Soil information sheets for part of the Jerramungup agricultural area

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Landcare Western Australia

Jerramungup Land Conservation District Committee

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SOIL
INFORMATION SHEETS
FOR PART OF THE JERRAMUNGUP
AGRICULTURAL AREA
1996
Preface

The Jerramungup Soil Information Sheets were compiled for the Jerramungup Land Conservation District Committee, in response to a grant received from the State Landcare Program. The Soil Information Sheets accompany a set of ‘soil peels’ (exact reproductions of the soil profiles) on display at the Jerramungup District Office of Agriculture. The intention of the soil peels and accompanying soil sheets was to improve the awareness of the different soil types around the Jerramungup area, to highlight different management options for each soil, and to act as supplemental information for farm or catchment extension activities.

In compiling the soil sheets, special acknowledgment must be given to all who assisted with their compilation. In particular:

- **State Landcare Program for funding**
- **The Shire of Jerramungup for the back hoe, operator and office facilities**
- **Members and associates of the Jerramungup Land Conservation District Committee**
- **Carolyn Daniel (Jerramungup LCDC coordinator)**
- **The land holders who allowed soil pits to be dug on their properties**
- **Staff of Agriculture Western Australia at Jerramungup and Perth, for reviewing the information.**

Timothy Overheu
Natural Resources Assessment Group
Agriculture Western Australia, 1996
Introduction

The Jerramungup Soil Information Sheets present soil and agronomic information for a selection of dominant or representative soils found within the Shire of Jerramungup, covering part of the Jerramungup agricultural area.

They have been produced for the Jerramungup Land Conservation District and associated sub-catchment groups to provide an easy reference guide to the soils, land use and management recommendations for the Jerramungup, Needilup, Gairdner and Bremer agricultural areas.

Use of this information by the farming community, planners, research officers and extension personnel providing technical advice to land users, should assist in the development of sustainable agricultural systems for rural production. The information should be used as a guide, and encourage the user to seek further information through relevant people and organisations.

The sheets have been prepared by the Natural Resources Assessment Group, Agriculture Western Australia. The author was Tim Overheu (Albany) in consultation with Graham Laslett (formerly District Leader of the Jerramungup District Office).

Information on the soil sheets

Each sheet summarises information on the soil's characteristic properties and associated land use suitability and management. A photograph of a representative profile is provided for each soil. Technical terms are defined in the glossary.

Information is presented under the following headings:

Soil series: The use of soil series is being adopted over Western Australia as a means of identifying particular soils. The soil series is identified by a unique name, usually from the locality where the soil was first described. It groups a range of soils with similar profile characteristics and management requirements for common agricultural uses. Also attached is a 'soil group' name followed in brackets by the local name (e.g. yellow clay) where available. The soil series or group name should be used in preference to the local name. This is followed by a brief description to aid identification.

Occurrence: This describes the distribution of the soil over the agricultural areas, followed by the landscape positions in which it may occur. Where the soil has been identified in a soil-landscape mapping project, the relevant map units are listed at the bottom of the page.

Native vegetation: A brief description of either indicator vegetation for the soil or common natural vegetation that was observed is presented. Where possible, both the common name and corresponding botanical scientific name are given.

Soil profile description: Identification, classification and description of the main soil features. It is simplified from the profile descriptions collected during land resource surveys, but should be sufficient for identification. Soil colour, structure and other terms are defined in the glossary.
Characteristic soil properties: Summarises the main features, including some chemical and physical attributes which may be relevant to land use. Comment is made on the drainage status, water repellence, pH (acidity or alkalinity) and other characteristics such as a hardsetting or loose surface, stones, sodicity of the subsoil, dispersive nature, possible subsoil salinity and perched watertable. An effective rooting depth is estimated. This is an approximation, usually to the depth of an impediment such as dense clay, dense ferruginous (ironstone) gravel or bedrock.

Soil classification: This is an extra for the scientist who may be using this information to understand and evaluate the soils. The Australian Soil Classification and the Northcote Principal Profile Form (PPF) are used and defined in the glossary.

A map unit is also included in the soil classification box. This is a number or a label which appears on a set of soil-landscape and system maps for the Esperance Land Resource Survey, Condingup Land Resource Survey and soils of the Mount Beaumont area.

Agricultural land use and management
This briefly describes the agricultural system that may best suit the soil, based on soil properties and limitations for sustainable production and minimal land degradation.

Crops, trees, annual and perennial pastures are described and discussed. Each land use may be specific for particular crops, rotations or species. This information is based on the soil properties and limitations only and should be taken as a guide. It should also act as a catalyst to encourage land managers to seek further information.

Soil characteristics and land conservation: This lists factors that might limit production and affect management. Wind erosion, water erosion, and surface run-off affect possible soil and land degradation. Dams and catchments cover possible land developments. These titles may be followed by a ranking of high, moderate, low or very low, or may just include a statement on suitability or unsuitability, depending on the soil.
Jerramungup agricultural area

The Jerramungup agricultural area covers the western portion of the Fitzgerald Biosphere of the Southern Sustainable Rural Development program. The agricultural systems development and landcare extension activities are overseen by the Jerramungup District Office of Agriculture Western Australia. This area comprises approximately 402,000 hectares and about 200 farms. These soil information sheets cover part of this area, as illustrated below.

The annual rainfall is highest on the coast, particularly near Bremer Bay, where it averages 550 mm. It decreases slightly to the east and west, and declines rapidly with increasing distance inland. The average rainfall around Jerramungup, 80 km inland, ranges between 400 and 450 mm. Some anomalies such as rainfall shadow with respect to the remnant vegetation and landscape may occur.

Geologically, the area is relatively complex in comparison to the sandplain areas along the coast. The landform patterns of undulating low hills and gently undulating plains are the result of a number of geomorphological processes. The Jerramungup area is characterised by many geological faults and dolerite dykes cutting through the landscape, and several large river systems that flow south.

Three significant events in geological history, have led to the landscape development. One was a major uplift of the landscape (about 20 km north of Jerramungup), slightly tilting the landscape to the north. Drainage over this area is slow, with the water either ponding on a large plateau or meandering into the Avon drainage system. Many soils within this area have alkaline subsoil. A second event was the significant faulting of the landscape, in particular the east-west Stirling Fault, which caused deep dissection of the southerly flowing river systems to the south of the fault escarpment. The third event was the marine transgression which led to the lower Gairdner plain and Bremer sandplain area. The receding sea left its mark as two barely discernible coastal escarpments. Soils below this palaeo-escarpment are developing on Tertiary sedimentary material, mostly siltstone (spongolite). Soils above the escarpment are developing on the southern-most portion of Yilgarn Craton granite.

The soils for the central Jerramungup and upper Gairdner areas are relatively well defined by the dissected granitic geology for the area, except over some large areas where there has been significant 'recent' geological activity. Examples are the development of the aeolian (wind-borne) sandplain area and over the areas that have had new material deposited on the land surface through colluvial or alluvial activity, upon which the soil is now developing.

The distribution of soils over the lower Gairdner to Bremer sandplain is relatively simple compared with the Jerramungup area. The sandplain is a result of the reworking (or masking) of aeolian (wind-borne) sands and sand sheets over gravels and clay. The clays are developing on sedimentary material deposited over granite bedrock. Subsequently, the soils remain remarkably uniform across a variety of landscapes, often differing only in depth of sand or gravel over the clay. The vegetation also remains relatively consistent.

Drainage over the lower Gairdner and Bremer areas is restricted by the lack of relief and southerly flowing waterways. Two well developed river systems bound the lower Gairdner and Bremer sandplain areas: the Pallinup River to the west and the Bremer River to the east. Both drain into large coastal estuary systems. Most other drainage channels terminate at large (fresh or brackish) swamps.
The major land uses for the Jerramungup area are cereal cropping and sheep production. Other crops include canola, lupins, peas and alternative grain legumes (faba beans, lentils and chickpeas), however these tend to be more soil and site specific. Smaller land uses include wildflower production, general prospecting/mining, aquaculture, eucalyptus oil production, agroforestry (Pinus pinaster) and exotic trees.

Areas covered by Jerramungup Soil Information Sheets.
<table>
<thead>
<tr>
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<th>Common name</th>
<th>Soil group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arenar-1 (deep phase)</td>
<td>Mungie sand</td>
<td>Pale deep sand</td>
</tr>
<tr>
<td>Bimburra</td>
<td>Alkaline moort soil</td>
<td>Alkaline grey shallow loamy duplex</td>
</tr>
<tr>
<td>Callumbrae</td>
<td>Spongeolite soil</td>
<td>Grey shallow sandy duplex</td>
</tr>
<tr>
<td>Cherene</td>
<td>Yellow clay</td>
<td>Grey/brown shallow loamy duplex</td>
</tr>
<tr>
<td>Chingarrup</td>
<td>Gairdner gravelly duplex</td>
<td>Moderately deep sandy gravel</td>
</tr>
<tr>
<td>Chittowurup</td>
<td>Alluvial brown loam</td>
<td>Brown sandy earth</td>
</tr>
<tr>
<td>Cobomup</td>
<td>Deep yellow clayey sand</td>
<td>Yellow deep sand</td>
</tr>
<tr>
<td>Corinup-2</td>
<td>Deep white sand</td>
<td>Pale deep sand</td>
</tr>
<tr>
<td>Courang</td>
<td>Sheoak soil</td>
<td>Grey deep sandy duplex</td>
</tr>
<tr>
<td>Cullyerbullup</td>
<td>Yate loam</td>
<td>Red loamy earth</td>
</tr>
<tr>
<td>Jarramlee</td>
<td>Swamp Road shallow gravel</td>
<td>Grey shallow sandy duplex</td>
</tr>
<tr>
<td>Jarramlee</td>
<td>Swamp Road gravel</td>
<td>Grey deep sandy duplex</td>
</tr>
<tr>
<td>Kindalika</td>
<td>Crabhole depression</td>
<td>Hard cracking clay</td>
</tr>
<tr>
<td>Moorungup</td>
<td>Gritty shallow sand over clay</td>
<td>Grey shallow loamy duplex</td>
</tr>
<tr>
<td>Notalika</td>
<td>Crabhole soil (mound)</td>
<td>Grey non-cracking clay</td>
</tr>
<tr>
<td>Tucker</td>
<td>North Bremer dolerite soil</td>
<td>Red/brown non-cracking clay</td>
</tr>
<tr>
<td>Umburra</td>
<td>Red/brown domed clay</td>
<td>Alkaline grey shallow sandy duplex</td>
</tr>
<tr>
<td>Valona</td>
<td>Grey mallee clay</td>
<td>Acid shallow loamy duplex</td>
</tr>
<tr>
<td>Warralonga</td>
<td>Sand over brown domed clay</td>
<td>Grey shallow sandy duplex</td>
</tr>
<tr>
<td>Yarmarlup</td>
<td>Gritty yate loam</td>
<td>Red/brown deep loamy duplex</td>
</tr>
<tr>
<td>Yarmarlup</td>
<td>Deep yate loam</td>
<td>Red/brown deep loamy duplex</td>
</tr>
</tbody>
</table>
Further reading


**Soil sheet glossary**

**Acidic:** The soil has an acidic reaction or pH. The pH measured in a dilute solution of calcium chloride is less than 6.0. When a soil is strongly acidic (pH less than 4.5) there is a large increase in the solubility of aluminium in the soil, which can be toxic to plants.

**Alkaline:** The soil has an alkaline reaction or pH. The pH measured in dilute solution of calcium chloride is more than 7.0. An alkaline soil alters the availability of some nutrients for plant growth and will affect the growth of certain crops (e.g. narrow-leaved lupins). If a soil is strongly alkaline (pH more than 8.5) it can indicate unfavourable conditions for most plants.

**Australian Soil Classification:** A system developed by Ray Isbell (CSIRO Division of Soils) to classify Australian soils. This system is being adopted as a national standard.

**Coarse fragments:** Particles coarser than 2 mm including rock, shell or any other fragments that are not the result of soil forming processes.

**Cracking clay:** Clay soils that develop vertical cracks when dry.

**Dispersion or clay dispersion:** The complete breakdown of aggregates into sand, silt and clay-sized particles when wet. Usually occurs slowly, often taking hours to complete. The dispersed clay can block pores, reducing rainfall infiltration and gas exchange. A characteristic sign of dispersion is muddy or cloudy water, the cloudiness being dispersed clay in suspension.

Dispersion is a chemical process that can occur in soils with low stability. Some soils disperse immediately on wetting, while others need an input of energy through raindrop impact, cultivation or stock trampling. Dispersive behaviour is largely governed by the exchangeable sodium percentage (ESP) and the electrolyte (salt) concentration. A straightforward test for dispersion is described in Farmnote 57/90.

**Duplex soil:** A soil that has an abrupt texture change between the topsoil and subsoil. The typical example is a sand over clay. Duplex soils are further defined in Northcote (1979) *A Factual Key for the Recognition of Australian Soils*.

**EC or Electrical Conductivity:** A measure of soluble salts present in soil or water. It can be used to determine soil salinity, where the unit of measurement is mS/m (milliSiemens per metre). This is used to express the electrical conductivity (or approximate salt content) of a soil or water. The unit can be converted to grains per gallon (gr/g) by multiplying the figure in mS/m by 0.385 and to mg/L by multiplying the mS/m figure by 5.5. The units have been rated as follows:

- 0 to 20 mS/m: very low salinity
- 21 to 40 mS/m: low salinity
- 41 to 80 mS/m: moderate salinity
- 81 to 160 mS/m: high salinity
- >161 mS/m: very high salinity

**Effective rooting depth for plants:** Refers to the rooting depth of the soil in which plants may have an unimpeded path until an obstruction such as a dense layer of clay or rock is encountered. This is only approximate, as subsoil structure may allow more root penetration.

**Erosion:** The wearing away of the land surface and removal of soil by running water, rain, wind, frost or other geological agents.
ESP: An abbreviation for Exchangeable Sodium Percentage. If a soil has an ESP between 6 and 14 it is considered to be sodic, and above 15 strongly sodic. Sodic soils could suffer problems such as sealing and dispersion which can affect plant growth and/or land use.

Further Information (Southern Region, Agriculture Western Australia)

Soil Resource Officers
   Albany Regional Office (098) 928-444
   Katanning District Office (098) 213-333

Land Conservation Officers
   Jerramungup District Office (098) 351-177

Revegetation Officer
   Katanning District Office (098) 213-333

Farming Systems Development Officers All of the above centres

Granite: A coarse grained igneous rock, that underlies most of the landscape.

Gravel: Coarse mineral particles between 2 and 60 mm in size. Gravel can refer to either ferruginous (ironstone) nodules of this size or other mineral fragments such as quartz or limestone distributed throughout the soil profile.

Hardsetting: Where the surface of a soil becomes very hard and compact when dry. This affects the soil’s productive condition for seed establishment and germination, water infiltration and drainage. When the soil wets up it may become soft again, but this can take varying amount of water over varying periods of time. After ‘wetting up’ some soil may become too soft to work.

Horizon: Layer within a soil profile which has characteristic properties different from those above or below, e.g. colour, texture, structure.

Landscape: Part of an area of land that is characterised by processes of erosion, weathering, sedimentation, and movements in the earth’s crust. It includes all identifiable and measurable features such as climate, geology, soils and land use.

Map unit: A map unit is a representation of a soil or group of soils on a map, that occurs within a system or soil-landscape area. A system/soil-landscape area is a topographic unit (e.g. low hills and rises or a level to gently undulating plain) that contains a series of common soil units. These units can be found on the corresponding soil-landscape map for the area.

Moisture availability: Describes the amount of moisture in the soil that is available to be absorbed by plant roots.

Mottles: Mottles are patches of red, brown or orange and bleached grey or blue spots in the soil horizon. Mottling occurs when iron (Fe) compounds react to the presence or absence of air (oxygen). Waterlogged soils have dull blue, green or grey mottles as the iron is being reduced (Fe$^{3+}$ to Fe$^{2+}$). This occurs when air is excluded from the soil. Mottles generally occur in lower soil horizons. When air is not excluded, brown or orange mottles may occur, iron being oxidised (Fe$^{2+}$ to Fe$^{3+}$). This mainly occurs at the boundary of waterlogged and aerated soil. They indicate a fluctuating watertable or seasonal waterlogging.

mS/m: The unit for electrical conductivity (EC) measured in milliSiemens per metre.

Northcote PPF: A PPF stands for Principle Profile Form. It is a coded description of the soil derived by working through a diagnostic soil classification key developed by K. Northcote. An
example code may be Dy5.43 where D: stands for Duplex; the y stands for yellow and the other numbers are further descriptions of the soil characteristics. It is now being replaced by Isbell’s classification.

**Peds:** Peds are distinct structural features within the soil. Sand, silt, clay and iron minerals within a soil bind together to form aggregates having shapes such as columnar (described in the sheets as domed), prismatic, blocky or horizontally layered (platy). The spaces between the peds act as pathways for air, water and plant roots. The opposite to a structured soil is *apedal* or structureless.

