

Local Planning Policy

Keeping of Livestock in Rural Residential Areas

Prepared by Planning and Sustainability Services
May 2018

Introduction

Farming is an important and defining industry within the Peel region which is a key primary production area on the Swan coastal plain.

Equine and associated industries are of utmost importance to the Shire of Murray with the Shire being a destination of choice for keeping of horses and equestrian activities. There is a long and established tradition of horse racing and training in the Shire which is home to a racecourse, a paceway and a multipurpose regional equestrian centre.

Whilst these uses may occur with little detrimental effect upon the local natural environment or the amenity of surrounding landowners, careful consideration is required to ensure that conflict does not occur as 'overstocking and other unsustainable land management practices' can lead to land degradation and amenity problems including soil erosion, dust nuisance, odour, water pollution and damage to wetlands and vegetation. These problems are most evident within the Shire's rural residential areas.

Overstocking can significantly increase nutrient loads, mainly phosphorus and nitrogen, entering groundwater, watercourses, wetlands, and the Peel-Harvey Estuary. Once in the environment, nutrients can reduce water quality, cause algal blooms, change conditions for aquatic fauna and lead to fish kills.

Small scale livestock management, especially within the coastal plain portion of the Peel-Harvey catchment area is aligned to the capability of each area's landforms and soils. The capability of each soil type within the Shire of Murray to sustain livestock is outlined in the Department of Agriculture and Food, Western Australia's "*Stocking rate guidelines for rural small holdings; Swan Coastal Plain and Darling Scarp, Western Australia*", and the soil mapping across the Shire is shown within that document and summarised in Appendix A.

Application/Definitions

This policy applies to all rural residential areas within the Shire of Murray.

'Base Stocking Rate' is the number of livestock that can consistently be kept on land with an average pasture throughout the year without additional feed or irrigation and without causing environmental damage. The base stocking rate will vary depending on soil capability which is determined by soil type. The base stocking rate is calculated on the area available for the exclusive use of the livestock, being a yard area for the livestock and excludes areas including the area set aside for buildings, vegetated areas, wetlands and creeks including buffers and areas subject to inundation.

'DAFWA Guidelines' refers to the Department of Agriculture and Food, Western Australia's *Stocking rate guidelines for rural small holdings. Swan Coastal Plain and Darling Scarp, Western Australia (Van Gool, Angell and Stephens, 2000)*.

'Livestock' refers to cows, horses, sheep, goats, lamas, alpacas and other similar grazing animals.

'Livestock Management Plan', which also referred to as an 'Equine Management Plan' where prepared in relation to horses, is a report that is prepared when required by the provisions of this policy describing how the property will be managed to prevent environmental damage, land degradation, water pollution and adverse amenity impacts.

'Nutrient and Irrigation Management Plan' (NIMP) is a report that is prepared when required to demonstrate how the land will be managed in terms of nutrient production and how it will meet the requirements of SPP 2.1.

'Rural residential areas' include land that is zoned Special Rural, Farmlet, Special Use (at Racecourse Road and Paceway Court) and similar zones where the keeping of livestock and associated infrastructure is permissible.

'Shelter' is a structure enclosed on up to three sides with a roof and a floor area no greater than 10 square metres.

'SPP 2.1' refers to the Western Australian Planning Commission's *State Planning Policy 2.1 - Peel-Harvey Coastal Plain Catchment* which is a key planning guidance document for nutrient targets in the Peel-Harvey Estuary catchment.

'Stables' has the same meaning as that given in the Scheme which means '*land and buildings used for the housing and keeping of horses*'.

'Yard area' is a general term used to describe an area or paddock that is fenced in for the purpose of confining livestock.

Planning Approval Requirements

Planning approval is required in the following instances:

- To keep livestock on any rural residential lot within the Peel-Harvey Catchment – Swan Coastal Plain boundary as shown in figure 1;
- To keep livestock on any rural residential lot which exceeds the base stocking rate under the 'DAFWA Guidelines' (refer Table 2 under Appendix A of the Policy) outside of the Peel-Harvey Catchment – Swan Coastal Plain boundary as shown in figure 1;
- For development associated with the keeping of livestock including the construction of stables, training tracks and dressage areas;
- Where otherwise specifically required under the Scheme for a particular zone.

