APPENDIX 1

Glossary

Acidic: Soils that have a pH less than 6.5.

Acidification: The process whereby soils become acidic over a period of time as a result of the parent material; the addition of nitrogen to the soil by either fertiliser or legumes (where nitrogen is converted to nitrate), and/or the leaching of the soil by rainfall.

Aeolian: A geomorphic process whereby soil forming material is transported and deposited by wind.

Aerobic: Soils in which free oxygen is abundant and chemically oxidising processes prevail. This usually occurs in well drained soils with good structure.

Alkaline: Soils that have a pH greater than 7.5.

Anaerobic: These soils are deficient of free oxygen and reducing processes are predominant. This generally occurs in poorly drained or waterlogged soils, where water has replaced the air in the soil resulting in a bluey-grey coloured soil.

Angular Blocky Structure: A cube-shaped ped bounded by six faces.

Aquifers: Rock or sediment in a formation, or several formations, which is saturated and can transmit water.

Aquitard: A formation that restricts the flow of water. A non-productive aquifer.

Arenic: Soils in which at least the upper 0.5m of the profile is non-gravelly and of sandy texture throughout. It is also loosely or weakly coherent (See **CONSISTENCE**), and may have aeolian (wind-blown) cross-bedding. This term is used in the Australian Soil Classification (Isbell, 1995) to describe Rudosols and Tenosols.

Argic Horizon: A subsoil horizon consisting of distinct lamellae (sharply defined, horizontal to sub horizontal layers that have a higher clay content than adjacent sandy or sandy loam material). They are usually 5 to 10 mm thick. Consistence is stronger and the colour usually darker and more reddish or brownish than the surrounding soil. This term is used as a definition for Calcarosols, Kandosols and Tenosols in the Australian Soil Classification (Isbell, 1996).

Australian Soil Classification (Isbell, 1996): A soil classification recently developed by Ray Isbell. The classification scheme operates using a hierarchical system and is based on Australian soils data that is significant with regard to land management. The general form of the nomenclature is: Subgroup, Great Group, Suborder, Order; family (eg. Bleached, Eutrophic, Red CHROMOSOL; thick, sandy)

Available Water Capacity: See **PLANT AVAILABLE WATER CAPACITY**.

Base Status: Is a ratio relating the major nutrient cations (Ca, Mg, K and Na) to the clay percentage in the soil. It is used as an indicator of soil fertility and is expressed in cmol (+) kg^{-1} clay. It is calculated by multiplying the sum of the reported basic cations by 100 and dividing by the clay percentage of the sample. Three classes are defined: **dystrophic** - if the sum is less than 5; **mesotrophic** - if the sum is between 5 and

15 inclusive; and **eutrophic** if it is greater than 15. It is used for some Great Group distinctions within the Australian Soil Classification (Isbell, 1996).

Bhs Horizon: Iron and organic compounds (often referred to as 'coffee rock') are prominent within the horizon and the organic compounds are distributed as streaks, patches or lumps. This term is used as a definition for the Podosol Order in the Australian Soil Classification (Isbell, 1996). In this classification system, Bhs horizons are referred to as humosesquic horizons.

Bk Horizon: A subsoil horizon notation whereby the "B" refers to the B horizon, and "k" to an accumulation of carbonates within the associated horizon.

Bleached Horizon: Horizons that are paler than adjacent horizons and are best seen when the soil is dry. A bleach is generally associated with the A2 horizon, although it is not restricted to it. It generally occurs over a much less permeable subsoil, pan or hard rock. A conspicuously bleached horizon is one in which 80% or more of the horizon is bleached, whereas a sporadic bleach occurs irregularly throughout the horizon or as blotches at the interface of the A and B horizons (Northcote, 1979). This horizon is the most leached part of a soil . Organic matter, clay, iron, aluminium and nutrient elements have been removed leaving an accumulation of silica, which gives the horizon its whitish colour. Field observations have established that bleached horizons are often saturated with water, and their occurrence is usually an indication of periodic waterlogging. This can indicate sodic subsoils where there is a strong texture contrast between A and B horizons.

Blocky Structure: See **ANGULAR BLOCKY**.

Brown Clays: See **GREY, BROWN AND RED CLAYS**.

Buffering Capacity: The soils ability to resist change in pH. Soils with a high clay and organic matter content have a higher buffering capacity and can tolerate the addition of acidifying fertilisers over an extended period, or at a higher rate of addition without becoming too acid. But, once it is acid, the soil will require a large amount of lime or dolomite to reverse the effect. The amount of lime or dolomite required varies from soil to soil depending on the pH (Baker and Eldershaw, 1993).

Calcareous: Used as a descriptive term in the Australian Soil Classification (Isbell, 1996). It describes a soil that has sufficient calcium carbonate (lime) to cause effervescence on the application of a few drops of hydrochloric acid.

Calcarosol: A Soil Order of the Australian Soil Classification (Isbell 1996). These soils are either calcareous throughout the solum (or at least directly below the A1 horizon or at a depth of 0.2m, which ever is shallower) and do not have clear or abrupt textural B horizons. The carbonate must have resulted from soil forming processes.

Calcrete: Any layer of cemented carbonate accumulation layer. The material must be hard. This definition does not describe the common soft carbonate nor the carbonate accumulated in nodules or concretions. This term is used to describe a number of soils in the Australian Soil Classification (Isbell, 1996).