**pH:** Measures the concentration of hydrogen ions in the soil. The pH is measured on a logarithmic scale (i.e. pH = negative logarithm of concentration of hydrogen ions). Consequently, a soil with a pH of 5 contains 10 times as many hydrogen ions as a soil with a pH of 6.

A soil is described as having a neutral reaction when the pH (in dilute calcium chloride) is between 6.0 and 7.0, acidic below 6.0, and alkaline above 7.0. In general, pH is of most concern when the soils are either strongly acidic (pH less than 4.5) or strongly alkaline (pH more than 8.5). Most of our soils are becoming more acidic over time due to removal of agricultural produce (i.e. grain, hay, wool) and through the use of nitrogen fertilisers.

**Profile:** A vertical sectional exposure extending downwards from the surface to the parent material. This puts the soil "on display", and is the best way to observe and describe its complete character and properties. The illustrations on the soil information sheets are examples of soil *profiles*.

**Relief:** The difference in elevation between the high and low points of a land surface.

**Salinity:** The presence of soluble salts (mainly sodium chloride, but also sodium carbonate and others) in the soil profile as solution or accumulated crystalline salts. High salinity adversely affects root growth if it occurs within the rooting zone. It is expressed as a measure of *electrical conductivity*.

**Segregations:** Segregations are gravels on other accumulations of material which occur in the soil. They are formed by the concentration of some constituent by chemical or biological action. ‘Ferruginous’ describes concentrations of iron.

**Slope:** An incline either upward or downward from the horizontal. Its angle is measured as a percentage. Observations span an area of about 20 m, so as not to be influenced too much by features of microrelief.

**Sodicity:** A measure of exchangeable sodium in the soil. Soils that are sodic have a high percentage of cation exchange sites occupied by sodium ions. Sodicity adversely affects soil stability and increases the likelihood of it dispersing. Problems with sodic soils include difficult seedbed preparation, reduced rainfall infiltration and seedling emergence, and poor root growth in sodic subsoils.

**Soil colour:** A soil’s colour can be determined by comparing the actual colour in the field with a small booklet called a Munsell Soil Colour Chart. This contains a set of standard (international) colour chips, not much different to an interior house paint guide. Use of the Munsell book means that the colour description will be exact so that "Scientist John in Sydney" can read a soil description, refer to his Munsell book and appreciate that exact colour. It also avoids approximate naming of the soil colour (e.g. a pinkish grey brown).
The colours are represented by a code, which describes three variables: hue, value and chroma. Hue represents the spectral colour (red, yellow or a combination of the two); value represents the lightness or darkness; and chroma represents the intensity of the colour. For example 10YR 6/4 is a soil with a yellow-red hue, a value of 6 and chroma of 4. All colours in the information sheets are moist soil colours.

**Structure:** Describes the distinctness, size and shape of the soil aggregates or peds. The surface structure in many agricultural soils reflects recent management practices, especially the amount and frequency of cultivation. The soil ‘aggregates’ are largely created by cultivation rather than being an inherent soil property. The soil structure described in the soil information sheets therefore concentrates on subsoil structure which is an intrinsic soil property.

A moderate or strongly structured soil allows roots to grow through even if it contains a large amount of clay. The exception is with ‘domed’ or columnar structured subsoils where the top of the clay layer is rounded into a distinct dome shape (more common in mallee soils). There is limited root growth into the domes and crop roots are essentially restricted to the sand seams between the clay domes.

**Subsoil:** Refers to a soil layer with certain properties, usually higher clay content and/or brighter colours, rather than a given depth. For instance, in ‘duplex’ soils the subsoil corresponds to the clay layer and the depth to this layer can vary from 10 to 80 cm.

**Texture:** A measure of the proportion of sand, silt and clay-sized particles in a soil. The coarsest soils are sands which contain less than 5% clay; medium textures such as loam contain about 25% clay, and heavy clays have more than 50% clay.

The ‘field’ (or hand) texture is a measure of the behaviour of a small handful of soil when moistened and kneaded into a ball and then pressed out between thumb and forefinger to form a ribbon. The behaviour of the soil during bolus formation and the ribbon length determine the field texture (also refer to TopCrop Soil field texture card).

Soil texture is important because it affects water storage and erodibility, two very important soil properties in our Australian environment. It is also important in relation to other properties including water repellence, nutrient deficiencies, nutrient leaching, subsoil compaction and soil structure decline.

**Waterlogging:** Excess water in the root zone either present as a perched watertable or water ponded on the soil surface. The excess water inhibits gas exchange with the atmosphere, and microbes use the available oxygen causing the soil to become anaerobic (i.e. deficient in oxygen). The tolerance of crops and pastures to waterlogging varies considerably and depends on the stage of growth. Prolonged waterlogging can reduce crop yields by more than 25%.

**Water repellence:** A condition which affects the wetting pattern of soils, especially sandy soils, and results in an uneven wetting pattern in autumn. In the paddock, patches of wet soil alternate with patches of dry soil which results in poor germination of crops and pasture. It is caused by the build-up of organic coatings on the sand grains. Water repellence can be demonstrated by a water droplet placed on the surface of a soil. If a soil is water repellent the water droplet will form a bead and not penetrate quickly.

**Weathering:** Weathering is the physical and chemical disintegration, alteration, and decomposition of rocks and minerals at or near the earth's surface by atmospheric and biological agents.
**Best way to use the sheets**

1. Compare the field site with the landscape description on the soil information sheet.

   ![Go to step 2](image)

2. Dig a hole! Use the soil description and the representative colour photograph to determine whether the soil in the field matches the soil type illustrated on the sheet. If the soil:
   
   (a) matches the soil description and colour soil photograph, go to step 4.
   
   (b) does not roughly resemble the soil description or the photograph, go to step 3.

3. If the site does not match the soil description and colour photograph, record the location and details and contact the nearest Agriculture Western Australia office with either a Soil Resource Officer or a Land Conservation Officer.

   ![Go to step 4](image)

4. If the soil matches the description and colour photograph, refer to the reverse of the sheet for all land use information and management considerations for the soil.

*It is important to understand that:*

- Because the scale of mapping for the Jerramungup Land Resource Survey is 1:250,000, it is possible that any one of the described soils could occur in a different landscape from that indicated and on the farm being planned without being delineated on the final soil-landscape map.

- Matching the soil information sheet to the actual field site does not imply that they must be 'identical', rather that they should be similar in most aspects.
Soil information sheet for the Jerramungup area

Arenar-1 Soil Series  
(deep sandy phase)  
Pale deep sand  
(Mungie sand)

This is a deep gritty and coarse sandy soil, sometimes with a layer of gritty and rough ironstone gravel at depth.

Occurrence: Commonly found on the upper slopes and ridges of the valleys and drainage systems throughout the Jerramungup area, extending as far south as Corackerup and Boxwood Hills. It occurs in small pockets on upper valley slopes and does not occupy large areas.

Native vegetation: Dominant natural vegetation is Christmas tree or mungie (Nuytsia floribunda), and parrot bush (Dryandra sessilis) is common in well drained locations.

Soil profile description

<table>
<thead>
<tr>
<th>Depth (cm)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
<td>Grey (10YR 5/1) loamy sand; structureless; pH 5.3; EC 2 mS/m (very low salinity); abrupt boundary.</td>
</tr>
<tr>
<td>10-60</td>
<td>Light grey (10YR 7/2) coarse sand with faint, very pale brown mottles; structureless; pH 5.1; EC 1 mS/m (very low salinity); abrupt boundary.</td>
</tr>
<tr>
<td>60-100</td>
<td>Yellow (2.5Y 7/6) coarse sand; structureless; pH 5.8; EC 1 mS/m (very low salinity); clear boundary.</td>
</tr>
<tr>
<td>100-158</td>
<td>Pale yellow (2.5Y 7/4) coarse sand; structureless; 20-50% large gravels; pH 6.0; EC 1 mS/m (very low salinity).</td>
</tr>
</tbody>
</table>

pH measured in CaCl₂

Characteristic soil properties

- Coarse, gritty topsoil
- Rapidly to well drained
- Low nutrient availability
- Neutral to slightly acidic pH trend
- Effective rooting depth more than 100 cm
- Rough-faced ironstone often found at depth

Soil classification

Australian Soil Classification: Basic Ferric Bleached-Orthic Tenosol (Isbell 1996)
PPF: Uc2.21  (Northcote 1979)
Map units: 243Ya, 243Fz, 243Mp (Jerramungup Land Resource Survey, reference profile JSI 1163)

Compiled by Tim Overheu, Natural Resources Assessment Group, Agriculture Western Australia, 1996
Agricultural land use and management

*Arenar-1 Soil Series*  
*(deep sandy phase)*

The soil is very low in nutrients, particularly potash. A cereal/lupin rotation using minimum tillage and stubble retention, or tagasaste (tree lucerne) might be suitable.

Crops: Wheat, barley, oats and lupins are suitable. The soil pH may prevent effective lupin production. It is necessary to direct drill in order to maintain surface stability and reduce wind erosion during establishment. Stubble retention is essential.

Trees and shrubs: The low soil water availability limits tree and shrub establishment. In dry years, trees will suffer from moisture stress.

Annual pastures: Subterranean clover is suitable, provided surface potash levels are above 65 ppm. On land that is marginal for potash, early maturing serradella is an alternative.

Perennial pastures: Low rainfall and light soil texture reduce the number of suitable perennial pasture varieties. Couch, perennial veldt grass and sheep’s burnet may be appropriate on uncropped areas. Tagasaste may persist where the deep sands are moist.

Alternative options: Tagasaste and lucerne may provide alternatives. *Pinus pinaster* may also be suitable.

Soil characteristics and land conservation

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acidity</td>
<td>Surface acidification could become a problem. Regular monitoring is advised.</td>
</tr>
<tr>
<td>Dams &amp; catchments</td>
<td>Unsuitable for catchments and earthworks.</td>
</tr>
<tr>
<td>Salinity</td>
<td>Negligible.</td>
</tr>
<tr>
<td>Structural decline</td>
<td>Not prone to surface structure decline.</td>
</tr>
<tr>
<td>Water availability</td>
<td>Limited because of coarse sandy nature. Recharge to groundwater is high.</td>
</tr>
<tr>
<td>Water erosion</td>
<td>Generally unlikely, but will erode if saturated.</td>
</tr>
<tr>
<td>Water repellence</td>
<td>May develop problems, especially if legumes are included in the rotation.</td>
</tr>
<tr>
<td>Waterlogging</td>
<td>Very low risk as the soil drains rapidly.</td>
</tr>
<tr>
<td>Wind erosion</td>
<td>Susceptible.</td>
</tr>
<tr>
<td>Workability</td>
<td>Good. Compacted layers can be a problem at 15-30 cm depth. Can be alleviated by deep ripping.</td>
</tr>
</tbody>
</table>

Notes:
Soil information sheet for the Jerramungup area

**Bimburra Soil Series**

*Alkaline grey shallow loamy duplex*  
*(Alkaline moort soil)*

This is a hardsetting sodic, yellowish grey clay. The shallow topsoil is a coarse gritty sandy loam to sandy clay loam. The subsoil is a dense, strongly sodic, alkaline medium to heavy clay.

**Occurrence:** Very common over the Great Southern. It can occur as relatively small and isolated patches across a paddock or distributed over large, but confined areas across the landscape. Bimburra Soil Series is most frequently found on mid-level valley slope, valley floors and sometimes in isolated areas high in the landscape. Most notable examples occur around Ongerup, Jerramungup, Nyabing and Pingrup. It is also found as far north as Newdegate and as far south as Boxwood Hills.

**Native vegetation:** The dominant natural vegetation is a near pure stand of moort (*E. platypus var. platypus*) and dense melaleuca scrub.

### Soil profile description

<table>
<thead>
<tr>
<th>Depth (cm)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-6</td>
<td>Dark grey (10YR 4/1) sandy clay loam; strong blocky structure; &lt;2% small quartz fragments; slightly dispersive; pH 6.3; EC 11 mS/m (very low salinity); abrupt boundary.</td>
</tr>
<tr>
<td>6-55</td>
<td>Pale olive (5Y 6/3) sandy, medium heavy clay; blocky structure; dispersive; pH 8.7; EC 120 mS/m (high salinity); clear boundary.</td>
</tr>
<tr>
<td>55-140</td>
<td>Pale yellow (2.5Y 7/4) medium heavy clay with distinct yellowish red mottles; strong blocky structure; dispersive; pH 7.5; EC 240 mS/m (very high salinity); clear boundary.</td>
</tr>
<tr>
<td>140-180</td>
<td>Light yellowish brown (2.5Y 6/4) medium heavy clay with distinct brownish yellow and white mottles; strong blocky structure; slightly dispersive; pH 5.4; EC 390 mS/m (very high salinity).</td>
</tr>
</tbody>
</table>

pH measured in CaCl₂

### Characteristic soil properties

- Sodic topsoil (ESP more than 6%)
- Strongly sodic below 6 cm (ESP over 25%)
- Highly dispersive clay subsoil
- Salinity increases with depth
- Poorly to imperfectionly drained
- Effective rooting depth less than 10 cm

### Soil classification

**Australian Soil Classification:** Hypocalcic Hypernatric Grey Sodosol (Isbell 1996)

**PPF:** Dy3.13 (Northcote 1979)

**Map units:** 243Je, 243Ug, 243Nw (Jerramungup Land Resource Survey, reference profile JSI 1162)

Compiled by Tim Overheu, Natural Resources Assessment Group, Agriculture Western Australia, 1996
Agricultural land use and management

Bimburra Soil Series  Alkaline grey shallow loamy duplex

(Alkaline moort soil)

The moort or hardsetting grey clay can be very difficult to manage, although good yields are achievable. It is suitable for an alternative grain legume/cereal or pasture/cereal rotation with consideration of tillage practice, increasing organic content and possible gypsum application.

Crops: Given appropriate fertiliser and rotations, cereals and pulses will grow satisfactorily plus canola in well drained sites. Lupins are not suitable. Pulse crops include faba beans, field peas, chickpeas and possibly lentils where the topsoil salinity is below 30 mS/m. Faba beans are more suitable for areas that waterlog. The soil structure may be improved by application of gypsum and increasing organic matter (e.g. green manure).

Trees and shrubs: Maintaining a native ecosystem is advisable. Revegetate with moort (Eucalyptus platypus) or mallet (E. annulata), with a low mallee (E. densa subsp. densa). This soil is not hospitable, so species selection is very important. Limiting factors are soil pH, subsoil salinity and very shallow effective rooting depth. Direct seeding may be unsuccessful, therefore use seedlings. Mounding may also be necessary.

Annual pastures: While subterranean clover may be recommended, the hardsetting surface affects burr burial and seedling emergence, causing problems in maintaining ground cover. Medics (Medicago polymorpha and M. truncatula) will be more suitable.

Perennial pastures: Several perennial grasses may be suitable in moist (niche) areas. Some varieties are Rhodes grass, tall fescue and perennial ryegrass. On marginally saline areas puccinellia and saltwater couch may be appropriate.

Alternative options: Revegetation of waterlogged or salt-affected areas should be considered. Perennial plants could be lucerne, Australian vetiver and sulla. Saltbush and melaleuca shrubs may also be appropriate.

Soil characteristics and land conservation

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acidity</td>
<td>Unlikely to be a problem because of the strong subsoil alkalinity.</td>
</tr>
<tr>
<td>Dams &amp; catchments</td>
<td>Very suitable for dams and earthworks. The presence of high soluble salts possibly indicates a perched saline watertable. Examine dam sites carefully.</td>
</tr>
<tr>
<td>Salinity</td>
<td>High. Waterlogging, poor drainage, sodicity, and low soil water use increase risks especially in degraded areas.</td>
</tr>
<tr>
<td>Structural decline</td>
<td>Moderate to high. Dispersive clays often come to the surface during cultivation. Minimum tillage is necessary and the soil must not be worked when too wet.</td>
</tr>
<tr>
<td>Water availability</td>
<td>Moderate. Good water storage, but the high clay may limit readily available water for plant use.</td>
</tr>
<tr>
<td>Water erosion</td>
<td>Low to moderate risk. If the dispersive subsoils are exposed at the surface reducing water infiltration, erosion may be a hazard on sloping land.</td>
</tr>
<tr>
<td>Water repellence</td>
<td>Not prone to water repellence.</td>
</tr>
<tr>
<td>Waterlogging</td>
<td>Waterlogging and boggy conditions occur frequently where dispersive clay has surfaced, clogging soil and reducing water infiltration.</td>
</tr>
<tr>
<td>Wind erosion</td>
<td>Low. The thin topsoil is erodible but frequently has been mixed with the subsoil reducing risks.</td>
</tr>
<tr>
<td>Workability</td>
<td>Low to moderate. If cultivated when wet, soil sets hard.</td>
</tr>
</tbody>
</table>
Soil information sheet for the Jerramungup area

Callumbrae Soil Series

Grey shallow sandy duplex
(Spongeolite soil)

This is a light-surfaced duplex soil with a sodic, columnar subsoil. The topsoil is a greyish brown sand. A small amount of gravel may be present over distinctive reddish brown clay. Siltstone (spongeolite) rock floaters are common throughout the soil.