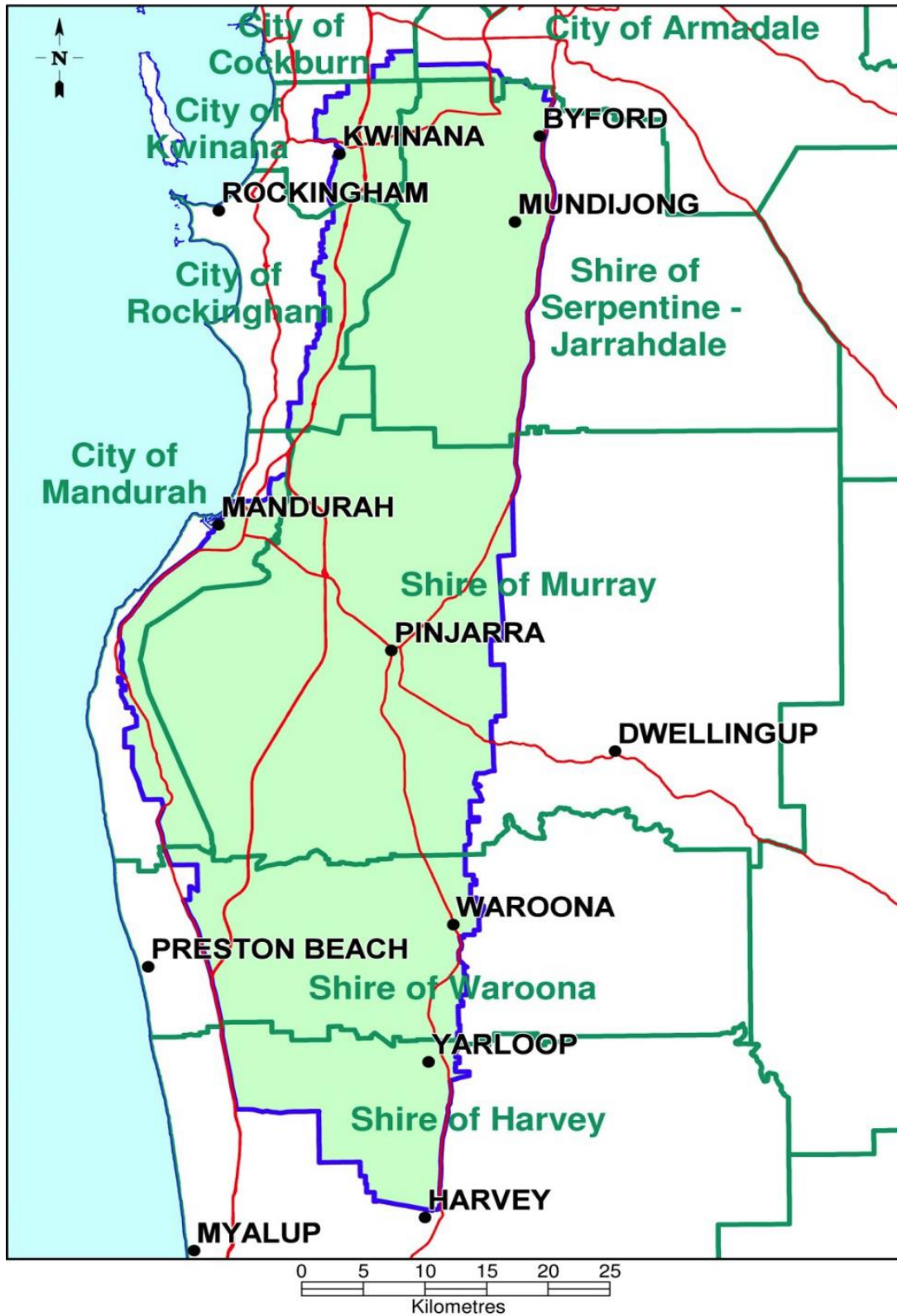


Figure 1: Peel-Harvey Catchment – Swan Coastal Plain Boundary

Where approval is required, applicants will need to clearly demonstrate that their proposal meets the objectives and requirements of this policy and any other requirement of the Shire's planning framework.