Calcic: These soils have a Bk horizon or a subsurface layer containing 2 - 20% soft carbonate and 0-20% hard calcrete fragments and/or carbonate nodules. This term is used to describe a number of Soil Orders in the Australian Soil Classification (Isbell, 1996).

CEC (Cation Exchange Capacity): Is the measure of the capacity of a soil to hold the major cations: calcium, magnesium, sodium and potassium (including hydrogen, aluminium and manganese in acid soils). It is a measure of the potential nutrient reserve in the soil and is therefore an indicator of inherent soil fertility. An imbalance in the ratio of cations can result in soil structural problems. High levels of individual cations (e.g. aluminium and manganese) can also be toxic to plants.

Cemented: (Indurated) Substances such as humus, calcium carbonate, and the oxides of silicon, iron and aluminium can bind soil particles together in a hard brittle mass. This hardened state persists even when wet.

Clay Skins: These features are coatings of clay on peds in the subsoil and are therefore dependent on the structure of the soil and the degree of illuviation (clay movement down the profile).

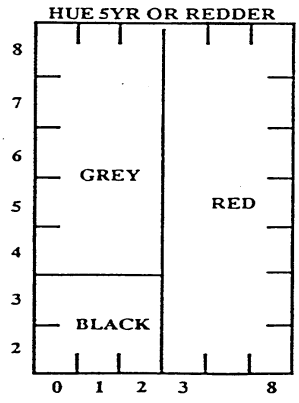
Chilling Hours: The number of hours below 7ºC between April and August. Used to identify areas with suitable winter chilling requirements for stone and pomme fruit.

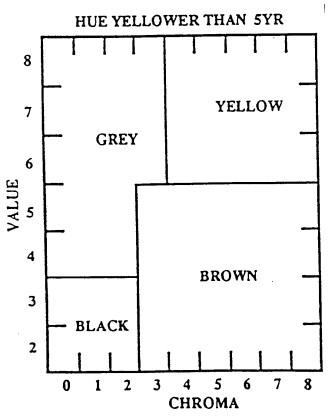
Chromosol: Soil Order of the Australian Soil Classification (Isbell, 1996). Soils with a clear or abrupt textural B2 horizon where the pH is 5.5 (water) or greater in the upper B2 horizon. This B2 horizon is often brightly coloured.

Coffee Rock: A compacted, cemented or indurated layer within the profile, which is comprised of humus and iron oxides.

Colour: Soil colour is assessed in a moist condition using a Munsell Colour Chart (Munsell Colour Company, 1975) to assess the dominant colour. Secondary colours, bleaches and mottles are also recorded. Colour provides a useful indication of a number of profile attributes. Dark surface soils, for instance, indicate a high level of organic matter. In subsurface horizons (i.e. A2), bleached colours indicate low levels of plant nutrients and that seasonal or periodic waterlogging occurs. In subsoils, the colour sequence from red to brown and yellow to grey colours, indicate a sequence from well aerated and well drained soils to poorly aerated and poorly drained soils.

The table below is used to obtain colour classes used in the Australian Soil Classification (Isbell, 1996).





Columnar Structure: Soil particles are arranged around a vertical axis with flat faced peds. The tops of the columns have clearly defined domes. Columnar structure is often associated with subsoil sodicity.

Compaction: The process whereby soil density is increased as a result of tillage, stock trampling and/or vehicular trafficking. Compaction can lead to lower soil permeability, poorer soil aeration resulting in increased erosion hazard and poorer plant productivity. Deep ripping and conservation tillage can alleviate the condition.

Consistence: relates to the texture and structure of a soil and is a measure of its workability and stability (e.g. friable soils are easier to work than hard soils). Consistence is measured by the resistance of a ped to

deformation between the thumb and forefinger, measured on a scale of 1 (small force required) to 7 (rigid force required). This varies depending on the soil water content.

0	= Loose	no force required, separate particles such as loose sand,
1	= Very weak	very small force,
2	= Weak	small but significant force,
3	= Firm	moderate or firm force,
4	= Very firm	strong force but within the power of the thumb and forefinger,
5	= Strong	beyond power of thumb and forefinger but crushes underfoot on hard flat surface with small force,
6	= Very strong	crushes underfoot on hard flat surface with full body weight applied slowly,
7	= Rigid	cannot be crushed underfoot by full body weight applied slowly.

Dermosols: Soil Order of the Australian Soil Classification (Isbell, 1996). Soils which have B2 horizons with structure more developed than weak throughout the major part of the horizon, and which also lack a strong texture contrast between the A and B horizons.

Discharge: The exiting of groundwater from an aquifer.

Dispersible soils: Soils that are structurally unstable and disperse in water into primary particles, i.e. sand, silt and clay. Dispersible soils tend to be highly erodible and present problems for earth works (See SODICITY).

Dispersion: is when the clay particles form a cloud around an aggregate placed in water. These soils generally have a high exchangeable sodium percentage. (See DISPERSION or DISPERSIBLE SOILS).

Duplex profile form: A Primary Profile form of the Northcote Factual Key (1979) classification. It describes a soil where there is a sharp contrast in the texture between the A and B horizons (often sandy or loamy surface horizons with a sharp to clear boundary to clay subsoils). Duplex soils are given the notation "D".