Occurrence: Occupies about 30% of the upper Bremer area in association with either Jarramlee gravelly soils or Corinup deep sands. Usually found on valley slopes of the moderate to deeply incised, southerly flowing drainage systems (notably Lower Fitzgerald, Lower Gairdner, Bremer and Pallinup Rivers) where the relief is very low (9 to 30 m) and the slope ranges from 1 to 8%. Variants also occur across the south coastal plain.

Native vegetation: Varies depending on landscape position and soil phase. Mostly dense low mallee and heath. Square-fruited mallee (E. tetraptera) grows where spongeolite outcrops, but elsewhere blue mallee (E. tetragona), Port Lincoln mallee (E. conglobata), ridge-fruited mallee (E. angulosa) and Alexander River mallee (E. micranthera) are more common.

Soil profile description

Depth (cm)

0-8 Dark greyish brown (10YR 4/2) loamy fine sand; structureless; water repellent; 2-10% medium siltstone fragments; 2-10% medium ironstone gravels; pH 5.0; EC 10 mS/m (very low salinity); abrupt boundary.

8-32 Light yellowish brown (10YR 6/4) structureless, fine sand; <2% medium ironstone gravels; pH 5.0; EC 4 mS/m (very low salinity); abrupt, tongued boundary.

12-40 Strong brown (7.5YR 5/8) sandy medium clay with faint reddish yellow mottles; slightly dispersive; strong columnar structure; <2% small ironstone gravels; pH 5.8; EC 37 mS/m (low salinity); clear boundary.

40-80 Strong brown (7.5YR 5/8) light medium clay with distinct yellowish red mottles; moderately strong, blocky structure; 10-50% medium siltstone fragments; pH 4.6; EC 110 mS/m (high salinity); clear boundary.

80-130 Yellowish brown (10YR 5/8) light clay with prominent yellowish red mottles; structureless; 20-50% medium siltstone fragments; pH 4.0; EC 220 mS/m (very high salinity).

pH measured in CaCl₂

Characteristic soil properties

- Distinctive reddish brown subsoil
- Slightly acidic to acidic subsoil
- Strong columnar structure
- Rocky throughout subsoil - spongeolite
- Effective rooting depth 10 to 30 cm
- Possibly overlies porous spongeolite

Soil classification

Australian Soil Classification: Mestrophic Hypermatric Brown Sodosol (Isbell 1996)

PPF: Dy5.42, Db5.41 (Northcote 1979)

Map units: 242Bh, 242Lg (Jerramungup Land Resource Survey, reference profile JSI 1151)

Compiled by Tim Overheu, Natural Resources Assessment Group, Agriculture Western Australia, 1996
### Agricultural land use and management

#### Callumbrae Soil Series

**Grey shallow sandy duplex**  
*(Spongeolite soil)*

This soil yields well under most conditions. Soil pH may decrease nutrient availability and increase aluminium which is adverse to plant growth. Regular monitoring is necessary. Suitable for cereal/canola/pasture rotation using minimum tillage and stubble retention.

| Crops: Cereals (wheat, barley, triticale, oats) and canola grow well. Soil pH will be the main limiting factor for yield, but it is possible that the surface pH can be amended by the addition of lime. Lupins are only suitable on the deeper sandier phases. Pulse crops such as faba beans are not suitable because of the low pH. |

| Trees and shrubs: Several native and ornamental tree and shrub species are suitable, particularly considering the rainfall zone in which this soil occurs (over 500 mm). The depth of sand over the clay, restricting root development and soil pH are the limiting factors for tree establishment. |

| Annual pastures: Subterranean clover is the recommended annual pasture legume, although topsoil pH may limit production. Amelioration with lime sand is appropriate. |

| Perennial pastures: A mix of serradella and veldt grass provides the best long-term option. Lucerne is not suitable because of the low soil pH. Other options include phalaris, fescue, brumby and perennial rye grass. Console love grass and Rhodes grass also have potential. |

| Alternative options: More suited to cropping, although with careful site selection, amelioration of the soil pH and supplemental irrigation, a small viticultural enterprise could be an alternative. |

### Soil characteristics and land conservation

| Acidity | Risk of surface soil acidification is high. The clay subsoil has a low buffering capacity. Regular monitoring is recommended. |
| Dams & catchments | Suitable, but sites should be chosen carefully. The spongeolite bedrock is fractured and porous, and dams can leak. Suitable for shallow earthworks. |
| Salinity | Usually not a problem because of the position in the landscape in which this soil occurs, unless there is a hillside seep. Risk increases on lower valley slopes and with proximity to the valley floor. |
| Structural decline | Adverse lower subsoil conditions may lead to subsoil clay slumping. |
| Water availability | Varies with the depth of sand over the clay and density on top of clay domes. |
| Water erosion | High risk in sloping areas, as subsoil clays are dispersive. |
| Water repellence | The sandy topsoil can be water repellent. |
| Waterlogging | Low; the gradient of the landscape in which this soil commonly occurs, together with good soil drainage reduces the risk of waterlogging. |
| Wind erosion | The sandy surface is prone to erosion, particularly if surface vegetative cover is not maintained during seasonally dry conditions. |
| Workability | Good at field capacity (moderately moist). Ironstone gravel and spongeolite rock at cultivation depth may increase wear on machinery. |
Soil information sheet for the Jerramungup area

*Cherene Soil Series*  
Grey/brown shallow loamy duplex  
*(Yellow clay)*

This is a typical shallow duplex soil, with a gritty sandy loam topsoil and an alkaline sandy clay subsoil.

**Occurrence:** Occurs on gently undulating plains and low rises with very gently inclined (low) slopes and flat landscapes in the upper Gairdner area. It is associated with the very gently inclined valley slopes, just above an old coastal escarpment.

**Native vegetation:** The dominant native vegetation could not be determined because of extensive clearing. Samples collected nearby include: *Eucalyptus redunca*, Hopetoun mallee (*E. leiptocalyx*), netbush (*Calothamnus* sp.), pin cushion hakea (*Hakea laurina*) and *Melaleuca calycina* subsp. *calycina*.

**Soil profile description**

<table>
<thead>
<tr>
<th>Depth (cm)</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-7</td>
<td>Very dark greyish brown (10YR 3/2) gritty sandy loam; structureless; 10-20% medium gravels; 20-50% small quartz fragments; pH 5.0; EC 28 mS/m (low salinity); sharp boundary.</td>
</tr>
<tr>
<td>7-30</td>
<td>Strong brown (7.5YR 5/6) clay loam, sandy; prismatic and strong blocky structure; 10-20% small gravels; slightly dispersive and slaking; slightly calcareous; pH 7.3; EC 42 mS/m (moderate salinity); clear boundary.</td>
</tr>
<tr>
<td>30-52</td>
<td>Brownish yellow (10YR 6/6) sandy, light medium clay; blocky structure; 10-20% medium sized gravels; slightly dispersive; slightly calcareous; pH 8.1; EC 60 mS/m (moderate salinity); clear boundary.</td>
</tr>
<tr>
<td>52-105</td>
<td>Yellow (10YR 7/8) light medium clay; with distinct, light grey and brownish yellow mottles; sandy; blocky structure; 10-20% medium quartz fragments; 10-20% small gravels; slightly dispersive; slightly calcareous; pH 7.9; EC 69 mS/m (moderate salinity); clear boundary.</td>
</tr>
<tr>
<td>105-140</td>
<td>Brownish yellow (10YR 6/8) light medium clay with prominent red mottles; slightly dispersive; slightly calcareous; pH 7.6; EC 120 mS/m (high salinity).</td>
</tr>
</tbody>
</table>

pH measured in CaCl₂

**Characteristic soil properties**

- Strongly sodic subsoil below 7 cm
- Imperfectly drained
- Alkaline, slightly calcareous subsoil
- Colluvial gravelly fragments throughout
- Shallow effective rooting depth 7 to 30 cm
- Weathering bedrock below 140 cm

**Soil classification**

*Australian Soil Classification:* *Mottled-Sodic Calcic Brown Dermosol* (Isbell 1996)  
*PPF:* *Dy3.12* (Northcote 1979)  
*Map units:* 243Lg, 242Jo, 243Jm (Jerramungup Land Resource Survey, reference profile JSI 1143)

Compiled by Tim Overheu, Natural Resources Assessment Group, Agriculture Western Australia, 1996
Agricultural land use and management

Cherene Soil Series  Grey/brown shallow loamy duplex
(Yellow clay)

Suitable for cereal-pulse or pasture cereal rotation using minimum tillage or direct drilling. The soil is susceptible to surface compaction and degradation through excess cultivation when the soil is too wet. Gypsum application may be appropriate, but gypsum response tests are recommended. Care needs to be exercised with winter grazing strategies as well.

Crops: With appropriate fertiliser and rotation practices, cereals can grow well. Yields are significantly affected by seasonal or climatic conditions. Wheat is the preferred cereal. Lupins are not suitable because of the shallow rooting depth and subsoil alkalinity. Pulse crops can be grown satisfactorily, however good management is needed when grazing the stubble to avoid possible wind erosion. Canola is suitable, and good yields have been achieved from this soil, but further advice should be sought.

Trees and shrubs: Tree performance may vary considerably. Maintaining a native species selection is advisable when revegetating. A selection of native eucalyptus mallee species can be grown. The limiting factor for trees is the restricted rooting depth.

Annual pastures: This soil is suited both to subterranean clover and burr medic. Pasture growth and production vary depending on soil nutrient availability.

Perennial pastures: Suitable perennial pastures depend on the condition and position of the soil. Phalaris and subterranean clover or perennial rye grass may be appropriate. Tall wheatgrass and balansa or Persian clover are recommended for marginally saline areas.

Alternative options: Lucerne placed into a cropping rotation may be an alternative.

Soil characteristics and land conservation

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acidity</td>
<td>Subsoil is alkaline, and would probably act as a good buffer for the topsoils.</td>
</tr>
<tr>
<td>Dams &amp; catchments</td>
<td>Suitable for dams and earthworks, unless the depth to bedrock is shallow.</td>
</tr>
<tr>
<td>Salinity</td>
<td>Possible subsoil salinity. More of a risk in waterlogged or degraded areas.</td>
</tr>
<tr>
<td>Structural decline</td>
<td>Moderate to high. Topsoils are slightly dispersive and subsoils are dispersive and dense.</td>
</tr>
<tr>
<td>Water availability</td>
<td>Moderate. Higher clay content in the subsoil ensures good water storage, but may reduce the readily available water to plants towards the end of the growing season.</td>
</tr>
<tr>
<td>Water erosion</td>
<td>Moderate. The topsoil is erodible, particularly where the soil occurs on sloping land.</td>
</tr>
<tr>
<td>Water repellence</td>
<td>Not considered a problem because of the topsoil texture.</td>
</tr>
<tr>
<td>Waterlogging</td>
<td>Low to moderate. Susceptible in low lying areas, but as this soil mostly occurs on landscapes with good relief, will not be a significant problem.</td>
</tr>
<tr>
<td>Wind erosion</td>
<td>Usually not a problem because of the heavier topsoil texture.</td>
</tr>
<tr>
<td>Workability</td>
<td>Good to fair. The gravelly gritty nature of the soil may cause excess wear on agricultural implements.</td>
</tr>
</tbody>
</table>

Notes:
Soil information sheet for the Jerramungiup area

**Chingarrup Soil Series**

This soil has a greyish brown loamy sand grading to a yellowish brown sand with abundant ironstone gravel over a brownish clay with abundant gravel.

**Occurrence:** Level to gently undulating plains on the southern most portion of the Yilgarn granite around the Upper Gairdner, Jerramungiup and Jacup areas. Slope from 1 to 3% and relief less than 9 m to 15 m. On upper valley slopes (crests), catchment divides and spurs.


**Soil profile description**

<table>
<thead>
<tr>
<th>Depth (cm)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
<td>Very dark greyish brown (10YR 3/2) loamy sand; structureless; 20-50% medium ironstone gravels; water repellent; pH 4.9; EC 15 mS/m (very low salinity); abrupt boundary.</td>
</tr>
<tr>
<td>10-45</td>
<td>Light yellowish brown (2.5Y 6/4) sand; structureless; &gt;50% medium ironstone gravels; pH 5.4; EC 5 mS/m (very low salinity), clear boundary.</td>
</tr>
<tr>
<td>45-90</td>
<td>Brownish yellow (10YR 6/8) with distinct, strong brown mottles; structureless, sandy, light medium clay; 10-20% medium ironstone gravels; pH 6.4; EC 12 mS/m (very low salinity); clear boundary.</td>
</tr>
<tr>
<td>90-125</td>
<td>White to brownish yellow (10YR 7/2 to 10YR 6/6) light medium clay with distinct, brownish yellow mottles; sandy; blocky structure; pH 6.6; EC 18 mS/m (very low salinity).</td>
</tr>
</tbody>
</table>

pH measured in CaCl2

**Characteristic soil properties**

- Greyish, water repellent, loose sand
- High gravel content in subsoil
- Weak subsoil structure
- Slightly acidic to acidic topsoil
- Neutral to slightly acidic subsoil
- More gravel cementation past 100 cm

**Soil classification**

**Australian Soil Classification:** *Ferric Mottled-Hypernatric Yellow Sodosol* (Isbell 1996)

**PPF:** *Dy5.82* (Northcote 1979)

**Map units:** 243Ug, 243Lg, 243Jm (Jerramungiup Land Resource Survey, reference profile JSI 1145)

Compiled by Tim Overheu, Natural Resources Assessment Group, Agriculture Western Australia, 1996
Agricultural land use and management

**Chingarrup Soil Series**

Moderately deep sandy gravel  
*(Gairdner gravelly duplex)*

Suitability for cropping depends on the depth to the gravel layer and the degree of packing. Where the gravel is dense or cemented and close to the surface, it is not suitable. This soil has a limited capacity to retain nutrients.

**Crops:** Suitable crops and potential yields are: wheat (2 to 3 t/ha), barley (2 to 3.5 t/ha), oats (2 to 3 t/ha), triticale (2 to 3 t/ha), lupins (0.5 to 1 t/ha) and canola (0.9 to 1.5 t/ha). A cereal/lupin or cereal/lupin/cereal/pasture rotation is the most suitable. In the more fertile, less gravelly and better drained areas, canola will perform well.

**Trees and shrubs:** The limiting factor is depth to the gravel layer. Many tree and shrub varieties will suit this soil. Deep-rooting trees and shrubs will extend roots laterally rather than pushing through the dense gravel, which could have a significant impact on water availability for adjacent crops. Tasmanian blue gum (*E. globulus*) and *Pinus pinaster* are only suitable for the deeper sandier phases.

**Annual pastures:** Subterranean clover is the recommended annual legume. Pink and yellow serradellas are also an option. Topsoil pH may limit pasture production. Soil pH amendment with lime may be necessary. Restricted grazing during summer and autumn is essential to minimise wind erosion.

**Perennial pastures:** Many perennial grasses are suitable. A mix of serradella and veldt grass provides the best option for long-term pasture.

**Alternative options:** Although ideally a cropping soil, alternative uses could be trees for windbreaks from which a number of other activities could develop such as honey production. Alternative grains for a home-based flour or noodle industry could also be an option.

**Soil characteristics and land conservation**

- **Acidity:** Topsoil susceptible to becoming acidic. Where the soil pH in calcium chloride has fallen below 4.5, application of lime is required.
- **Dams & catchments:** Often not suitable for dams and catchments.
- **Salinity:** Usually not a problem, however poor internal drainage, water run-on or groundwater rise will impact on this soil.
- **Structural decline:** Subsurface sandy layers can become compacted over time, decreasing the porosity of the subsoil. Deep cultivation may be appropriate.
- **Water availability:** Low, because of poor water holding capacity. Water repellence early in the growing season will also cause patchy water availability.
- **Water erosion:** Non-wetting nature can cause poor infiltration of early rains leading to run-off, especially during thunder storms and some erosion if the soil has been loosened.
- **Water repellence:** Water repellent during the early part of the season.
- **Waterlogging:** Moderate risk. Internal soil drainage can be slow and waterlogging can occur in level areas.
- **Wind erosion:** High, because of the light surface. Restricted summer grazing management, maintenance of vegetation and establishment of windbreaks are essential.
- **Workability:** Good, although abundant gravel may cause excess wear on machinery.
Soil information sheet for the Jerramungup area

Chittowurup Soil Series  Brown sandy earth (Alluvial brown loam)

The Chittowurup soil is a deep fine sandy alluvial loam. The topsoil and subsurface layers are dark brown in colour which progressively become yellowish brown with depth.

Occurrence: Only found in the narrow (stagnant) alluvial plains within the larger southerly flowing river systems around Jerramungup. More prominent in the Middle Pallinup River system, although similar varieties also commonly occur in the lower Phillips, Fitzgerald, Gairdner and Bremer Rivers. Usually occurs on a step or bench, above the main drainage channel (where the soils tend to be gritty sands) and below the valley slope and crests (where soils can range from yate loams to mungie sands).

