops. Establish wind protection barriers. *Horticulture* - improve organic matter through maintenance of vegetative cover and growing green manure crops. Establish wind protection barriers. Increase frequency of fertiliser (eg side dressings) and irrigations.
Hydrophobic topsoil	Poor infiltration of water into the soil. Increased risk of water erosion. Poor seed germination.	Maintenance of surface vegetative cover. Claying.
Strong textural contrast between topsoil and subsoil	Strong texture and structure difference between the topsoil	Improve organic matter through maintenance of vegetative cover and growing green manure crops.

(duplex)	and the subsoil. Can result in impeded internal drainage and restricted root growth	Reduce tillage. Mounding for orchards and vineyards. Bed formation for vegetables. Optimise plant growth through regular balanced fertiliser programme. Consider sub-surface drainage (if appropriate).
Ferric pan	Restricted root penetration into the subsoil. Indication of period waterlogging.	Select shallow rooted species. Improve topsoil by increasing organic matter and nutrition. Ripping may assist if pan is continuous and close to the surface, include gypsum if subsoil is sodic. Consider subsoil drainage (if appropriate).
Acidic topsoil	Potential nutrient imbalance. Unsuitable for acid intolerant plants.	Apply lime.

Land Suitability Rating Table

LAND USE	SUITABILITY CLASS	MAJOR LIMITING COMPONENT
Wheat	2	Climate, landscape, soil
Canola	2	Climate, landscape, soil
Chickpeas	3	Climate, soil
Lentils	3	Climate, soil
White clover seed	2	Climate, landscape, soil
Lucerne for seed production	2	Landscape, soil
Viticulture	2	Soil
Apples	2	Climate, soil
Potatoes	2	Climate, landscape, soil
Carrots	2	Landscape, soil
Onions	2	Landscape, soil
Sweet corn	3	Soil
Radiata Pine	2	Climate, landscape, soil
Blue Gum	2	Climate, landscape, soil

Land Suitability Assessment and Primary Limitations

Wheat	*Climate*	2	Slightly high rainfall
	Landscape	2	Wind erosion hazard
	Soil	2*	Hydrophobicity
Canola	*Climate*	2	Slightly high rainfall
	Landscape	2	Wind erosion hazard
	Soil	2*	Hydrophobicity
Chickpeas	*Climate*	3	High rainfall
	Landscape	2	Wind erosion hazard
	Soil	3	Sandy topsoil texture
Lentils	*Climate*	3	High rainfall
	Landscape	2	Wind erosion hazard
	Soil	3	Sandy topsoil texture
White clover seed	*Climate*	2	Slightly high rainfall
	Landscape	2	Wind erosion hazard
	Soil	2*	Hydrophobicity
Lucerne for seed production	*Climate*	1	No major limitation
	Landscape	2	Wind erosion hazard
	Soil	2*	Slightly impeded internal drainage, hydrophobicity
Viticulture	*Climate*	1	No major limitation
	Landscape	1	No major limitation
	Soil	2*	Slightly impeded drainage, hydrophobicity
Apples	*Climate*	2	Slightly high mean maximum January temperature
	Landscape	1	No major limitation
	Soil	2*	Slightly impeded internal drainage hydrophobicity
Potatoes	*Climate*	2	Slightly high mean maximum January temperature
	Landscape	2	Wind erosion hazard
	Soil	2*	Depth of topsoil, slightly impeded internal drainage, hydrophobicity
Carrots	*Climate*	1	No major limitation
	Landscape	2	Wind erosion hazard
	Soil	2*	Depth of topsoil, slightly impeded internal drainage, hydrophobicity

Onions	*Climate*	1	No major limitation
	Landscape	2	Wind erosion hazard
	Soil	2*	Sandy topsoil texture, slightly impeded internal drainage, hydrophobicity
Sweet Corn	*Climate*	2	Slightly low mean monthly temperature (October - March)
	Landscape	2	Wind erosion hazard
	Soil	3	Sandy topsoil texture
Radiata Pine	*Climate*	2#	Moderate to low rainfall, slightly high mean maximum January temperature
	Landscape	2	Wind erosion hazard
	Soil	2*	Depth to hardrock, hydrophobicity
Blue Gum	*Climate*	2#	Moderate to low rainfall, slightly high mean maximum January temperature
	Landscape	2	Wind erosion hazard
	Soil	2*	Depth to hardrock, hydrophobicity

* Root growth may be resticted if ferruginised pan is cemented or continuous
\# Some areas may have lower rainfall