Dystrophic: see **Base Status**.

Earths: A Great Soil Group (Stace et al., 1968) description defining a variable group of soils which are porous and sandy textured. They usually have an acidic trend (i.e. the pH decreases with depth), weak profile differentiation, diffuse horizon boundaries, an increase in clay content with depth and no A2 horizon.

EC (Electrical Conductivity): A measure of the conduction of electricity through water, or a water extract of soil. The value can reflect the amount of soluble salts in an extract and therefore provide an indication of soil salinity. Saline soils are defined as those with an EC of greater than 1.5 dS/m for a 1:5 soil water extract(ECw) and greater than 4 dS/m for a saturation extract (ECe)(See SALINITY). It can be interpreted in terms of the salinity tolerance of plants. Soil texture needs to be considered in this interpretation.

ECe (Electrical Conductivity; Saturated extract): This is the electrical conductivity for a soil paste which is a more accurate assessment of salinity of the soil than the 1:5 soil water suspension. However the soil

water suspension method (ECw) is easier to carry out than the extract method and a conversion is used to determine the extract value based on the suspension method. This conversion is proportional to the texture of the soil such that light soils(sands) have a high (x13) conversion factor and heavy (clay) soils have lighter conversion factors (x6).
Saline soils have greater than 4 dS/m but some crops can tolerate this level. As a comparison sea water has a salinity value of 53 dS/m.

Endocalcareous: A term used to describe a soil in which the major part of the profile below 0.5m+ is calcareous. This term is used as a Subgroup definition for the Vertosol Order in the Australian Soil Classification (Isbell, 1996).

Endohypersodic: These soils have an ESP of 15 or greater below a 0.5m depth. This term is used as a Subgroup definition for Calcarosols and Vertosols in the Australian Soil Classification (Isbell, 1996).

Epicalcareous: A soil in which the major part of the top 0.5m of the profile is calcareous. It is used to describe Hydrosols and Vertosols in the Australian Soil Classification (Isbell, 1996).

Epihypersodic: Soils with at least one subhorizon within the top 0.5m of the profile having an ESP greater than 15. Used as a Subgroup definition for Calcarosols and Vertosols in the Australian Soil Classification (Isbell, 1996).

Epipedal: These soils have a pedal A horizon and no surface crust. Used as a Great Group definition for Vertosols in the Australian Soil Classification (Isbell, 1996).

ESP (Exchangeable sodium percentage): Is calculated as the proportion of the cation exchange capacity occupied by the sodium ions and is expressed as a percentage. Sodic soils are categorised as soils with an ESP of 6-14%, and strongly sodic soils have an ESP of greater than 15% (See SODICITY).

Eutrophic: see **Base status**.

Fabric: Describes the appearance of the soil material (under a hand lens). The difference between fabrics is associated with the presence or absence of peds, the lustre of the ped surface and the presence, size and arrangement of pores in the ped. Fabric is described based on:

> EARTHY (or porous) (E): The soil material is coherent and characterised by the presence of pores, but few if any peds. Soil particles are coated with oxides and/or clay particles are clumped around the pores.
>
> SANDY (G): Soil material is coherent, with few if any peds. The closely packed sand grains provide the appearance of the soil mass.
>
> ROUGH-PED FABRIC (R): Peds are evident and characteristically more than 50% of the peds are rough-faced, that is, they have relatively porous surfaces. They tend to have less clearly defined faces than smooth faced peds.
>
> SMOOTH-PED (S): Peds are evident and more than 50% of them are dense and smooth faced, although the degree of lustre varies.

Factual Key (Northcote, 1979): A soil classification system used in Australia which groups soils into recognisable profile forms. These are based on visible morphological properties and simple chemical properties of a soil and are labelled using an alphanumeric code. Further details can be found in Northcote (1979).

Fault: A fracture in a rock along which there has been an amount of structural movement, these often produce topographic and/or groundwater highs.

Ferric Horizon: A soil horizon containing more than 20% ferruginous nodules or concretions ("ironstone" or "buckshot") which are uncemented. The term is used as a definition for numerous Soil Orders in the Australian Soil Classification (Isbell, 1996).

Ferrosols: Soil Order of the Australian Soil Classification (Isbell, 1996). These soils lack strong texture contrast and have a B2 horizon with structure more developed than weak, and a B2 horizon with a fine earth fraction which has a free iron oxide content greater than 5% Fe (as opposed to a DERMOSOL).
Ferruginisation: The formation of iron bearing silica cemented layers (often associated with past watertable levels).

Field Capacity (Field Moisture Capacity): The amount of moisture remaining in a soil horizon 2-3 days after being saturated (by rainfall or irrigation) and after free drainage has ceased.

Fluvial: A geomorphic process whereby soil forming material is transported and deposited by flowing river water.

Fluvio-Lacustrine: Referring to rivers or lake environments.

Formation: The way geological beds or layers are arranged in a certain way to be distinct of other geological beds or layers.

Fossiliferous: Formations in which fossils are predominant.

Geomorphology: The description and interpretation of landforms.

Gilgai Micro-Relief: Surface undulations in the soil, forming small rises or ridges and depressions.