Native vegetation: Flat-topped yate (Eucalyptus occidentalis) is the dominant eucalypt. Other vegetation comprises low wattle (Acacia harveyi), Jerramungup astartea (Astartia heteranthera), silvery leaved pimelea (Pimelea argentea), scarlet kunzea (Kunzea jucunda) and various grasses and sedges.

Soil profile description

Depth (cm)

0-20  Dark brown (10YR 3/3) loamy fine sand; structureless; slightly water repellent; pH 5.1; EC 10 mS/m (very low salinity); clear boundary.

20-40  Dark brown (7.5YR 3/2) loamy sand; structureless; <2% medium granite fragments; pH 6.0; EC 2 mS/m (very low salinity), clear boundary.

40-60  Strong brown (10YR 4/6) with faint reddish yellow mottles; clayey sand; structureless; pH 6.8; EC 3 mS/m (very low salinity); clear boundary.

60-86  Dark brown (10YR 3/3) loamy fine sand; structureless; pH 7.1; EC 3 mS/m (very low salinity), clear boundary.

86-100 Dark yellowish brown (10YR 3/4) with faint yellowish brown mottles; sandy clay loam; structureless; completely dispersive; pH 7.1; EC 2 mS/m (very low salinity), abrupt boundary.

100-155 Yellowish brown (10YR 5/4) with faint very pale buried profile (buried brown mottles; clayey sand; structureless; pH 7.1; layer) EC 2 mS/m (very low salinity). pH measured in CaCl₂

Characteristic soil properties

- Organic, dark brown coloured topsoil
- Fine loamy sand, silty texture throughout
- Neutral soil pH throughout
- Good organic matter content throughout
- Effective rooting depth greater than 155 cm
- Possible perched watertable

Soil classification

Australian Soil Classification: Melanic Regolithic Chernic Tenosol (Isbell 1996)
PPF: Um4.22 buried profile (Northcote 1979)
Map units: 243Ya5, 243Mp (Jerramungup Land Resource Survey, reference profile JSI 1164)

Compiled by Tim Overheu, Natural Resources Assessment Group, Agriculture Western Australia, 1996
Agricultural land use and management

Chittowurup Soil Series  Brown sandy earth (Alluvial brown loam)

Although an alluvial loamy sand, it is similar to a deep fine textured sand. Nutrient status is good, however, long term retention may be poor, especially with potash and micronutrients. A suitable cereal/lupin rotation using minimum till and stubble retention, or revegetated with trees for shelter belts or agro-forestry is an appropriate land use.

Crops: Like the related yate loams, this soil has the potential to yield well with good management. Wheat, barley, oats, lupins and possibly canola are suitable crops.

Trees and shrubs: There is a multitude of suitable trees and shrubs, particularly with the good volume of soil for root development. The limiting factors will be nutrient retention and subsoil water.

Annual pastures: Subterranean clover is the recommended annual legume.

Perennial pastures: Couch, perennial veldt grass, Rhodes grass and phalaris may be appropriate on uncropped areas. Tagasaste and lucerne may persist where soils are moist.

Alternative options: This is a good soil for alternative land use because limited distribution does not make it a viable broadscale farming soil. It has good natural fertility and is well drained. Water availability and nutrient leaching will be the limiting factor for alternative options. Viticulture or even market gardening could be suitable provided an adequate supply of water for irrigation is available.

Soil characteristics and land conservation

Acidity  The topsoil pH is slightly acidic. This may not affect plant growth, but regular monitoring is advised depending on intensity of land use.

Dams & catchments  Not suitable for dams and catchments.

Salinity  Negligible, unless saline creep is moving out of the drainage channel.

Structural decline  Not prone to structure decline, although subsurface layers may compact.

Water availability  Fair. Water will drain through relatively quickly.

Water erosion  Generally unlikely, however if saturated and experiencing surface flow (e.g. flooding from adjacent river systems in a wet year), it will erode.

Water repellence  May become a problem, especially if legumes are grown.

Waterlogging  Low risk; a free-draining soil in which waterlogging is unusual.

Wind erosion  High to very high. Surface cover must be maintained as wind erosion can be extreme due to the loose, fine loamy topsoil.

Workability  Easy to work. Compacted layers may form between 15 and 30 cm because of cultivation. Deep ripping will alleviate the problem.

Notes:
Soil information sheet for the Jerramungup area

**Cobomup Soil Series**

**Yellow deep sand**

*(Deep yellow clayey sand)*

This is a deep sand, grey at the surface, grading to white, and overlying yellowish sand.

**Occurrence:** Not very widespread but occurs in association with other moderately deep duplex soils, dunes or lunettes. In the Jerramungup area it occurs as low sand dunes and deep sand sheets beside some of the river systems.

**Native vegetation:** Open shrub and mallee woodland including ridge-fruiting mallee *(Eucalyptus incrassata)*, blue mallee *(E. tetragona)*, narrow-leaf mallee *(E. angulosa)*, southern plains banksia *(Banksia media)* and jam wattle *(Acacia acuminata)*.

**Soil profile description**

<table>
<thead>
<tr>
<th>Depth (cm)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-6</td>
<td>Dark greyish brown (10YR 4/2); structureless, gritty loamy sand; pH 6.0; EC 6 mS/m (very low salinity); abrupt boundary.</td>
</tr>
<tr>
<td>6-48</td>
<td>Very pale brown (10YR 7/4); structureless sand; pH 5.0; EC 1 mS/m (very low salinity); abrupt boundary.</td>
</tr>
<tr>
<td>48-95</td>
<td>Brownish yellow (10YR 6/8); structureless sand; pH 6.2; EC 2 mS/m (very low salinity); clear boundary.</td>
</tr>
<tr>
<td>95-150</td>
<td>Yellowish brown (10YR 5/6) with distinctive red and very pale brown mottles; structureless clayey sand; pH 6.2; EC 4 mS/m (very low salinity).</td>
</tr>
</tbody>
</table>

pH measured in CaCl₂

**Characteristic soil properties**

- Coarse sandy topsoil
- Neutral to slightly acidic pH
- Effective rooting depth 2 m
- Topsoil can become water repellent
- Clay content increases slightly with depth
- Porous subsoil

**Soil classification**

*Australian Soil Classification:* Basic Arenic Bleached-Orthic Tenosol *(Isbell 1996)*

*PPF:* Ue2.21, rarely Dy5.82 *(Northcote 1979)*

*Map units:* 243Ug, 243Fz, 243Jm *(Jerramungup Land Resource Survey, reference profile JSI 1154)*

Compiled by Tim Overheu, Natural Resources Assessment Group, Agriculture Western Australia, 1996
Agricultural land use and management

**Cobomup Soil Series**

The soil is very low in nutrients, particularly potash. A cereal/lupin rotation using minimum tillage and stubble retention, or tagasaste (tree lucerne) might be suitable. Careful management must be observed to maintain surface vegetation to reduce wind erosion risk.

**Yellow deep sand**

*(Deep yellow clayey sand)*

Crops: Wheat, barley and lupins are suitable. It is necessary to direct drill in order to maintain surface stability and reduce wind erosion during establishment. Stubble retention is essential. Where water repellence is a problem, furrow sowing on the contour will allow early and more uniform crop establishment.

Trees and shrubs: Many suitable tree and shrub species, particularly with the good volume of soil for root development. The limiting factor for establishment will be the subsoil water availability. In the 400 to 500 mm rainfall zone, this soil may be suitable for *Pinus pinaster* shelter belts.

Annual pastures: Subterranean clover is suitable, provided surface potash levels are above 65 ppm. On land that is marginal for potash, early maturing serradella is an alternative.

Perennial pastures: Low rainfall and the light soil texture reduce the number of suitable perennial pasture varieties. Couch, perennial veldt grass and sheep’s burnet may be appropriate on uncropped areas. Tagasaste and lucerne may persist where the deep sands are moist.

Alternative options: Cobomup soil is moderately well to well drained, has good aeration and a good volume of soil for root development. Given a good supply of water for supplemental irrigation various alternative crops could be tried.

**Soil characteristics and land conservation**

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acidity</td>
<td>Prone to acidification. Regular monitoring is advised. Where the topsoil pH in CaCl₂ has fallen below 4.5, application of lime will be required.</td>
</tr>
<tr>
<td>Dams &amp; catchments</td>
<td>Not suitable for dams or roaded catchments.</td>
</tr>
<tr>
<td>Salinity</td>
<td>Not a problem, unless there is a perched saline watertable, or a discharge site at the base of the sand dune.</td>
</tr>
<tr>
<td>Structural decline</td>
<td>Possibility of a traffic pan developing. If so, will respond to deep ripping.</td>
</tr>
<tr>
<td>Water availability</td>
<td>Water availability will be low because of poor and patchy infiltration of early rains and poor water-holding capacity of the sandy soil.</td>
</tr>
<tr>
<td>Water erosion</td>
<td>Usually not a problem, but in some phases where water repellence can be a problem early in the season, poor infiltration of early rains can lead to run-off (particularly during thunderstorms) which can cause erosion.</td>
</tr>
<tr>
<td>Water repellence</td>
<td>Usually not a problem with the gritty topsoil, but in some phases, water repellence can be a problem early in the season till the soil wets up.</td>
</tr>
<tr>
<td>Waterlogging</td>
<td>Well drained and waterlogging is not a problem.</td>
</tr>
<tr>
<td>Wind erosion</td>
<td>Wind erosion is a serious problem. Stubble retention, restricted grazing in summer and autumn and establishment of windbreaks are necessary.</td>
</tr>
<tr>
<td>Workability</td>
<td>Good.</td>
</tr>
</tbody>
</table>

**Notes:**
Soil information sheet for the Jerramungup area

**Corinup-2 Soil Series**

This is a grey sand over a deep white sand. Usually, no yellowish brown coloured layer is encountered before 80 cm.

**Occurrence:** Commonly found along the south coastal areas of Boxwood Hills through to Bremer Bay, often in association with the long linear dunes and large swamp lunettes. Similar soils occur all along the South Coast from Albany to Esperance.

**Native vegetation:** The dominant vegetation is a mixture of scrub heath, such as chittick (*Lambertia inermis*), Baxter's banksia (*Banksia baxteri*) and candle stick banksia (*B. attenuata*). Eucalyptus mallee such as the tall sand mallee (*Eucalyptus eremophila*) and ridge-fruiting mallee (*E. increassata*) can sometimes be present where the depth to the clay or gravel layer is less.

**Soil profile description**

<table>
<thead>
<tr>
<th>Depth (cm)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-14</td>
<td>Dark grey (10YR 4/1) loamy fine sand; strongly water repellent, structureless; pH 5.2; EC 12 mS/m (very low salinity); abrupt boundary.</td>
</tr>
<tr>
<td>14-56</td>
<td>Light brownish grey (2.5Y 6/2) conspicuously bleached sand; structureless; pH 4.4. EC 2 mS/m (very low salinity); gradual boundary.</td>
</tr>
<tr>
<td>56-145</td>
<td>Light grey (10YR 7/2) sand; structureless; pH 4.5; EC 1 mS/m (negligible salinity); clear boundary.</td>
</tr>
<tr>
<td>145-160</td>
<td>Yellow (2.5Y 7/6) fine sand; 2-10% small brownish yellow mottles; structureless; pH 4.8; EC 1 mS/m (very low salinity), abrupt boundary.</td>
</tr>
<tr>
<td>160-170</td>
<td>Light yellowish (10YR 6/4) brown clayey sand; structureless; 10-20% medium sized ironstone gravel; pH 4.9, EC 1 mS/m (very low salinity).</td>
</tr>
</tbody>
</table>

pH measured in CaCl₂

**Characteristic soil properties**

- Very deep white sand
- Very loose topsoil
- Medium sand texture
- Negligible salinity throughout
- Rapidly to very well drained
- Neutral pH throughout

**Soil classification**

**Australian Soil Classification:** *Acidic Arenic Bleached-Orthic Tenosol* (Isbell 1996)

**PPF:** Uc2.21 (Northcote 1979)

**Map units:** 242Bb, 242Ch 243Hp3 (Jerramungup Land Resource Survey, reference profile JSI 1153)

Compiled by Tim Overheu, Natural Resources Assessment Group, Agriculture Western Australia, 1996
Agricultural land use and management

Corinup-2 Soil Series
Pale deep sand
(Deep white sand)

This is a very versatile soil and with reasonable annual rainfall, high yields can be obtained using high fertiliser input, especially potash and micro-nutrients. Suitable for cereal/lupin rotation using minimum till and stubble retention, or revegetated with trees for shelter belts or agroforestry.

Crops: Cereals rotated with lupins are recommended but other options include barley, triticale, oats and canola. Lupins can be highly successful if the manganese supply is adequate. Stubble retention systems are essential to maintain ground cover. Minimum tillage and/or direct drilling are recommended with occasional deep ripping to alleviate subsoil compaction. If water repellence develops, it may be necessary to seed with press wheels.

Trees and shrubs: Blue gums (Eucalyptus globulus) or Monterey pines (Pinus radiata) can be grown commercially in areas receiving 500 mm of rainfall. Rooting depth is good but saline groundwater at 200 cm will affect growth in some places.

Annual pastures: Subterranean clover grows with difficulty because of low potash, which is readily leached. Serradella is an alternative. Extreme care must be taken with grazing strategies.

Perennial pastures: A mix of serradella and veldt grass provides the best long-term option. Lucerne is suitable but insects are a problem. Other options include phalaris, fescue or brumby perennial rye grass. Console lovegrass and Rhodes grass have potential.

Alternative options: Pinus pinaster in areas receiving 400 to 500 mm of rainfall for commercial saw logs or shelter belts may be an alternative.

Soil characteristics and land conservation

Acidity
The slightly acidic pH is within the acceptable range for most recommended cereal crops. This is not affecting plant growth, but will increase after longer agricultural production.

Dams & catchments
Flat batter dams can be built, but only when clay is within 90 cm of the surface. Not suitable for catchments and earthworks.

Salinity
Negligible, without saline groundwater.

Structural decline
Not prone to surface structure decline.

Water availability
Low. Water draining through this soil can add significantly to groundwater recharge.

Water erosion
Generally unlikely, however will erode if saturated and experiencing surface flow (e.g. river systems in a wet year).

Water repellence
May become a problem, especially if legumes are grown.

Waterlogging
Low risk. This is a free-draining soil in which waterlogging is unusual.

Wind erosion
High to very high. Surface cover must be maintained to protect the loose, fine sandy topsoil.

Workability
Easy to work. Compacted layers may form between 15 and 30 cm because of cultivation. Deep ripping will alleviate the problem.

Notes:
Soil information sheet for the Jerramungup area

Courang Soil Series

This has a coarse loamy sand topsoil grading to a yellowish sand. At 30 to 80 cm the sandy surface layers directly overlie a clay subsoil. Weathering granite is often encountered at 80 to 100 cm.

Occurrence: Often near small granite outcrops. It is a common association found more often around Jerramungup and Ongerup on the upper valley slopes of the dissected drainage systems than the Gairdner area where it phases out with the increased coastal influence. It is related to the Jura Soil Series, common around north Jerramungup and Ravensthorpe.

Native vegetation: In its natural state, this soil supports a dense stand of granite sheoak (Allocasuarina hugeliana), with the occasional flat-topped yate (Eucalyptus occidentalis) and jam wattle (Acacia acuminata). Other understorey vegetation is often inhibited by the sheoak's thick canopy and dense drop of needles.

Soil profile description

<table>
<thead>
<tr>
<th>Depth (cm)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
<td>Very dark greyish brown (10YR 3/2) coarse loamy sand; &lt;2% medium sized quartz fragments; pH 4.4; EC 8 mS/m (very low salinity); abrupt boundary.</td>
</tr>
<tr>
<td>10-22</td>
<td>Dark yellowish brown (10YR 4/6) structureless sand; 2-10% small quartz fragments; &lt;2% medium sized gravels; pH 4.2; EC 3 mS/m (very low salinity); clear boundary.</td>
</tr>
<tr>
<td>22-30</td>
<td>Brownish yellow (10YR 6/6) structureless sand; pH 5.0; EC 4 mS/m (very low salinity); abrupt boundary.</td>
</tr>
<tr>
<td>30-70</td>
<td>Yellowish brown (10YR 5/6) gritty, medium clay with yellowish red mottles; strong blocky structure; slightly dispersive; pH 5.9; EC 18 mS/m (very low salinity).</td>
</tr>
<tr>
<td>70+</td>
<td>Decomposing granite.</td>
</tr>
</tbody>
</table>

pH measured in CaCl₂

Characteristic soil properties

- Coarse sandy texture above the clay
- Slightly acidic to neutral soil pH trend
- Pale brownish colour
- Effective rooting depth 30 to 80 cm
- Decomposing granite at 30 to 80 cm
- Possible perched watertable above the granite

Soil classification

Australian Soil Classification: Mesotrophic Mottled-Mesonatric Brown Sodosol (Isbell 1996)
PPF: Dy5.82 (Northcote 1979)
Map units: 243Ya, 243Ug, 243Fz (Jerramungup Land Resource Survey, reference profile JSI 1139)

Compiled by Tim Overheu, Natural Resources Assessment Group, Agriculture Western Australia, 1996
Agricultural land use and management

*Courang Soil Series*  
*Grey deep sandy duplex*  
*(Sheoak soil)*

Usually a shallow soil (often with less than 50 cm to the underlying bedrock) so has to be managed with care to prevent erosion. The coarse sandy topsoil may lack adequate nutrients.

Crops: Wheat, barley and oats are the recommended cereals. Narrow leaf lupins are possible on the deeper phases, but not recommended unless there is more than 50 cm of soil above the decomposing rock. Canola may also be possible on the deeper phases. Minimum tillage and stubble retention are also recommended.

Trees and shrubs: Suitable for a number of ornamental and native species from the myrtle (*Eucalyptus* and *Melaleuca* species) and protea families (*Grevillea, Callistemon, Dryandra*). Vegetation should be chosen carefully because of the shallow depth to bedrock.

Annual pastures: Subterranean clover, ryegrass, yellow serradella (*Ornithopus compressus*) and pink serradella (*Ornithopus sativus*) are recommended.

Perennial pastures: Depending on the rainfall zone, there are many pasture options. Some suitable pastures are Rhodes grass, cocksfoot, veldt grass, couch and tall wheatgrass.

Alternative options: Quinoa as an alternative cereal grain. On the deeper phases of this soil, *Pinus pinaster* could be suitable, providing a small shelter area for stock as well as possibly reducing groundwater recharge. Evening primrose could also be considered.

**Soil characteristics and land conservation**

- **Acidity**: May not be a problem for several years after clearing as the weathering products from the granite will buffer the acidity.

- **Dams & catchments**: Not suitable as the soil is often too shallow.

- **Salinity**: Usually not a problem unless there is a seep because of high bedrock and forced groundwater discharge.

- **Structural decline**: Will not be a problem because of the coarse sandy topsoil. The porosity of the subsoil clay will decrease with excessive cultivation on the shallower phases, and increased water infiltration.

- **Water availability**: Can be low where the soils are shallow and lighter. In deeper soils where the sand grades to a clay layer, the water availability is better.

- **Water erosion**: Can be serious on sloping land, especially if there is run-on from rock outcrops upslope. Surface water control measures where possible are recommended (either by grade banks where suitable or by intercepting vegetation).

- **Water repellence**: Generally not a problem because of the coarse textured topsoils.

- **Waterlogging**: Generally well drained, however can waterlog easily in shallower phases with the weathering bedrock at less than 30 cm.

- **Wind erosion**: A problem if the soil is loosened by stock when dry. Stubble retention and restricted grazing in summer and autumn are necessary.

- **Workability**: Good.
Soil information sheet for the Jerramungup area

**Cullyerbullup Soil Series**

This soil is a colluvial brown loam with a number of buried layers. The topsoil is a gritty to coarse loam to sandy clay loam. The subsoil is a dense, sodic, alkaline light medium clay that overlies a buried medium to heavy clay.

**Occurrence:** Associated with the dissected granitic drainage landscapes common around Jerramungup and Ongerup and related to the (Yarmarlup) yate loams found further upslope. It is most frequent on long valley slopes preceding the drainage channel. The common slope is 3 to 5% and the relief is greater than 9 m.

**Native vegetation:** The dominant vegetation is the flat-topped yate (*Eucalyptus occidentalis*). Other vegetation is granite sheoak (*Allocasuarina hugeliana*), and closer to drainage channels, jam wattle (*Acacia acuminata*), lesser bottlebrush (*Callistemon phoeniceus*), quandong (*Santalum acuminatum*), needlebush (*Hakea preissii*), grasses and sedges.

**Soil profile description**

<table>
<thead>
<tr>
<th>Depth (cm)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
<td>Very dark brown (10YR 2/2) structureless sandy loam; &lt;2% medium sized quartz fragments; pH 5.7 EC 8 mS/m (very low salinity); abrupt boundary.</td>
</tr>
<tr>
<td>10-18</td>
<td>Very dark brown (10YR 2/2) structureless, sandy clay loam; 10-20% medium granite fragments; pH 6.2; EC 4 mS/m (very low salinity); clear, wavy boundary.</td>
</tr>
<tr>
<td>18-20</td>
<td>20-50% large, rounded (colluvial) granite fragments, abrupt boundary.</td>
</tr>
<tr>
<td>20-45</td>
<td>Dark brown (7.5YR 3/4) coarse sandy, light medium clay with faint brown mottles; strong, blocky structure; pH 7.1; EC 12 mS/m (very low salinity); clear boundary.</td>
</tr>
<tr>
<td>45-66</td>
<td>Dark yellowish brown (10YR 4/6) structureless light clay with distinct white mottles; slightly dispersive; moderately calcareous; pH 8.5; EC 48 mS/m (moderate salinity); abrupt boundary.</td>
</tr>
<tr>
<td>66-140</td>
<td>Dark yellowish brown (10YR 4/4) gritty, clay loam with distinct olive-grey mottles; sandy; 20-50% medium sized, granite fragments; slightly dispersive; pH 7.6; EC 10 mS/m (very low salinity).</td>
</tr>
</tbody>
</table>

pH measured in CaCl₂

**Characteristic soil properties**

- Gritty topsoil texture
- Distinct reddish brown colour
- Low salinity
- Neutral to slightly alkaline soil pH

**Soil classification**

**Australian Soil Classification:** Sodic Calcic Brown Dermosol (Isbell 1996)

**PPF:** Gn3.53 (Northcote 1979)

**Map units:** 243Ya, 243Ug, 243Mp (Jerramungup Land Resource Survey, reference profile JSI 1140)

Compiled by Tim Overheu, Natural Resources Assessment Group, Agriculture Western Australia, 1996
Agricultural land use and management

Cullyerbulp Soil Series

Red loamy earth
(Yate loam)

The Cullyerbulp soil and the related yate loams have the potential to yield highly given appropriate management. Stubble retention and minimum tillage are necessary to maintain soil stability, good fertility, drainage and yield potential.

Crops: Wheat, barley, oats and canola are recommended. Lupins may not be suitable because of the shallow rooting depth. Pulse crops may be suitable for rotation including faba beans, field peas, chickpeas and albus lupins. However, these legumes can leave the soil surface exposed during summer, increasing the wind erosion risk.

Trees and shrubs: Several native and ornamental tree and shrub species are suitable. The red flowering gum (Eucalyptus ficifolia) is an attractive tree that grows well on this soil. Retaining a natural vegetation selection such as the flat-topped yate (Eucalyptus occidentalis), kunzea, grevillea or melaleuca shrubs is appropriate.

Annual pastures: Subterranean clover is the recommended pasture legume with ryegrass.

Perennial pastures: In moist areas and along water courses, Rhodes grass, strawberry clover, cocksfoot, veldt grass, couch and tall wheatgrass are suitable.

Alternative options: The Cullyerbulp soil (and related yate loam) has good natural fertility and is well drained. Its potential for alternative uses is high. Even viticulture could be suitable, although an adequate supply of water would be the limiting factor.

Soil characteristics and land conservation

Acidity
The topsoil is buffered by the alkaline clay subsoil. Risk of surface acidification is low.

Dams & catchments
Suitable, although the slope on which this soil occurs and colluvial granite boulders in the soil profile may present some problems. Suitable for shallow earthworks e.g. banks.

Salinity
Low. May be a problem on the lower valley slopes, or where hillside seeps are present.

Structural decline
Susceptible to surface compaction. Lower subsoil is sodic and dispersive.

Water availability
Good. Clay content throughout assists in retaining moisture over the growing season.

Water erosion
Moderate to high risk, particularly on sloping land where there is run-on from upslope. Surface water control measures are recommended.

Water repellence
Generally not a problem with the clay in the topsoil.

Waterlogging
Low because of the landscape relief. Moderately well drained.

Wind erosion
High risk, particularly if summer stocking rates are high.

Workability
Very good, except in stony variants of this soil.

Notes:
**Soil information sheet for the Jerramungup area**

**Jarramlee Soil Series**

**Grey shallow sandy duplex**

*(Swamp Road shallow gravel)*

This is a shallow gravelly sand (although other phases occur where sand over the gravel is deeper), over an often indurated layer, over a mottled, gleyed yellow clay.

**Occurrence:** One of the more common soils over the lower coastal plain area of the Hillup and Bremer Systems. Usually occurs on level to very gently undulating plains, where the relief is less than 9 m and the slope is 0-3%.

**Native vegetation:** A mixture of native vegetation is usually found, ranging from dense mallee comprising silver mallee (Eucalyptus falcata), redheart moit (E. decipiens) and Albany blackbutt (E. staeri) to dense scrub heath consisting of cauliflower hakea (Hakea corymbosa), Hakea pandanocarpa, oak-leaved dryandra (Dryandra quercifolia) and others.

**Soil profile description**

<table>
<thead>
<tr>
<th>Depth (cm)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-8</td>
<td>Very dark greyish brown (10YR 3/2) structureless loamy fine sand; 2-10% medium sized ironstone gravels; slightly water repellent; pH 4.8; EC 11 mS/m (very low salinity); abrupt boundary.</td>
</tr>
<tr>
<td>8-11</td>
<td>Brown (10YR 5/3) structureless, fine sand; 2-10% small ironstone gravels; pH 5.1; EC 6 mS/m (very low salinity); clear boundary.</td>
</tr>
<tr>
<td>11-28</td>
<td>Light yellowish brown (10YR 6/4) structureless sand; &gt;50% very large ironstone gravels; pH 5.8; EC 9 mS/m (very low salinity); clear boundary.</td>
</tr>
<tr>
<td>28-38</td>
<td>Very pale brown (10YR 7/4); structureless sand; &gt;50% medium sized ironstone gravels, pH 6.0; EC 9 mS/m (very low salinity); clear boundary.</td>
</tr>
<tr>
<td>38-70</td>
<td>Brownish yellow (10YR 6/6) structureless, sandy clay loam with distinctive, small, light grey mottles; 2-10% coarse gravel fragments; 10-20% small ironstone gravel; pH 6.0; EC 9 mS/m (very low salinity); abrupt boundary.</td>
</tr>
<tr>
<td>70 +</td>
<td>Brownish yellow (10YR 6/8) sandy light medium clay with distinctive, light grey small mottles; weak blocky structure; &lt;2% small ironstone gravel; pH 6.1; EC 9 mS/m (very low salinity).</td>
</tr>
</tbody>
</table>

**pH measured in CaCl₂**

**Characteristic soil properties**

- Loose sandy surface
- Possible topsoil acidification risk
- Low water-holding capacity in topsoil
- Gravelly throughout subsoil
- Poorly structured sodic subsoil
- Effective rooting depth to 30 cm

**Soil classification**

**Australian Soil Classification:** Ferric-Sodic Mesotrophic Yellow Chromosol (Isbell 1996)

**PPF:** Dy5.82 (Northcote 1979)

**Map units:** 242Bb, 242Jo, 243Hp, 243Lg (Jerramungup Land Resource Survey, reference profile JSI 1148)

Compiled by Tim Overheu. Natural Resources Assessment Group. Agriculture Western Australia. 1996
Agricultural land use and management

**Jarramlee Soil Series**

*Grey shallow sandy duplex (Swamp Road shallow gravel)*

The most suitable land use is determined by the depth of sand to the clay. If the sand is deep, the soil will behave more like a Swamp Road moderately deep gravel or a Corinup sand. If the soil is shallow, waterlogging may limit options. Cereal/pasture rotations using minimum tillage, or continuous pasture may be suitable.

**Crops:** Cereals grow well on sites free of waterlogging. If soil is shallower than 50 cm to clay and prone to waterlogging, avoid wheat and lupin rotations and crop barley or oats infrequently. If soil is well drained, lupins, wheat and canola are suitable. Stubble retention is necessary in multiple cropping, and direct drilling or minimum tillage should be adopted.

**Trees and shrubs:** May not grow well because of restricted rooting depth and risk of waterlogging.

**Annual pastures:** If poorly drained, it is necessary to plant balansa clover or subtropical clovers such as trikkala which tolerate waterlogging. Serradella is an option in well drained areas.

**Perennial pastures:** On poorly drained sites plant pastures such as phalaris, fescue, brumby, perennial rye or tall wheatgrass. Serradella and veldt grass are options for well drained sites.

**Alternative options:** The Jarramlee soil has reasonably good nutrient availability, good soil workability. Alternative land use options could include floriculture or quinoa cereal grain.

**Soil characteristics and land conservation**

**Acidity**

Could become a problem, but not yet affecting plant growth. These soils have high risk of surface or topsoil acidification. Monitoring is required.

**Dams & catchments**

Possible to build dams, but catchments are ineffective because of the sandy surface and low gradient which makes them difficult to fill. Unsuitable for other earthworks.

**Salinity**

Common over low lying areas associated with waterlogging.

**Structural decline**

Not prone to surface structural decline.

**Water availability**

Low to moderate water-holding capacity.

**Water erosion**

May occur on sloping sites if the sand layer is shallow and becomes saturated.

**Water repellence**

Topsoil can become strongly water repellent.

**Waterlogging**

Moderate to high risk. Unless on a sloping site, drainage may be a problem because of the depth to clay.

**Wind erosion**

Will occur unless there is more than 50% gravel on the surface.

**Workability**

Good, because of the loose sandy surface. Subsoil may compact if the sand is deeper than 30 cm. Deep ripping will alleviate the problem.

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**Notes:**
Soil information sheet for the Jerramungup area

**Jarramlee Soil Series**

**Grey deep sandy duplex**

*(Swamp Road gravel)*

This is a gravelly sand (although other phases can occur where the depth of sand over the gravel may vary), over an often dense gravelly layer over a mottled, gleyed yellow clay.

**Occurrence:** This is one of the more common soils over the lower coastal plains of the Hillup and Bremer systems. It usually occurs on the level to very gently undulating plains, where the relief is less than 9 m and the slope is 0 to 3%.

**Native vegetation:** A mixture of native vegetation is usually found, ranging from dense mallee scrub of blue mallee (*Eucalyptus tetragona*), silver mallee (*E. falcata*), ball-fruited mallee (*E. bupestium*) and redheart moit (*E. decipiens*) to low heath. A common association is mallee and dense scrub heath consisting of cauliflower hakea (*Hakea corymbosa*), *Hakea pandanocarpa*, oak-leaved dryandra (*Dryandra quercifolia*) and *Melaleuca* spp.

**Soil profile description**

<table>
<thead>
<tr>
<th>Depth (cm)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-16</td>
<td>Very dark greyish brown (10YR 3/2) loamy sand; weak structure; many medium sized ironstone gravels; slightly water repellent; pH 4.6; EC 1 mS/m (very low salinity); clear boundary.</td>
</tr>
<tr>
<td>16-70</td>
<td>Light grey (10YR 7/2) sand; weak structure; 50 to 90% medium ironstone gravels; pH 5.1; EC 6 mS/m (very low salinity); clear boundary.</td>
</tr>
<tr>
<td>70-142</td>
<td>Very pale brown (10YR 7/4) sandy light medium clay; poor structure; &gt;50% medium sized ironstone gravels; pH 5.9; EC 11 mS/m (very low salinity).</td>
</tr>
</tbody>
</table>

pH measured in CaCl₂

**Characteristic soil properties**

- Often water repellent topsoil
- Dense gravelly subsoil
- Topsoil can be slightly acidic
  - Poorly structured subsoil
  - Can be slow to drain
  - Effective rooting depth to 70 cm

**Soil classification**

**Australian Soil Classification:** Basic Ferric Orthic Tenosol (Isbell 1996)

**PPF:** Dy5.82 (Northcote 1979)

**Map units:** 242Bb, 243Hp, 243Lp, 243Lg, 243Ug (Jerramungup Land Resource Survey, reference profile JSI 1146)

Compiled by Tim Overheu, Natural Resources Assessment Group, Agriculture Western Australia, 1996
Agricultural land use and management

**Jarramlee Soil Series**

This is a versatile and productive soil with a deep layer of sand over gravelly clay. However, all nutrients leach from these deep sands, especially potash which is deficient. A cereal/lupin/canola rotation or pasture/cereal rotation using minimum tillage and stubble retention would be suitable.

Crops: The best options are lupin/wheat or wheat/pasture rotations. Barley and oats can be grown with canola. Peas are not suitable because of the high risk of wind erosion. It is necessary to maintain stubble in multiple cropping operations and advisable to use direct drilling or minimum tillage.

Trees and shrubs: Blue gums (*Eucalyptus globulus*) may be planted for shelter but not for high production because of the limited depth of sand over clay and possible high watertables.

Annual pastures: Subterranean clover is the best choice.

Perennial pastures: A mix of serradella and veldt grass provides the best option for long-term pasture. Lucerne dislikes waterlogging and water may be held in the subsoil above the clay. Other options include phalaris, fescue, brumby and perennial rye grass. Console love grass and Rhodes grass have potential.

Alternative options: The Jarramlee soil has adequate nutrients, soil workability and rooting depth. Agroforestry and floriculture could be suitable.