Gradational Profile Form: A Primary Profile Form of the Factual Key (Northcote, 1979). It describes a soil with a gradual increase in texture (i.e. becomes more clayey) as the profile deepens. Gradational soils are given the notation "G".

Granodiorite: A coarse grained igneous rock consisting of 20-40% quartz, alkali feldspar and various ferromagnesian minerals

Great Soil Groups (Stace *et al*., 1968): A soil classification system which is based on the description of soil properties such as colour, texture, structure, drainage, lime, iron, organic matter and salt accumulation, as well as on theories of soil formation. The profile to be classified is assigned to a Great Soil Group based on its description. The system is limited in that central concepts are inadequately defined making confident identification of some described profiles difficult.

Grey, Brown and Red Calcareous Soils: These soils are shallow, soft, powdery or weakly structured loams to light clays containing finely divided carbonates throughout the profile and showing very little horizon development. The tend to develop from highly calcareous rocks which underlie them at depths up to 50 cm. Fragments of limestone may also be found in the profile. The surface texture may be a loam or a clay loam, with a weak platy or a fine blocky structure. Below this the structure is massive or more clayey with a medium blocky structure of rough faced peds. The clay content tends to increase about one texture class throughout the profile.

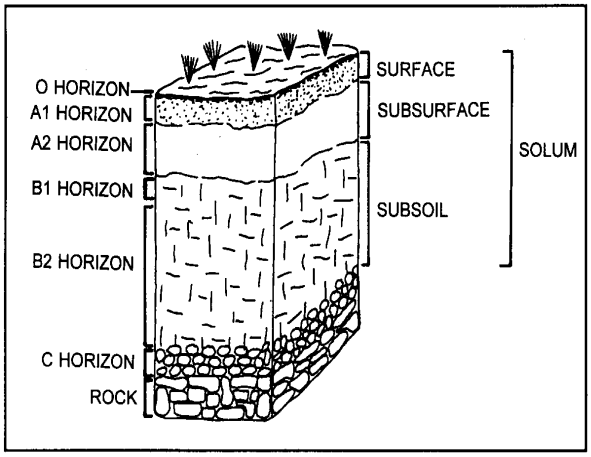
Grey, Brown and Red Clays: Great Soil Group Classification, Stace *et al.*, (1968). This is a broad group of soils which have a moderate to very deep profile. These soils crack deeply on drying and have a high clay content throughout. Subsoil clays range from grey to brown or red in colour gradually becoming paler with increasing depth. In Victoria, these soils are typically alkaline throughout most of the profile and carbonates may also be present.

Growing Season Rainfall: The sum of total monthly rainfall between April and October.

Gypsum: A naturally occurring soft crystalline material which is a hydrated form of calcium sulphate. Deposits occur naturally in inland Australia. Gypsum contains approximately 23% calcium and 18% sulphur. It is used to improve soil structure and reduce crusting in hard setting clayey soils.
Hard: A general term indicating strength, used to describe a number of soils in the Australian Soil Classification (Isbell, 1996). Hard nodules or segregations cannot be broken between thumb and forefinger (i.e. strong in McDonald et al., pg 147). Pans are classified as hard if they are moderately cemented or stronger (McDonald et al., pg 143). The substrate is classed as hard if they are moderately strong or stronger (McDonald et al., pg 157).

Hardsetting: The condition of a dry surface which is compact and hard with no apparent pedal development. These soils are not disturbed by pressure of a finger. These harder setting soils tend to result in high runoff.

Horizons: A layer within the soil profile having morphological characteristics and properties (e.g. colour, texture, and structure) differing from the layer above and/or below it.



1) The **O horizon** consists of plant material in various stages of decomposition, which has accumulated above the soil surface (A horizon). The O horizon can be subdivided into:

i) **O1** horizon: undecomposed organic material e.g. leaves and twigs.
ii) **O2** horizon: organic debris in various states of decomposition.

2) The **A horizon** consists of one or more surface mineral horizons and can be subdivided into:

i) **A1** horizon: this is the mineral horizon at or near the surface, usually with some accumulation of organic matter making the colour darker than the underlying horizon. This horizon is usually high in biological activity. The A1 horizon can be further subdivided into the A11 horizon: more organic matter, darker colour with relatively high amounts of biological activity; A12 horizon varies in colour (i.e. hue, value or chroma) usually lighter, but not pale enough to be an A2 horizon. A13 and A14 horizons are further options if necessary.

ii) **A2** horizon: this is the mineral horizon having either: less organic matter; less sesquioxides; and/or less silicate clays than the surrounding horizons. It can be differentiated from the A1 by its paler colour. The A2 can be differentiated from the B horizon by its colour value being 1 unit higher than the B, chroma units being 2 lower than the B horizon, by a coarser texture in the A2 horizon than the B, or a combination.

iii) **A3** horizon: this is a transitional horizon between the A and B horizon which is dominated by A horizon properties.