**Soil characteristics and land conservation**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Acidity</strong></td>
<td>Not yet affecting plant growth but in future could become acidic.</td>
</tr>
<tr>
<td><strong>Dams &amp; catchments</strong></td>
<td>Dams can be constructed because of the clay but catchments are difficult because of the sandy surface and lack of gradient. Not suitable for other earthworks unless clay is within 40 cm of the surface.</td>
</tr>
<tr>
<td><strong>Salinity</strong></td>
<td>Can occur in low lying areas.</td>
</tr>
<tr>
<td><strong>Structural decline</strong></td>
<td>Low, because of the sandy surface. The subsoil clay is slightly dispersive, and could cause problems if brought to the surface.</td>
</tr>
<tr>
<td><strong>Water availability</strong></td>
<td>Low water-holding capacity, but can be high on level ground.</td>
</tr>
<tr>
<td><strong>Water erosion</strong></td>
<td>Low risk, increasing where soils are saturated and receive large volumes of water from upslope.</td>
</tr>
<tr>
<td><strong>Water repellence</strong></td>
<td>Could develop, especially if legumes are used in the rotation.</td>
</tr>
<tr>
<td><strong>Waterlogging</strong></td>
<td>Generally well drained but depends on the depth of sand and gravel over the clay. If sand and gravel layers are shallow, waterlogging may occur (see Jarramlee, Swamp Road shallow gravelly sand).</td>
</tr>
<tr>
<td><strong>Wind erosion</strong></td>
<td>Prone to wind erosion and the surface must be protected at all times.</td>
</tr>
<tr>
<td><strong>Workability</strong></td>
<td>Good. Subsurface compaction possible at 15 to 30 cm but can be alleviated by deep ripping.</td>
</tr>
</tbody>
</table>

Notes:
Soil information sheet for the Jerramungup area

**Kindalika Soil Series**

Hard cracking clay (Crabhole depression)

The Kindalika soil is a heavy textured crabhole (gilgai) soil which has a dark organic clay loam topsoil over a strongly mottled light medium to medium clay subsoil.

**Occurrence:** Crabhole soils are easily recognised and occur as a series of small mounds with an adjacent hole. They should not be confused with natural swamps. There is often great variability, but generally they are heavy textured, deeply cracked, strongly mottled and neutral in pH.

**Native vegetation:** Vegetation, even in the natural state is often quite sparse, with perhaps only one or two strata and very little undergrowth. The dominant association is a low mallee or mallet woodland of clay mallee (*Eucalyptus recondita*), swamp mallet (*E. spathulata*), pin cushion hakea (*Hakea laurina*) or tea-tree (*Melaleuca preissiana*) and swamp paperbark (*M. cuticularis*). Reeds and weeds are common in the cleared state.

**Soil profile description**

<table>
<thead>
<tr>
<th>Depth (cm)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-7</td>
<td>Dark brown (10YR 3/3) fine sandy clay loam; structureless; 20-50% medium sized gravels; pH 5.0; EC 16 mS/m (very low salinity); abrupt boundary.</td>
</tr>
<tr>
<td>7-32</td>
<td>Pale red (2.5YR 6/2) gritty, light medium clay with distinct brownish yellow mottles; strong prismatic structure; 2-10% small gravels; pH 5.2; EC 10 mS/m (very low salinity); gradual tongued boundary.</td>
</tr>
<tr>
<td>32-60</td>
<td>Yellowish brown (10YR 5/8) sandy, light medium clay with distinct red mottles; strong prismatic structure; &lt;2% small gravels; pH 4.4; EC 10 mS/m (very low salinity); gradual boundary.</td>
</tr>
<tr>
<td>60-105</td>
<td>Light brownish grey (10YR 6/2) medium clay with prominent dark yellowish brown and distinct brownish yellow mottles; prismatic structure; &lt;2% small gravels; pH 4.0; EC 24 mS/m (low salinity); gradual boundary.</td>
</tr>
<tr>
<td>105-140</td>
<td>Light grey (2.5Y 7/2) medium clay; with prominent dark red and yellowish red mottles; structureless; pH 3.9; EC 38 mS/m (low salinity).</td>
</tr>
</tbody>
</table>

pH measured in CaCl₂

**Characteristic soil properties**

- Heavy texture throughout
- Deep cracks on the surface
- Acidic soil pH trend
- Strongly sodic subsoil (ESP >20%)
- Seasonally inundated for 2-3 months
- Often a perched saline watertable at depth

**Soil classification**

Australian Soil Classification: **Episodic-Endoacidic Massive Grey Vertosol** (Isbell 1996)

Map units: **243Hp variants are found in many units** (Jerramungup Land Resource Survey, reference profile JSI 1141)

Compiled by Tim Overheu, Natural Resources Assessment Group, Agriculture Western Australia, 1996
Agricultural land use and management

Kindalika Soil Series

Hard cracking clay
(Crabhole depression)

This is a difficult soil whose best use is for pasture that tolerates heavy soil and waterlogging. Machinery limitations and waterlogging generally make cropping non-viable.

Crops: Although it is unwise to cultivate crabhole country, various crops can be grown. The more saline or acidic phases may not perform at all. It is important to check pH before selection as it varies through mixing with nearby alkaline soils. Wheat (preferred), barley, peas, canola and faba beans are suitable, but will only perform well in average to low rainfall years. Direct drilling when the soil is at field capacity is necessary to maintain soil structure and associated benefits.

Trees and shrubs: Waterlogging, heavy texture and shallow rooting depth limit the choice of suitable trees. This soil is well suited to a large variety of *Melaleuca* species.

Annual pastures: Acid-tolerant medics such as burr medics and sub. clover can be grown on the slightly acidic phases. Barrel medics are better suited to alkaline soils.

Perennial pastures: Lower rainfall and heavy texture reduce the number of suitable pasture varieties. Tall wheatgrass may succeed and puccinellia and salt water couch suit salt-affected areas. Phalaris may grow in crabhole areas unsuitable for cropping. Where this soil occurs in a higher rainfall zone, many perennial pastures may be suitable.

Alternative options: Floriculture.

Soil characteristics and land conservation

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acidity</td>
<td>Not likely to be a problem for many years.</td>
</tr>
<tr>
<td>Dams &amp; catchments</td>
<td>Marginally suitable for dam construction; but difficult to fill. Building suitable catchments is difficult in crabhole country.</td>
</tr>
<tr>
<td>Salinity</td>
<td>Frequently associated with waterlogging.</td>
</tr>
<tr>
<td>Structural decline</td>
<td>Sometimes called a ‘Sunday soil’. Excessive or inappropriate cultivation at the wrong moisture state will damage surface structure reducing infiltration. If the surface is self-mulching it will be prone to temporary crusting but may eventually regenerate when worked under optimal conditions. Becomes slippery when wet.</td>
</tr>
<tr>
<td>Water availability</td>
<td>Low, as the clay holds water tightly.</td>
</tr>
<tr>
<td>Water erosion</td>
<td>Possible on sloping land, especially if the surface is hard or sealed.</td>
</tr>
<tr>
<td>Water repellence</td>
<td>Not a problem.</td>
</tr>
<tr>
<td>Waterlogging</td>
<td>Tends to become waterlogged after every rain.</td>
</tr>
<tr>
<td>Wind erosion</td>
<td>Unlikely, except on the self-mulching crabhole soils.</td>
</tr>
<tr>
<td>Workability</td>
<td>Cultivating over crabholes is not recommended because of the degradation of soil structure, especially if the crabholes are deep or the surface sets hard. May respond to gypsum.</td>
</tr>
</tbody>
</table>

Notes:
Soil information sheet for the Jerramungup area

**Moorungup Soil Series**

Grey shallow loamy duplex
*(Gritty shallow sand over clay)*

This is a medium to shallow sandy loam over a yellowish brown domed clay. The subsoil is dense, and sodic and the pH is usually neutral throughout.

**Occurrence:** One of the dominant soils over the gently undulating plains of the central and upper Jerramungup area. The representative profile described below was from the Jerramungup north area (Rabbit Proof Fence Rd). It is found as far south as Gairdner, across to Fitzgerald to the east and Ongerup to the west.

**Native vegetation:** Dominant vegetation comprises mallee eucalypts: hook-leaved mallee (*Eucalyptus uncinata*), yellow-flowered mallee (*E. xanthonema*), silver mallee (*E. falcata*) and merrit (*Eucalyptus flocktoniae*), with other heath vegetation such as honeymyrtle (*Melaleuca aff. undulata*) and scrubby sheoak (*Allocasuarina campestris*).

**Soil profile description**

<table>
<thead>
<tr>
<th>Depth (cm)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
<td>Very dark greyish brown (10YR 3/2) sandy loam; structureless; &lt;2% medium sized quartz fragments; pH 5.2; EC 78 mS/m (moderate salinity); clear boundary.</td>
</tr>
<tr>
<td>10-40</td>
<td>Light yellowish brown (2.5Y 6/4) sandy, light medium clay with faint brownish yellow mottles; polyhedral structure; slightly dispersive; pH 7.9; EC 140 mS/m (high salinity); clear boundary.</td>
</tr>
<tr>
<td>40-60</td>
<td>Light yellowish brown (2.5Y 6/4) sandy medium clay with prominent red mottles; blocky structure; slightly dispersive; pH 7.8; EC 160 mS/m (high salinity); clear boundary.</td>
</tr>
<tr>
<td>60-100</td>
<td>Light grey (10YR 7/2) sandy medium clay with prominent red and white mottles; blocky structure; slightly dispersive and slaking; pH 7.3; EC 200 mS/m (very high salinity); abrupt boundary.</td>
</tr>
<tr>
<td>100-130</td>
<td>Light grey (5Y 7/2) sandy light medium clay with prominent yellowish red and red mottles; weathering granite; &lt;2% small quartz fragments; slightly slaking; pH 6.0; EC 330 mS/m (very high salinity).</td>
</tr>
</tbody>
</table>

pH measured in CaCl₂

**Characteristic soil properties**

- Coarse sandy topsoil with quartz grit
- Subsoil clay usually pasty to pale brown
- Effective rooting depth 10 to 20 cm
- Sodicity increases with depth
- Significantly salt-affected at depth
- Possible perched saline watertable at depth

**Soil classification**

Australian Soil Classification: *Mesotrophic Mottled-Hypernatric Yellow Sodosol* (Isbell 1996)

PPF: *Dy 3.12* (Northcote 1979)

Map units: 243Ug, 243Jm, 243Fz (Jerramungup Land Resource Survey, reference profile JSI 1160)

Compiled by Tim Overheu, Natural Resources Assessment Group, Agriculture Western Australia, 1996
Agricultural land use and management

Moorungup Soil Series

Grey shallow loamy duplex
(Gritty shallow sand over clay)

Surface crusting or hardsetting is possible. Erosion can be a problem on sloping ground, especially if there is run-on from upslope, as this soil is dispersive. If appropriately managed by improving the drainage and reducing tillage, it will yield well.

Crops: Wheat, barley and oats in pasture rotations or canola where waterlogging is not a problem. Peas can be grown, although some areas are prone to wind erosion. It is possible to grow lupins on the better drained and deeper sandier phases. Suitable for rotations including faba beans, field peas, chickpeas and albus lupin. Shallow rooting depth and seasonal waterlogging may be a problem, particularly with chickpeas. Reduced tillage is recommended to decrease the risk of wind erosion. Wheat can yield 2.5 t/ha; barley to 3 t/ha; and canola to 1 t/ha.

Trees and shrubs: Several native and ornamental species are suitable. The depth of sand over the clay is the limiting factor for tree establishment. Oil mallees could be an option. Contact your local Revegetation Officer for more details.

Annual pastures: Subterranean clover is the recommended legume.

Perennial pastures: Rainfall is marginal (380 to 450 mm) for good perennial grass establishment. Depending on the condition and location of the soil, tall wheatgrass, tall fescue and phalaris may be grown.

Alternative options: A good alternative land use would be incorporating lucerne into the cropping rotation. Lucerne (Medicago sativa) tolerates the heavier soil, subsoil salinity and neutral to alkaline soil pH trend.

Soil characteristics and land conservation

Acidity
Usually not a problem as the subsoil clay buffers the topsoil. Regular monitoring is advised.

Dams & catchments
Suitable for earthworks. Dams may be possible only where there is no perched or shallow saline groundwater.

Salinity
Could be a problem in low lying areas with rising groundwater, or impediments to subsoil drainage such as dolerite dykes.

Structural decline
Moderate to high; excessive cultivation when the soil is too wet may lead to hardsetting or surface crusting. Exposure of the tilled soil to raindrop impact can cause surface dispersion leading to surface sealing. Gypsum application may be appropriate.

Water availability
Fair to good depending on the soil structure. Good where the surface condition has been maintained by conservation tillage and stubble retention. A hardset or crusted surface will result in reduced infiltration of rain decreasing the water availability.

Water erosion
A potential problem because of the dispersive subsoil and slope of land.

Water repellence
Usually not a problem.

Waterlogging
Waterlogging can be a serious problem, particularly in low lying areas.

Wind erosion
Usually not a problem.

Workability
Limited by soil moisture range. Poor trafficability when too wet.
Soil information sheet for the Jerramungup area

Notalika Soil Series

The Notalika soil is the mound adjacent to the hole associated with crabhole gilgai soils. Although there are a lot of variations of this soil, certain features remain fairly constant, such as the saline and strongly alkaline nature.

Occurrence: Crabhole or gilgai soils are easily recognised as a series of small mounds with an adjacent hole. The Notalika soil occurs as the adjacent mound to the crabhole. There is often great variability in the soils in mounds adjacent to crabhole gilgai, but generally they are silty or light textured, fluffy, cracked on the surface and alkaline in pH.

Native vegetation: Even in the natural state this is often quite sparse, with perhaps only one or two strata, and very little undergrowth. The dominant association is a low mallee or mallet sparse woodland of gimlet (Eucalyptus salubris), swamp mallet (Eucalyptus spathulata) and pin cushion hakea (Hakea laurina) or tea-tree (Melaleuca preissiana).

Soil profile description

Depth (cm)

0-6 Dark brown (10YR 3/3) sandy, light medium clay with faint yellowish brown and distinct red mottles; polyhedral structure; <2% large limestone fragments; <2% coarse gravels; slightly slaking; pH 7.1; EC 28 mS/m (low salinity); clear boundary.

6-41 Light olive-brown (2.5Y 5/6) medium to heavy clay with faint light yellowish brown mottles; strong, angular blocky structure; completely slaking and dispersive; pH 8.5; EC 63 mS/m (moderate salinity); gradual boundary.

41-148 Light olive-brown (2.5Y 5/4) medium heavy clay with faint light yellowish brown mottles; blocky structure; completely slaking; pH 7.8; EC 180 mS/m (very high salinity).

pH measured in CaCl₂

Characteristic soil properties

- Brown crumbly topsoil
- Gravelly calcareous fragments in topsoil
- Moderate to high salinity throughout
- Strongly sodic subsoil (ESP >35%)
- Neutral to alkaline pH trend
- Well structured throughout

Soil classification

Australian Soil Classification: Episodic-Epicalcareous Epipedal Brown Vertosol (Isbell 1996)

PPF: Uf6.4 (Northcote 1979)

Map units: 242Bb, 243Hp, 243Lg (Jerramungup Land Resource Survey, reference profile JSI 1166, although variants of this soil are found in many map units)

Compiled by Tim Overheu, Natural Resources Assessment Group, Agriculture Western Australia, 1996
Agricultural land use and management

**Notalika Soil Series**

Grey non-cracking clay  
*(Crabhole mound soil)*

Generally, this soil yields poorly as it is highly alkaline, inhibiting nutrient availability. It should be maintained under natural vegetation, or if cleared, planted to salt-tolerant fodder shrubs and grazed in rotation.

**Crops:** Marginal for cereals. Boron toxicity, subsoil salinity and high alkalinity are limiting factors. Boron toxicity is more significant in dry years. Barley is more suitable than wheat as it tolerates higher alkalinity and poor drainage. The recommended variety is Skiff. It is unsuitable for grain legumes (lupins, peas) because of alkalinity.

**Trees and shrubs:** Suitable trees are limited by lower rainfall, alkalinity and salinity, and the dense subsoil. When cleared, natural revegetation is very slow, exposing the soil to degradation.

**Annual pastures:** Barrel medics are marginally suitable. Subterranean clovers or other medics are unlikely to perform well.

**Perennial pastures:** Unsuitable. Salt-tolerant shrubs grow well and may provide autumn grazing for sheep.

**Alternative options:** Continuous pasture. Revegetation.

**Soil characteristics and land conservation**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acidity</td>
<td>Not applicable; more prone to decreased nutrient availability.</td>
</tr>
<tr>
<td>Dams &amp; catchments</td>
<td>Dam construction is difficult; unsuitable for roaded catchments.</td>
</tr>
<tr>
<td>Salinity</td>
<td>Contains considerable salt at shallow depth. Land quality at any site varies depending on salt concentration and alkalinity.</td>
</tr>
<tr>
<td>Structural decline</td>
<td>Trampling by sheep results in severe breakdown.</td>
</tr>
<tr>
<td>Water availability</td>
<td>Not a problem, although the surface can become slippery after rain.</td>
</tr>
<tr>
<td>Water erosion</td>
<td>Low.</td>
</tr>
<tr>
<td>Water repellence</td>
<td>Low.</td>
</tr>
<tr>
<td>Waterlogging</td>
<td>Severe in some areas as the soil is associated with crabholes, however can be moderately well drained in other areas.</td>
</tr>
<tr>
<td>Wind erosion</td>
<td>Moderate to low risk. Topsoil is relatively stable.</td>
</tr>
<tr>
<td>Workability</td>
<td>Usually good.</td>
</tr>
</tbody>
</table>

**Notes:**
Soil information sheet for the Jerramungup area

Tucker Soil Series

Red/brown non-cracking clay
(North Bremer dolerite soil)

This is a dense, brown alkaline, clay, covered only by a thin veneer of loam and sand. Much dolerite rubble litters the surface.

Occurrence: Derived from dolerite dyke material and very common and locally significant across the Great Southern. The soil described below differs from the typical dolerite dyke soils found around Jerramungup and Gnowangerup, which are usually a distinctive reddish brown colour. This example is only representative of the dolerite dyke soils of the Bremer (south coastal) and north Bremer areas.

Native vegetation: At the sampled site, no dominant or representative natural vegetation was observed. Pasture consisted mainly of rye and barley grass.

Soil profile description

Depth (cm)

0-8 Dark brown (10YR 3/3) sandy loam; structureless;
2-10% medium gravelly dolerite fragments; pH 7.7; EC 28 mS/m (low salinity); sharp boundary.

8-32 Light yellowish brown (10YR 6/4) light medium clay;
slightly dispersive, structureless, sandy; <2% medium
grayly dolerite fragments; slightly dispersive; small
amounts of lime; pH 8.5; EC 60 mS/m (moderate
salinity); abrupt boundary.

32-55 Pale brown (10YR 6/3) light clay; structureless; 10-20%
medium soft, carbonate gravels; large amounts of lime;
pH 8.9, EC 110 mS/m (high salinity); abrupt boundary.

55-155 Olive brown (2.5Y 4/4) medium clay with yellowish
brown mottles; dispersive; strong blocky structure; <2%
small dolerite fragments; small amounts of lime; pH 8.7;
EC 180 mS/m (very high salinity); clear boundary.

155-170 Dark brown (7.5YR 4/3) sandy, light medium clay;
structureless; 2-10% medium sized dolerite fragments;
small amounts of lime; pH 8.4; EC 190 mS/m (very high
salinity).

pH measured in CaCl₂

Characteristic soil properties

- Susceptible to waterlogging
- Strongly alkaline subsoil
- Strongly sodic (high ESP >20%)
- Salinity increases with depth
- Very shallow effective rooting depth
- Possible boron toxicity

Soil classification

Australian Soil Classification: Epihypersodic Pedal Hypercalcic Calcarosol (Isbell 1996)
PPF: Dy3.53 (Northcote 1979)
Map units: 242Hp, 242Jo, 242Bb, 242Lp, 242Lg (Jerramungup Land Resource Survey,
reference profile JSI 1150)

Compiled by Tim Overheu, Natural Resources Assessment Group, Agriculture Western Australia, 1996
Agricultural land use and management

**Tucker Soil Series**

*Red/brown non-cracking clay (North Bremer dolerite soil)*

The high clay and lime content, although able to store a large volume of water, reduces the soil water availability to growing plants. Over dry seasons cereal yields will be poor. Salinity, waterlogging and alkalinity will be concerns.

**Crops**: All cereals (wheat, barley, oats, triticale) yield well given adequate rainfall. Lupins are not suitable because of the subsoil alkalinity. Field peas may be grown, although the dense scatter of surface stones would present difficulties during harvest. The subsoil alkalinity may also affect suitability for canola. Pulse crops such as faba beans are suitable, although yields will be variable. Chickpeas are not suitable because of salinity (more than 30 mS/m). Application of gypsum may be necessary.

**Trees and shrubs**: Many unfavourable characteristics for revegetation. Any variety will have to tolerate shallow rooting depth, waterlogging, strong alkalinity, salinity and possible moisture stress. Contact your local Revegetation Officer for more details.

**Annual pastures**: Subterranean clover may not persist because of salinity or alkalinity. Well suited to medic pastures (*Medicago polymorpha*).

**Perennial pastures**: A number of perennial grass pastures may be suitable including tall wheatgrass, tall fescue and perennial ryegrass depending on the position in the landscape and state of the soil. On marginally saline areas, puccinellia, saltwater couch and a suitable medic may be appropriate.

**Alternative options**: This is ideally a pasture soil, although revegetation in severely waterlogged or salt affected areas should be considered. Alternative perennial plants could be lucerne, Australian vetiver and sulla. Saltbush and melaleuca shrubs may also be appropriate.

**Soil characteristics and land conservation**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acidity</td>
<td>Unlikely to be a problem because of the strong subsoil alkalinity.</td>
</tr>
<tr>
<td>Dams &amp; catchments</td>
<td>Suitable, but as the soil is dispersive, care must be taken to minimise erosion. The possibility of either a perched or shallow saline watertable is high, and dam building in these areas should be avoided.</td>
</tr>
<tr>
<td>Salinity</td>
<td>High. Waterlogging, inundation, impeded drainage, sodicity and low soil water use increase the risk of salinity especially in degraded areas.</td>
</tr>
<tr>
<td>Structural decline</td>
<td>Moderate to high risk. Dispersive clays often come-the surface during clearing and cultivation causing structural decline once the topsoil layer is incorporated into the subsoil. Minimum tillage is necessary and the soil must not be worked when wet.</td>
</tr>
<tr>
<td>Water availability</td>
<td>Low to moderate.</td>
</tr>
<tr>
<td>Water erosion</td>
<td>Low to moderate risk. If the dispersive subsoils are exposed reducing water infiltration, erosion may be a hazard on sloping land.</td>
</tr>
<tr>
<td>Water repellence</td>
<td>Not prone to water repellence.</td>
</tr>
<tr>
<td>Waterlogging</td>
<td>Waterlogging and boggy conditions occur frequently where dispersive clay has surfaced, clogging soil and reducing water infiltration.</td>
</tr>
<tr>
<td>Wind erosion</td>
<td>Low risk. The thin topsoil is erodible but frequently has been mixed with the subsoil reducing risks.</td>
</tr>
<tr>
<td>Workability</td>
<td>Low to moderate. If cultivated when wet, the soil sets hard.</td>
</tr>
</tbody>
</table>
Soil information sheet for the Jerramungup area

**Umburra Soil Series**

*Alkaline grey shallow sandy duplex (red/brown domed clay)*

This is a shallow, columnar duplex soil. It has a greyish brown fine sandy topsoil over an alkaline, pale brown, columnar medium clay. The subsoil indicates frequent waterlogging and becomes more reddish to brown with depth.

**Occurrence:** Associated with the level to very gently undulating landscapes of the coastal plain from Bremer Bay through to Boxwood Hills and as far north as Gairdner. Common near large closed depressions and swamps.

**Native vegetation:** Mixed mallee-scrub heath comprising silver mallee (*Eucalyptus falcata*), Hopetoun mallee (*E. leptocalyx*), Port Lincoln mallee (*E. conglobata*), grass trees (*Xanthorea* sp.), corky honeymyrtle (*Melaleuca suberosa*), scented honeymyrtle (*Melaleuca acuminata*).

### Soil profile description

<table>
<thead>
<tr>
<th>Depth (cm)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5</td>
<td>Very dark greyish brown (10YR 3/2) loamy fine sand; structureless; &lt;2% small ironstone gravels; water repellent; pH 8.3; EC 19 mS/m (very low salinity); abrupt boundary.</td>
</tr>
<tr>
<td>5-20</td>
<td>Pale brown (10YR 6/3) fine sand; structureless; pH 5.1; EC 12 mS/m (very low salinity); abrupt, tongued boundary.</td>
</tr>
<tr>
<td>8-30</td>
<td>Yellowish red (5YR 5/8) sandy, medium clay; strong columnar structure; slightly dispersive; pH 8.6; EC 82 mS/m (moderate salinity); abrupt boundary.</td>
</tr>
<tr>
<td>30-50</td>
<td>Brown (7.5YR 4/4) sandy, light clay; moderately strong, blocky structure; &lt;2% coarse granitic fragments; slightly dispersive; high in lime; pH 8.2; EC 50 mS/m (moderate salinity); clear boundary.</td>
</tr>
<tr>
<td>50-85</td>
<td>Yellowish brown (10YR 5/6) sandy, light medium clay; structureless; slightly dispersive; moderate amounts of lime; pH 8.2; EC 100 mS/m (high salinity); clear boundary.</td>
</tr>
<tr>
<td>85-150</td>
<td>Yellowish red (5YR 4/6) sandy clay loam; structureless; &lt;2% small gravelly siltstone coarse fragments; pH 4.7; EC 240 mS/m (very high salinity).</td>
</tr>
</tbody>
</table>

**pH measured in CaCl₂**

### Characteristic soil properties

- Loose, fine topsoil sand
- Soil frequently waterlogs
- Distinctive domed or columnar clay structure
- Strongly sodic subsoil clay (>20% ESP)
- Effective rooting depth 10 to 30 cm
- Possible perched watertable beyond 150 cm

### Soil classification

**Australian Soil Classification:** Calcic Hypermatric Red Sodosol (Isbell 1996)

**PPF:** Dy4.43 (Northcote 1979)

**Map units:** 243Hp, 243Bb (Jerramungup Land Resource Survey, reference profile JSI 1147)

Compiled by Tim Overheu, Natural Resources Assessment Group, Agriculture Western Australia, 1996
Agricultural land use and management

**Umburra Soil Series**  
*Alkaline grey shallow sandy duplex*  
*red/brown domed clay*

This soil is suitable for a cereal/pasture or cereal/canola/pasture rotation. In most years it is susceptible to waterlogging and to flooding in severe wet years. Control of surface water run-on is necessary.

**Crops:** Given the appropriate fertiliser and rotation, selected cereals (barley, triticale and oats) can be grown satisfactorily. Over wet seasons this soil can become too wet, significantly reducing yields. Waterlogging will increase the risk of disease carry over such as take-all, rust and septoria. Although canola is suitable, waterlogging will present some problems. Lupins are not suitable except on deeper sandy phases. Cereal yields can be around 2 t/ha, canola 0.8 t/ha and lupins 0.5 t/ha.

**Trees and shrubs:** Waterlogging and subsoil salinity are the main limitations. Revegetation with tolerant native and ornamental trees and shrubs is appropriate and may use excess soil water. Mounding will be necessary for tree planting.

**Annual pastures:** Subterranean clover is the appropriate legume, however, seasonal waterlogging will limit growth.

**Perennial pastures:** The possible higher seasonal water availability makes this soil very suitable for perennial pastures. A fescue-sub. clover mix may suitable if waterlogged or marginally saline. Tall wheatgrass, balansa/Persian clover or kikuyu are also suitable.

**Alternative options:** In particularly wet phases of this soil, planting an ornamental honey myrtle (*Melaleuca* sp.) may be appropriate. This shrub can provide shelter and use water.

**Soil characteristics and land conservation**

- **Acidity**  
  Topsoil pH is buffered by the alkaline subsoil, however should still regularly monitored.

- **Dams & catchments**  
  Underlying clays can be suitable for dam construction, however, sites should always be checked for possible perched or shallow saline watertable.

- **Salinity**  
  Can be a problem.

- **Structural decline**  
  Subsoils are strongly sodic and dispersive.

- **Water availability**  
  Good moisture availability through to summer.

- **Water erosion**  
  Moderate to high. Can be saturated for long periods and often prone to inundation. Subsoils are dispersive.

- **Water repellence**  
  Topsoil can be water repellent.

- **Waterlogging**  
  Moderate to high. Waterlogging will occur in most years because of the poor internal drainage (impeded by the clay). The layer at 8 to 30 cm indicates seasonal waterlogging.

- **Wind erosion**  
  Low to moderate; soils are usually moist, however, if plant cover is lost after long periods of inundation or by overgrazing and dries out, erosion can be a potential problem because of the fine textured topsoils.

- **Workability**  
  Poor trafficability; can become very boggy.
Soil information sheet for the Jerramungup area

**Valona Soil Series**

Acid shallow loamy duplex  
(Grey mallee clay)

This is a very shallow duplex soil which has a dispersive, hardsetting sandy loam surface, and a moderately well structured light brownish grey clay subsoil. A distinct feature is the deep white (kaolinitic and weathering granitic) layer below 80 cm.

**Occurrence:** One of the typical duplex (sand over clay) soils found over the central Jerramungup area. They frequently occur in small pockets on gently inclined, upper undulating plains, sometimes with small granite exposures nearby. They also occur adjacent the upper valley slopes. A close relative is the Kyltorran soil of the Ravensthorpe area.

**Native vegetation:** Dominant natural vegetation is mallee eucalypts (hook-leaved mallee *Eucalyptus uncinata*, *Eucalyptus xanthonema*), with other heath vegetation e.g. broombush (*Melaleuca uncinata*), shrubby sheoak (*Allocasuarina campestris*), scented honeymyrtle (*Melaleuca acuminata*) and one-sided bottlebrush (*Calothamnus quadrifidus*).

**Soil profile description**

<table>
<thead>
<tr>
<th>Depth (cm)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-6</td>
<td>Dark greyish brown (10YR 4/2) gritty light sandy clay loam; structureless; slightly dispersive; few coarse quartz fragments; pH 5.4, EC 100 mS/m (high salinity); abrupt boundary.</td>
</tr>
<tr>
<td>6-27</td>
<td>Light brown (7.5YR 6/3) gritty light medium clay with a few faint very pale brown mottles; strong sub-angular blocky structure; pH 4.9, EC 73 mS/m (moderate salinity); abrupt boundary.</td>
</tr>
<tr>
<td>27-79</td>
<td>Light brownish grey (10YR 6/2) light medium clay with common distinct white mottles; slightly dispersive; moderate sub-angular blocky structure; pH 4.8; EC 140 mS/m (high salinity); clear boundary.</td>
</tr>
<tr>
<td>79-159</td>
<td>White (10YR 8/2) light medium clay with common distinct pale brown mottles; slightly dispersive; moderate sub-angular blocky structure; 10-20% angular quartz and 2-10% (weathering) granitic coarse fragments; pH 4.7, EC 180 mS/m (very high salinity).</td>
</tr>
</tbody>
</table>

pH measured in CaCl₂

**Characteristic soil properties**

- Shallow, heavy textured surface
- Gritty, hardsetting surface
- Well structured in upper clay horizon
- pH becomes acidic with depth
- Developing on weathering granite
- Effective rooting depth 5 to 30 cm

**Soil classification**

**Australian Soil Classification:** Sodic Magnesic Grey Dermosol (Isbell 1996)  
**PPF:** G3.91, D3.11 (Northcote 1979)  
**Map units:** 243Jm, 243Ug (Jerramungup Land Resource Survey, reference profile JSI 1138)

Compiled by Tim Overheu, Natural Resources Assessment Group, Agriculture Western Australia, 1996
Agricultural land use and management

Valona Soil Series

Acid shallow loamy duplex
(Grey mallee clay)

This is difficult to manage for consistent production because of its unfavourable properties. A suitable cereal-pasture rotation with minimum tillage and stubble retention will be appropriate. Continuous pasture may also be an option.

Crops: Given appropriate fertiliser and rotations, these soils are suitable for a variety of cereals (wheat, barley etc). Alternative grain legumes may not be an option because of the low pH. Lupins are unsuitable because the extremely shallow depth to clay.

Trees and shrubs: Maintaining a native species selection to suit the inhospitable growing conditions is advisable. Eucalyptus mallee and melaleuca shrubs can be grown, provided they tolerate waterlogging, dense surface texture, low soil pH and restricted rooting depth.

Annual pastures: Subterranean clover would be the appropriate pasture legume. Growth, burr burial and performance may vary over the seasons depending on the hardsetting nature and/or possible nutrient deficiencies related to the low subsoil fertility and pH.

Perennial pastures: Rainfall is marginal (380 to 400 mm) but a variety of perennial pastures will grow, depending on conditions and location. Suitable species could be tall wheatgrass, tall fescue and phalaris.

Alternative options: Difficult to recommend alternatives because of the unfavourable characteristics for growth. Lucerne in a cropping rotation could be an option.

Soil characteristics and land conservation

Acidity
Becomes acidic with depth and the subsoil has a low buffering capacity, therefore acidity could be a problem. Ameliorative lime is recommended.

Dams & catchments
Suitable for dams, natural catchments and drainage works, unless near a bedrock high. The pallid clay makes a good basement for dams. When constructing or deepening an existing dam, the site should always be checked for the presence of a perched saline watertable.

Salinity
A potential problem if the soil becomes seasonally waterlogged and if the dispersive topsoil restricts drainage.

Structural decline
Low risk; subsoil is moderately well structured, and did not seem dispersive.

Water availability
Fair; water entry and storage is good.

Water erosion
Moderate risk; due to dispersive nature, heavy surface and location.

Water repellence
Low.