3) The **B horizon** consists of one or more mineral soil layers characterised by one or more of the following: a concentration of silicate clays, iron, aluminium, and/or organic matter; a structure and/or consistence unlike the A horizon or any horizon below; stronger colours (i.e. higher chroma and/or redder hue) than the above or below horizon. The B horizon is subdivided into:

i) **B1** horizon: the transition between the A and B horizons where the underlying B2 horizon properties dominate (as opposed to the A horizon properties).

ii) **B2** horizon: the dominant feature is one of the following: an illuvial, residual or other concentration of silicate clays, iron, aluminium, or humus; maximum development or pedological organisation within the profile i.e. different structure; consistence and/or stronger colours than the A

horizon or any horizon below. The B2 horizon can be further divided into subhorizons: B21, B22, and B23 horizons.

iii) **B3** horizon: a transition between B and C where the B2 horizon characteristics dominate.

4) The **C horizon**: the layer below the solum (A and B horizons) that consists of consolidated or unconsolidated parent material that is not significantly affected by soil forming processes. It is easily recognised by its lack of soil characteristic development and its visible geologic structure.

Horizon Suffixes: These are lower case letters or numbers used as further descriptors of the main horizons. The suffixes describe the genetic processes operating in the soil, for example, humus in the A1 horizon is indicated by A1h, and calcium carbonate in the B2 horizon is indicated by B2k.

Hydrophobicity: This refers to the repellency of the soil to water and is generally a surface phenomenon which has implications for surface water infiltration, plant water use and erosion risk. A high level of hydrophobicity is exhibited when the surface soil is of a light texture, coated in organic matter and has a very high matric potential (ie. dry). Once the material wets up over time the hydrophobicity decreases.(see WATER REPELLENT)

Hydrogeology: The study of geological factors that relate to the Earth's water

Hydrology: The science dealing with water on the land, or under the earths surface.

Hypercalcic: These soils have a Bk horizon or a subsurface layer containing more than 20% of mainly soft, finely divided carbonate, and 0-20% of hard calcrete fragments and/or carbonate nodules, and/or carbonate coated gravel. The term is used as a definition for a number of Orders in the Australian Soil Classification (Isbell, 1996).

Hypernatric: The major part of the upper 0.2m of the B2 horizon has an ESP greater than 25. This term is used as a Great Group definition for the Sodosol Order in the Australian Soil Classification (Isbell, 1996).

Indurated: Hardened soil particles (See cemented).

Infiltration: The movement of water through the soil surface. Soils with a high infiltration capacity allow more rain to enter the soil than soils with a low capacity. Runoff will occur when the rate of rainfall exceeds the soil's infiltration capacity. Surface soil structure and texture are important determinants of the infiltration capacity of a soil.

Intermittent: Stopping and starting, e.g. recurring.

Internal Drainage: An estimate of the rate of water movement through the soil profile. While internal drainage is concerned with local wetness conditions it is affected by internal and external site factors. The internal drainage is dependent on the soil permeability via the hydraulic conductivity with sands having a high hydraulic conductivity and clays (in general) having a low conductivity. This is affected by external factors such as the amount of water the site is receiving and the drainage of the site(shedding potential). Drainage is described generally within a range between very poorly drained to rapidly drained, which is discussed by McDonald & Isbell in McDonald et al., (1990). [Waterlogging potential is another aspect of these concepts].

Ironstone: Refer to Ferric Horizon

Karst: A land type which limestone and dolomitic rocks have occurred due to the percolating of ground water.

Kurosols: A Soil Order of the Australian Soil Classification (Isbell, 1996). These soils have a clear or abrupt textural B horizon which is strongly acidic i.e. less than 5.5 (water) in the upper B2 horizon.

Lacustrine: A geomorphic process whereby soil forming material is deposited in lakes.

Land Element: Landform elements are the basic building blocks that make up landform patterns (see landform system) and describe such entities as flat, midslope, cliff etc. Speight in McDonald *et al* (1990) lists more than 70 possible elements and suggests that their dimensions are greater than 40m across.

Land Pattern: Landform patterns re-occur over the landscape and are composed of a collection of elements, since land facets or components make up the land system. For example the land pattern Rolling Hills consists of hillslopes (crests, upper, mid & lower slopes) with a particular amplitude ie. relative relief and slope angle with the possibility of depressions in between as part of the land form pattern. Speight in McDonald *et al* (1990) lists more than 40 possible landform patterns and suggests that their dimensions are greater than 600m across.

Land Suitability: This refers to the suitability of a piece of land in relation to a specific use and has implications for sustainability. While suitability refers mainly to the biophysical characteristics of the land and matching those to the needs of the use, some definitions include other factors such as accessibility and other socio-economic factors. Land suitability has implications of being more specific (such as a particular crop) and at a finer scale than land capability. Climatic factors are included in the suite of biophysical characteristics that are used in any land suitability assessment.

Land System: This is an ecological land complex based on landform, parent material and climate which in ecological combination form specific soil and vegetation types which form patterns of occurrence within the land system.

Land Unit: There are a number of definitions of land unit though it is generally a generic term which covers any (spatial) land entity such as land system, terrain pattern or land facet. However it is often associated with the land facet level of detail, typically presented as map units at a scale of 1:25,000 to 1:100,000 and may be a homogeneous area or have special features (simple patterns) which distinguish it from the whole. Speight in Gunn *et al* (1988) discusses the various connotations of the term.

Laterite: Refers to a soil profile with horizon/s rich in iron oxides. This is usually associated with deeply weathered profiles. The process whereby Laterite is formed is referred to as **laterisation**. Laterisation occurred especially in the early Tertiary period when Australia experienced a warm, wet climate.

Leaching: The removal in solution of soluble minerals and salts as water moves through the profile.

Lenticular Structure: Soil particles are arranged around an elliptical or circular plane and bounded by curved faces i.e. lens shaped. This structure often occurs in subsoils of Vertosols and can be associated with slickenside development.

Lime: A naturally occurring calcareous material used to raise the pH of an acidic soil and/or supply calcium for plant growth. It is effective for treating acidic soils.

Lunettes: Crescent shaped aeolian deposits generally of fine sediment located on the eastern sides (or the lee sides) of lake beds or playas in semi-arid areas of southern Australia.

Manganese Flecks: These occur in some subsoils where drainage is poor and the watertable fluctuates.

Map Unit: A map unit is the unit represented on a map for a given scale and may be equivalent to a land unit depending on the scale of the survey. For example, some land units may be described in a report but not mapped due to scale or survey limitations.

Massive: This term applies to soil horizons which appear to be coherent or solid and devoid of peds. It should be greater than 6 mm in thickness. When displaced, the soil separates into fragments which may be crushed into individual particles.

Miocene: Geological age 5-23 million years before present time.
Mesonatric: In these soils, a major part of the upper 0.2m of the B2 horizon has an ESP between 15-25. Used as a Great Group definition for Sodosols in the Australian Soil Classification (Isbell, 1996).

Mottling: The presence of more than one soil colour in a horizon. The soil may differ in colour either within peds or aggregates, or between them. Mottling occurs as blotches or streaks of subdominant colour throughout the main (ie. matrix) colour. It does not refer to stains or coloured deposits on ped faces. Mottling is often an indication of poor profile drainage but may be caused by the weathering of parent material. Diffusely mottled implies that neighbouring colours are only slightly different.

Northcote Factual Key (1979): See Factual Key (Northcote, 1979).

Organic Materials: Plant derived organic accumulations.

Pans: Hard or cemented layers interfering with water and root penetration.

Parent Material: The rock from which a soil profile develops.

Parilla Sand: Sand**,** sandstone and silt, white to yellow. Occurs as ridges or 'stranded beach ridges' aligned NNW-SSE that were formed from marine regression.

Particle Size Analysis: The measurement of the relative amounts of coarse sand, fine sand, silt and clay size particles in a soil sample (as determined in the laboratory). Also called 'mechanical analysis'.

Ped: The natural unit of soil structure formed by the soil's tendency to fracture along planes of weakness.

Perennial: Lasting for a long time duration, e.g. perennial plants grow for many years.

Petrocalcic: Soils with a B horizon which directly overlies a calcrete pan. This term is used as a Great Group or Subgroup distinction for a number of Soil Orders in the Australian Soil Classification (Isbell, 1996).

pH (Soil): A measure of soil acidity and soil alkalinity on a scale of 0 (extremely acidic) to 14 (extremely alkaline), with a pH of 7 being neutral. It gives an indication of the availability of plant nutrients and relates to the growth requirements of particular crops. Acid soils are usually deficient in necessary nutrients eg. calcium and magnesium.

Plant Available Water Capacity (PAWC): The amount of soil water that can be extracted by the plant. It is defined as the difference in soil moisture content between the field capacity and the wilting point (See **Field Capacity** and **Wilting Point**). It is expressed as millimetres of plant-available water within the root zone.

Plastic Limit: The water content of the soil above which the soil will compress and shear when compacted; ie. structural degradation occurs.

Plastic Soils: A soil capable of being moulded or deformed permanently in shape without a change in volume, rebound or texture.

Platy Structure: (laminar) Peds are layered in plate-like sheets. This type of structure is usually associated with soils which have been subjected to compaction and does not normally occur in undisturbed soil profiles.

Pliocene: Geological age 1.8-5 million years before present time.

Podosol: A Soil Order of the Australian Soil Classification (Isbell, 1996). These soils have a B horizon dominated by the accumulation of compounds of organic matter, aluminium and/or iron. These horizons may occur individually or in combination within a profile.

Polyhedral Structure: Soil particles arranged around a point and bounded by more than six relatively flat but dissimilar faces.

Porosity (Soil): The degree of pore space in a soil (i.e. the percentage of the total space between solid particles).

Potentiometric Levels: The level to which groundwater will rise in a tightly cased well.

Prior Stream: The course of a former stream responsible for the nearby sediments, and which does not carry water other than local drainage.

Prismatic Structure: Soil particles are arranged around a vertical axis and bounded by relatively flat faces. The top of the prisms are also relatively flat. Prismatic structure is often associated with subsoil sodicity.

Profile: The vertical section of the soil from the soil surface down through the horizons including the parent material. It consists of two parts: the solum, and the parent material.

Quaternary: Geological age recent to 1.8 million years before present time. The age of the aeolian deposition.

Red-Brown Earths: Great Soil Group Classification, Stace *et al.*, (1968). The characteristic features are: grey-brown to red-brown loamy sand to sandy clay loam A horizon which is weakly structured to massive; an abrupt to clear boundary between the A and B horizons; a brighter brown to red clay B horizon with a well developed medium prismatic to blocky structure. The surface soil is moderately thick and mildly acid to neutral, and the B horizons are usually alkaline and may contain carbonates. These soils are typical of semiarid to subhumid climates and develop on various parent materials.