Waterlogging
The subsoil is moderately structured, and often located in areas of high relief. Although the dispersive, sandy loam surface can make this soil slippery/boggy, waterlogging is not perceived to be a problem.

Wind erosion
Low risk; heavy surface texture, surface quartz and granitic fragments.

Workability
Moderate to low; texture degradation may occur on the surface, because of the shallow depth to clay and potential of mixing the subsoil clay and topsoil during cultivation. Surface can become hardsetting, and wear on implements is high.
Soil information sheet for the Jerramungup area

Warralonga Soil Series

Grey shallow sandy duplex
(Sand over brown domed clay)

This has a greyish brown gritty loamy sand topsoil overlying a columnar or domed light medium to medium clay subsoil often at less than 30 cm. Weathered granite usually occurs at 100 to 150 cm.

Occurrence: One of the most common soils over the Jerramungup central and upper plains. Usually on the gently undulating landscapes of the Upper Gairdner System. Deeper phases occur on slopes and valley slopes.

Native vegetation: The dominant natural vegetation comprises a mixed stand of mallee and heath e.g. hook-leaved mallee (Eucalyptus uncinata), broombush (Melaleuca uncinata), Hakea verrucosa, manna wattle (Acacia microbotrya), granite sheoak (Allocasuarina hugeliana). Where the depth of sand exceeds 30 cm, parrot bush (Dryandra sessilis) and southern plains banksia (Banksia media) are also common.

Soil profile description

<table>
<thead>
<tr>
<th>Depth (cm)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
<td>Dark greyish brown (10YR 4/2) gritty, sandy loam; &lt;2% small gravelly quartz fragments; pH 6.8; EC 30 mS/m (low salinity); abrupt boundary.</td>
</tr>
<tr>
<td>10-30</td>
<td>Light brownish grey (10YR 6/2) coarse sand; structureless; 2-10% small gravelly quartz fragments; pH 6.9; EC 20 mS/m (very low salinity), abrupt, tongued boundary.</td>
</tr>
<tr>
<td>20-55</td>
<td>Brown (7.5YR 5/6) with prominent, yellowish red mottles; sandy, medium clay; strong columnar structure; small gravelly quartz fragments; slightly dispersive; pH 6.7; EC 160 mS/m (high salinity); clear boundary.</td>
</tr>
<tr>
<td>55-75</td>
<td>Yellowish Brown (10YR 5/6) sandy, light medium clay with prominent, yellowish red mottles; strong, blocky structure; &lt;2% medium gravelly quartz fragments; slightly dispersive; pH 6.7; EC 290 mS/m (very high salinity); abrupt boundary.</td>
</tr>
<tr>
<td>75-140</td>
<td>White (2.5Y 8/2) with distinct, brownish yellow mottles; 10-20% large gravelly quartz fragments; slightly dispersive; pH 6.8; EC 120 mS/m (high salinity).</td>
</tr>
</tbody>
</table>

pH measured in CaCl₂

Characteristic soil properties

- Often gritty top soil texture
- Sometimes surface is hardsetting
- Effective rooting depth is less than 30 cm
- pH is neutral to slightly acidic
- Usually moderately well drained

Soil classification

- Australian Soil Classification: Mesotrophic Mesonatric Brown Sodosol (Isbell 1996)
- PPF: Dy5.42 (Northcote 1979)
- Map units: 243Ug, 243Lg, 243Fz, 243Jm (Jerramungup Land Resource Survey, reference profile JSI 1157)

Compiled by Tim Overheu, Natural Resources Assessment Group, Agriculture Western Australia, 1996
Agricultural land use and management

Warralonga Soil Series

Grey shallow sandy duplex
(Sand over brown domed clay)

This soil is yields well in most years. Nutrient availability is usually good because few limiting factors of the subsoil clay. Suitable for cereal/canola/pasture rotation using minimum tillage and stubble retention.

Crops: Wheat, barley, and canola rotations are successful. Peas should be avoided because of the risk of wind erosion. It is possible to grow lupins on the better drained and deeper sandier areas. Reduced tillage is recommended to decrease the risk of wind erosion. Wheat can yield to 3 t/ha; barley to 3.5 t/ha; and canola to 1 t/ha. On the deeper sandier soils, lupins can yield 0.8 to 1.2 t/ha.

Trees and shrubs: Although more suited to cropping, several native and ornamental tree and shrub species are suitable. The depth of sand over the clay, restricting root development is the limiting factor. Oil mallees could be an option. Contact your local Revegetation Officer for more details.

Annual pastures: Subterranean clover and burr medic are suited to this soil.

Perennial pastures: Rainfall is marginal (380 to 450 mm) for good perennial grass establishment. Pastures that will grow, depending on the condition and location of the soil, may be tall wheatgrass, tall fescue and phalaris. Lucerne is also an option in a phase rotation.

Soil characteristics and land conservation

Acidity
Risk of acidification is very low.

Dams & catchments
Dams are effective and hold water well. Shallow country is ideal for roaded catchments. Scraped catchments are best. Take care not to disturb deeper layers which contain carbonate. This suits other earthworks, but will erode on sloping ground.

Salinity
Subsoil salinity is a problem, and low-lying, waterlogged areas may show effects.

Structural decline
Prone to surface structural decline. It sets hard, causing problems with water infiltration and workability.

Water availability
Varies with the depth of sand over the clay.

Water erosion
High risk in sloping areas.

Water repellence
The sandy topsoil can be water repellent.

Waterlogging
Widespread over all areas.

Wind erosion
The sandy surface is prone to erosion as it is generally too shallow to protect the highly dispersive clayey subsoil.

Workability
Only good at field capacity (moderately moist).

Notes:
Soil information sheet for the Jerramungup area

Yarmarlup Soil Series

Red/brown deep loamy duplex
(Gritty yate loam)

This a distinctive gritty, reddish brown loam to sandy clay loam over clay. The topsoil contains a good amount of organic matter and some gritty gravelly fragments distributed throughout.

Occurrence: Very common around central Jerramungup, and the dissected landscapes of the upper Pallinup River and Gairdner River areas. Most frequent on gently undulating rises and rolling low hills (often associated with valley slopes and undulating granite bedrock). Notable examples occur around Jerramungup (Woolshed Rd), Needilup, Ongerup and Gnowangerup.

Native vegetation: The dominant native species is the flat-topped yate (Eucalyptus occidentalis). Other associated vegetation is granite sheoak (Allocasuarina hugeliana), jam wattle (Acacia acuminata), lesser bottlebrush (Callistemon phoeniceus), quandong (Santalum acuminatum), needlebush (Hakea preissii) and grasses and sedges closer to drainage channels.

Soil profile description

Depth (cm)

<table>
<thead>
<tr>
<th>Depth</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-14</td>
<td>Dark brown (7.5YR 3/4) light sandy clay loam; structureless; 2-10% medium quartz fragments; pH 5.0; EC 10 mS/m (very low salinity); clear boundary.</td>
</tr>
<tr>
<td>14-28</td>
<td>Dark reddish brown (5YR 3/3) coarse light sandy clay loam; structureless; 2-10% medium sized granite fragments; pH 5.6; EC 18 mS/m (very low salinity); abrupt boundary.</td>
</tr>
<tr>
<td>28-46</td>
<td>Dark brown; (7.5YR 3/4) gritty clayey sand; structureless; 50-90% medium sized granite fragments; pH 6.1; EC 18 mS/m (very low salinity); sharp boundary.</td>
</tr>
<tr>
<td>46-68</td>
<td>Dark reddish brown (5YR 3/4) coarse sandy medium clay, with red mottles; structureless; 10-20% medium sized quartz fragments; slightly dispersive; pH 6.4; EC 20 mS/m (very low salinity), clear boundary.</td>
</tr>
<tr>
<td>68-125</td>
<td>Reddish brown (5YR 5/3) sandy light medium clay with pale red mottles; structureless; 10-20% large granite fragments; slightly dispersive; pH 7.4; EC 40 mS/m (low salinity); abrupt boundary.</td>
</tr>
<tr>
<td>125-135</td>
<td>Brown (10YR 5/3) light medium clay with dark red mottles; medium blocky structure; 10-20% large granite fragments; slightly dispersive; pH 7.3; EC 45 mS/m (moderate salinity).</td>
</tr>
</tbody>
</table>

pH measured in CaCl₂

Characteristic soil properties

- Gritty topsoil texture
- Distinctive reddish brown colour
- Associated with yate vegetation

- Effective rooting depth 40+ cm
- Weathered bedrock often at 100+ cm
- Neutral soil pH trend

Soil classification

Australian Soil Classification: Eutrophic Mottled-Mesosorative Red Sodosol (Isbell 1996)

PPF: Dr5.32 (Northcote 1979)

Map units: 243Ya, 243Mp, 243Fz, 243Up (Jerramungup Land Resource Survey, reference profile JSI 1155)

Compiled by Tim Overheu, Natural Resources Assessment Group, Agriculture Western Australia, 1996
Agricultural land use and management

**Yarmarlup Soil Series**  
*Red/brown deep loamy duplex*  
*(Gritty yate loam)*

One of the most productive soils around the Jerramungup area and has the potential to yield highly given the appropriate management. Stubble retention and minimum tillage are necessary to maintain good fertility, drainage and yield.

**Crops:** Wheat, barley, and oats are the recommended cereals. The Agriculture Western Australia MIDAS model for Jerramungup proposes that potential yields for either a pasture/wheat or pasture/barley rotation can be greater than 3.5 t/ha. Lupins’ potential yield is to 1.2 t/ha; canola 1.8 t/ha; faba beans to 1.8 t/ha). Legumes can leave the soil surface exposed during summer, increasing the wind erosion risk.

**Trees and shrubs:** Many native and ornamental tree and shrub species are suitable. The red flowering gum (*Eucalyptus ficifolia*) is an attractive tree that does well. A selection of natural vegetation could include flat-topped yate (*Eucalyptus occidentalis*) and lesser bottlebush (*Callistemon phoeniceus*).

**Annual pastures:** Subterranean clover and slightly acid-tolerant medics are recommended. Species include *Trifolium subterranean, Medicago truncatula, Medicago polymorpha B*.

**Perennial pastures:** Depending on the moisture, soil pH and salinity, many perennial pasture options are available. Some suitable plants are Rhodes grass, strawberry clover, cocksfoot, veldt grass, couch and tall wheatgrass.

**Alternative options:** Potential alternatives are many. Even viticulture could be suitable, although adequate water would be the limiting factor.

**Soil characteristics and land conservation**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acidity</td>
<td>Usually not a problem because soils are colluvial derived from nearby weathering granite. Products from the granite will buffer the acidity. Topsoil pH may need amendment by lime addition.</td>
</tr>
<tr>
<td>Dams &amp; catchments</td>
<td>Suitable, although some large granite boulders may present problems.</td>
</tr>
<tr>
<td>Salinity</td>
<td>Usually not a problem unless there is a seep because of a bedrock high, dolerite dyke or shear zone nearby.</td>
</tr>
<tr>
<td>Structural decline</td>
<td>Possible with excessive cultivation at too high moisture level. Excessive cultivation when too wet may lead to crusting of the surface.</td>
</tr>
<tr>
<td>Water availability</td>
<td>Good. High clay content assists in retaining moisture.</td>
</tr>
<tr>
<td>Water erosion</td>
<td>Can be a serious problem on sloping land particularly where there is run-on from rock outcrops and heavier soils upslope. Surface water control measures such as contour or grade banks where possible to lead the surface run-off to a dam or waterway would be necessary.</td>
</tr>
<tr>
<td>Water repellence</td>
<td>Generally not a problem with the gritty surface and clay in the topsoil.</td>
</tr>
<tr>
<td>Waterlogging</td>
<td>Usually well drained, and reduced because of the landscape relief.</td>
</tr>
<tr>
<td>Wind erosion</td>
<td>Can be a problem, even though the topsoil contains some clay. Loosening by trampling and reduced vegetative cover over summer will lead to erosion on gusty days. Stubble retention and restricted grazing in summer and autumn are necessary.</td>
</tr>
<tr>
<td>Workability</td>
<td>Good, although the gritty nature may cause excess wear on tynes.</td>
</tr>
</tbody>
</table>
Soil information sheet for the Jerramungup area

Yarmarlup Soil Series

Red/brown deep loamy duplex
(Deep yate loam)

This is a reddish brown, colluvial loam over clay. The topsoil is a coarse gritty loam to sandy clay loam. The deep subsoil is a dense, strongly sodic, alkaline medium to heavy clay.

Occurrence: This is very common around the Needleup and Jerramungup west areas, and is a common feature in the dissected landscapes of the upper middle Pallinup River. It is most frequent on gently undulating rises (more often associated with mid to upper valley slopes). Most notable examples occur around Needilup (Browns Rd), and Ongerup.

Native vegetation: The dominant native vegetation is the flat-topped yate (Eucalyptus occidentalis), hence the local soil name. Other associated native vegetation is granite sheoak (Allocasuarina ingeliana) and quandong (Santalum acuminatum).

Soil profile description

Depth (cm)

0-12 Dark yellowish brown (10YR 3/4) gritty loamy sand; structureless; 10-20% medium sized coarse granite fragments; pH 5.2; EC 15 mS/m (very low salinity); clear boundary.

12-25 Dark brown (7.5YR 4/4) gritty, sandy clay loam; structureless; 20-50% medium sized granite fragments; pH 5.5; EC 6 mS/m (very low salinity); gradual boundary.

25-50 Strong brown (7.5YR 4/6) gritty clayey sand; structureless; 20-50% medium sized granite fragments; pH 5.8; EC 4 mS/m (very low salinity); abrupt boundary.

50-75 Dark red (2.5YR 3/6) gritty light medium clay with prominent red mottles; strong blocky structure; 10-20% medium sized granite fragments; slightly dispersive; pH 5.8; EC 30 mS/m (low salinity); clear boundary.

75-107 Red (2.5YR 5/6) gritty, light medium clay; structureless; complete slaking; pH 7.2; EC 40 mS/m (low salinity).

pH measured in CaCl₂

Characteristic soil properties

- Gritty topsoil texture
- Distinctive reddish brown throughout
- Neutral soil pH trend
- Effective rooting depth 40+ cm
- Weathered bedrock often at 100+ cm

Soil classification

Australian Soil Classification: Mesotrophic Mottled-Natric red Sodosol (Isbell 1996)
PFF: Dr5.22, Db4.22 (Northcote 1979)
Map units: 243Ya, 243Fz, 243Mp, 243Up (Jerramungup Land Resource Survey, reference profile JSI 1156)

Compiled by Tim Overheu, Natural Resources Assessment Group, Agriculture Western Australia, 1996
Agricultural land use and management

Yarmarlup Soil Series     Red/brown deep loamy duplex
                        (Deep yate loam)

Yarmarlup soils are some of the most productive around Jerramungup. They have potential to yield highly given appropriate management. Stubble retention and minimum tillage are necessary to maintain good fertility, drainage and yield potential.

Crops: Wheat, barley and oats are the recommended cereals. Potential yields may be as high as 4 t/ha. Narrow leaf lupins, albus lupins (to 1.8 t/ha) are possible. Canola may also be possible (1.2 t/h) as well as faba beans (1.8 t/ha). Minimum tillage and stubble retention are recommended.

Trees and shrubs: Many native and ornamental trees and shrubs are suitable. The red flowering gum (Eucalyptus ficifolia) is an attractive tree that does well. Otherwise, natural vegetation such as the flat-topped yate (Eucalyptus occidentalis) is suitable.

Annual pastures: Subterranean clover and slightly acid tolerant medicas are recommended legumes. Species include Trifolium subterranea, Medicago truncatula, M. polymorpha B. Ryegrass is also suitable.

Perennial pastures: Depending on the moisture, soil pH and salinity, there are many pasture options available. Some suitable pastures are Rhodes grass, strawberry clover, cocksfoot, veldt grass, couch, tall wheatgrass and lucerne.

Alternative options: As this soil has good natural fertility and other favourable features, its potential for alternative uses is high. Even viticulture could be suitable, although an adequate supply of water would be the limiting factor.

Soil characteristics and land conservation

**Acidity**
Usually not a problem because the soil is colluvial and derived from nearby weathering granite. Products from the granite will buffer the soil acidity.

**Dams & catchments**
Marginally suitable depending on the depth to the clay. Large colluvial granite boulders soil may present some problems.

**Salinity**
Usually not a problem unless there is a seep because of high bedrock, a dolerite dyke or shear zone nearby.

**Structural decline**
Usually not a problem.

**Water availability**
Good. High clay content throughout assists in retaining the moisture over the growing season.

**Water erosion**
Can be serious on sloping land particularly with run-on from rock outcrops and heavier soils that shed water upslope, or where the soil may be saturated for a long period of time. Surface water control measures would be necessary.

**Water repellence**
Generally not a problem with the gritty texture and clay content in the topsoil.

**Waterlogging**
Usually well drained.

**Wind erosion**
Can be a problem, even though the topsoil contains some clay. Loosening by trampling and reduced vegetative cover over summer will lead to erosion on gusty days. Stubble retention and restricted grazing in summer and autumn are necessary.

**Workability**
Good, although the gritty nature may cause excess wear on tynes.