Red Clays: See Grey, Brown and Red Clays.

Recharge: The adding of water to an aquifer.

Remnant: A part remaining.

Runaway Holes: Sink holes in karst terrane.

Salinity: A measure of the total soluble salts in a soil. A saline soil is one with an accumulation of free salts at the soil surface and/or within the profile affecting plant growth and/or land use. It is generally attributed to changes in land use or natural changes in drainage or climate which affects the movement of water through the landscape. Salinity levels of soil or water can be tested using Electrical Conductivity (see **EC**).

Saprolite: Decomposed rock that has maintained characteristics that were present as an unweathered rock.

Saturated: When the voids/pores in rocks/soils are completely filled with water

Segregations: Accumulations of minerals in the soil due to the concentration of constituents. They occur as a result of chemical or biological action. They can develop *in situ* by either current or relict pedogenic processes. Segregations are described by their nature, abundance and form:

1) Nature: for example, calcareous (carbonate), gypseous (gypsum), manganiferous (manganese) and ferromanganiferous (iron-manganese).

2) Abundance: for example,

• Very few	(Trace and Occasional)	<2%
• Few	(Slight)	2-10%
• Common	(Light)	10-20%
• Many	(Moderate)	20-50%
• Very many	(Heavy)	>50%

3) Form: for example,

• C	concretions	Spheroidal formations (concentric in nature).
• N	nodules	Irregular rounded formations (not concentric or symmetric). Can have a hollow interior.
• F	fragments	Broken pieces of segregations.
• X	crystals	Single or complex clusters of visible crystals.
• S	soft segregations	Finely divided soft segregations.

They contrast with surrounding soil in colour and composition but are not easily separated from the soil as separate bodies.

Self-Mulching: A structural condition of soils, notably found in the surface soils of Vertosols, where there is a high degree of pedality and the peds naturally fall apart as the soil dries to form a loose surface mulch.

Sequences: The following of one thing after another; succession.

Siliceous Sands: These are a broad group varying in colour but are characterised by their uniform sand to clayey sand texture, deep profiles, massive single-grain structure and the absence of any distinct horizons except for a minimal accumulation of organic matter in the A1 horizon, making it slightly darker. This horizon can be absent when there is no vegetation to hold it in place.

Slaking: The breaking down of soil aggregates when immersed in water into smaller sized micro-aggregates. These aggregates may subsequently disperse (See **Dispersible Soils**).

Slickensides: Subsoil structural features which develop as a result of two masses moving past each other, polishing and smoothing the surfaces. These are common in Vertosols.

Sodicity: Is a measure of exchangeable sodium in relation to other exchangeable cations. It is expressed as the Exchangeable Sodium Percentage (See **ESP**). A sodic soil contains sufficient exchangeable sodium to interfere with the growth of plants, including crops. A soil with an ESP greater than 6 is generally regarded as being a sodic soil in Australia (Northcote and Skene, 1972). ESP levels are further classified in the Australian Soil Classification (Isbell, 1996).

Sodosol: A Soil Order of the Australian Soil Classification (Isbell, 1996). These soils have a clear or abrupt textural change between A horizons and sodic B horizons. Soils with a subplastic B2 horizon are excluded.

Solodic Soil: Great Soil Group, Stace *et al.*, (1968). These soils have a strong contrast between the texture of the A and B horizons and a bleached A2 horizon (which may contain a few sesquioxidic nodules). The A horizons are usually acidic and the B horizons are alkaline grading to strongly alkaline at depth. The B horizon has medium to coarse blocky peds (which may be arranged in a coarse columnar fashion). These soils are typical in semi-arid and subhumid climatic zones and tend to be very dense soils with low permeability. The difference between solodic soils and solodised solonetz soils occurs in the structure of the B horizon: solodics have a medium to coarse blocky structure whereas solodised solonetz soils have a coarse columnar structure with clearly defined domes on the tops of the columns.

Solodised Solonetz: Great Soil Group, Stace *et al.*, (1968). These soils are identical to solodic soils except for the structure of the B horizon: solodics have a medium to coarse blocky structure and solodised solonetz have a coarse columnar structure with clearly defined domes on the tops of the columns.

Solonetz Soils: Great Soil Group, Stace *et al*., (1968). Typically, there is weak differentiation between the A horizons. The A2 horizon may be sporadically bleached just above the clay subsoil. There is an abrupt boundary and a strong texture contrast between the A and B horizons. Surface soils are typically neutral to alkaline with a strongly alkaline subsoil. The subsoil clays are high in sodium and magnesium ions and usually have a prismatic structure.

Solonised Brown Soils: These soils have large amounts of calcium and magnesium carbonates in the profile. Soil properties show gradual change down the profile; the most evident is the increase in carbonates down the profile. Texture becomes finer with depth, and the pH changes from a neutral/slightly alkaline surface horizon to an alkaline subsoil. The soluble salt content of the subsoil also increases significantly. Dark manganiferous nodules can also occur in the subsoil.

Soloth: Great Soil Group, Stace et al., (1968). Similar to a solodic soil but acidic throughout the profile. Tends to be a more typical soil of the humid regions where the exchangeable cations in the B horizon of the solodised soils are leached.

Stranded Beach Ridges: The remnant outcrop of Parilla sand resulting from marine regression

Structure: Describes the way the soil particles are arranged to form soil peds. Peds are units of soil structure which are separated from each other by natural planes of weakness. They differ from clods which are formed as a result of soil disturbance such as ploughing.

Structure is defined by three characteristics: grade, size and type.

> 1) GRADE measures the degree of development and the distinctiveness of the peds. It varies depending on the soil water status and can be divided into five groups: 1) **SINGLE GRAIN**, loose and incoherent mass of individual particles; 2) **MASSIVE**, when displaced the soil separates into fragments which may be crushed into ultimate particles; 3) **WEAK**, peds indistinct; 4) **MODERATE**, peds are well formed and visible but not distinct in undisplaced soil, adhesion between peds is usually firm and when displaced between one third and two thirds of the soil material consists of peds, and; 5) **STRONG**, peds distinct in undisplaced soil, adhesion between peds is firm, and when displaced, two-thirds or more of the soil material consists of peds.
>
> 2) SIZE is measured and described based on the average least dimension of the peds. A guideline is provided in the Australian Soil and Land Survey Field Handbook (Yellow Book) pages 126 to 131.
>
> 3) TYPE of structure has been described throughout the glossary. For example, platy, prismatic, columnar, angular blocky, subangular blocky, polyhedral and lenticular.

A number of different grades and sizes of peds may occur within a horizon. This is referred to as **compound pedality**. An example of this is when prismatic structure exists which then breaks down into smaller blocky peds.

Subangular Blocky Structure: A ped bound by six faces intersecting with round edges (ie. like a rounded cube).

Subnatric: In these soils a major part of the upper 0.2m of the B2 horizon has an ESP between 6 and less than 15. These soils are considered to be sodic (See SODICITY). Used as a Great Group definition for Sodosols in the Australian Soil Classification (Isbell 1996).

Subplastic: These soils have a consistence or textural property suggesting less clay sized particles than the soil actually contains. The soils increase in field texture after 10 minutes of kneading ie. the soil texture becomes more clayey and harder to work. It is a feature of relatively deep subsoils and much energy is required to break down the soil aggregates. Also, these soils do not shrink/swell greatly when wet.

Subsidence: Sinking to a lower level.

Subsoil: The B horizon and their subdivisions, excluding the C horizon (See HORIZONS diagram).

Tenic B Horizons: This horizon has a weakly developed B horizon in comparison with adjacent A horizons above and below, in terms of texture, colour, structure and/or presence of segregations (including carbonate). This term is used in the Australian Soil Classification (Isbell, 1996)

Tenosols: Soil Order of the Australian Soil Classification (Isbell, 1996). These soils generally have weak pedological organisation throughout the profile apart from an A horizon. They display more profile development than Rudosols which may include a weakly developed B horizon with 15% clay or less (See Isbell, 1996, for a detailed definition).

Tertiary: Geological age 1.8 million years - 65 million years before present time.

Texture (Field): Field texture is determined by measuring the behaviour of a small handful of soil when moistened and kneaded (1-2 minutes) until it does not stick to the hand. It provides an estimate of the relative amounts of coarse sand, fine sand, silt and clay size particles. Soil texture influences many soil physical properties such as water holding capacity and hydraulic conductivity. Numerous soil properties affect the determination of texture such as type of clay minerals, organic matter, carbonates, etc. Texture is determined by the behaviour of the moist bolus and length of the ribbon when sheared between thumb and forefinger, as described by McDonald et al., (1990).

Through-Flow: The horizontal movement of water in an aquifer.

TSS (Total Soluble Salts): A measure of the soluble salts in the soil (mainly sodium chloride, sulphate and carbonate). It is a calculated value derived using the Electrical Conductivity reading (See **EC**) where, Total Soluble Salts % = Electrical Conductivity (dS/m) x 0.33. TSS needs to be considered relative to profile water movement.

Uniform Profile Form: A Primary Profile Form of the Factual Key Classification, (Northcote, 1979). These soil profiles have limited, if any texture change throughout the profile. There is generally no textural boundaries found within the profile, except for possibly a surface crust. Uniform soils are given the notation "U".

Vertic Properties: This term is used to describe a subsoil with a field texture of 35% or more clay which experiences significant shrinking and swelling resulting from drying and wetting. This often results in the development of features such as surface cracking and gilgai formation. Evidence of vertic properties include the presence of slickensides and/or lenticular peds in the subsoil. The amount of swelling is dependent on the type of clay present. These features are of significant importance for engineering purposes such as road construction. This term is used as a Subgroup definition for a number of Soil Orders in the Australian Soil Classification (Isbell, 1996).

Vertosols: A Soil Order of the Australian Soil Classification (Isbell, 1996). These are clay soils with shrink/swell properties that display strong cracks when dry and have slickensides and/or lenticular structural aggregates at depth.

Water Repellent: Soils that show resistance to wetting (from a dry state). It is a condition usually associated with sandy surface horizons and is generally caused by organic coatings on sand grains.

Watertable: The depth to the point of soil saturation.

Wilting Point: (Measured at approximately pF 4.2) It defines the amount of water remaining in the soil when a plant wilts and does not respond to added water.

Yield: The amount of groundwater that can be produced from an aquifer.