Where there is an inconsistency between this policy and a requirement under a more specific planning framework document for a particular site, the more specific requirement prevails to the extent of an inconsistency.

Policy Objectives

The objective of this policy is encourage the keeping of livestock in the Shire's rural residential areas in accordance with the carrying capacity of the land, in a way that:

1. Prevents soil erosion and land degradation;
2. Protects native vegetation and wetlands from damage;
3. Protects ground water and waterways from pollution;
4. Does not result in adverse amenity impacts, particularly relating to dust, odour and noise;
5. Demonstrates compliance with SPP 2.1 within the Swan Coastal Plain Catchment of the Peel-Harvey.

Requirements

In recognition of the detrimental impact that the keeping of livestock may have on the environment and amenity of a locality, each application shall outline the site's suitability for and describe the management practices that will be used to minimise impacts from the keeping of livestock. Details on the following matters are to be provided with each application.

Environmental Considerations

1. Areas of remnant vegetation, wetlands and watercourses are to be appropriately fenced to exclude livestock;
2. Special management techniques including actions such as manure removal, specific drainage design and soil amendment, which may be required for the keeping of livestock within:
 - a) 200m of identified Conservation Category or Resource Enhancement Wetlands;
 - b) 50m of the bank of any permanent watercourse; and
 - c) 30m of the bank of any ephemeral (non-permanent) watercourse including agricultural drains.

Amenity Considerations

3. The construction of any built structure or yard area for the keeping of livestock should be sited to protect the amenity of adjacent residents, including protection against:
 - a) The production of dust;
 - b) The creation of noise;
 - c) The attraction of insects;
 - d) The production of odour associated with the animals and their excrement; and
 - e) Increased environmental degradation, including erosion or increased surface water drainage onto adjacent properties;

General Livestock Assessment Criteria

4. The number of livestock to be kept on a property is to be generally consistent with the 'base stocking rate' outlined within the DAFWA Guidelines.
5. Where the number of livestock to be kept on a property exceeds the base stocking rate outlined with the DAFWA Guidelines, the applicant is to submit a livestock management plan which provides an indication of the management needed to protect the environment and amenity of the locality. This should include

reference to factors including pasture improvement, farm planning, nutrient and waste management, and stabling and demonstrate compliance with SPP 2.1.

Yard Areas

6. Livestock are to be kept in a yard area at all times unless in the case of horse/s they are stabled.
7. Yard areas are to be fenced with open post and rail or post and wire construction sufficient to confine livestock.
8. Yard areas should be located:
 - a) At least 50 metres from a natural river, waterway, lake, conservation category or resource enhancement wetland;
 - b) At least 30 metres from drainage line, private water supply bores or dam;
 - c) At least 15 metres from a dwelling house, public building or premises where people are employed or where food is stored, prepared, manufactured or sold;
 - d) Outside an area recognised as being flood prone or subject to seasonal inundation.
 - e) Outside of areas with a slope of greater than 10%;
 - f) Outside of areas containing remnant native vegetation or re-vegetation;
 - g) Outside of Public Drinking Water Supply Areas.
9. Individual trees located within a yard area are to be protected from damage from livestock if deemed necessary.

Buildings associated with Keeping of Livestock

10. Where an approved building envelope exists for a property then buildings associated with the keeping of livestock are to be located within the approved building envelope.
11. Notwithstanding provision 10, shelters may be located outside of approved building envelopes however are to be located within an approved yard area and no closer to a lot boundary than the setback distance specified in the Scheme.
12. Where there is no approved building envelope for a property then buildings associated with the keeping of livestock are to be located within an approved yard area and no closer to a lot boundary than the setback distance specified in the Scheme.
13. Stables are to be designed and constructed in accordance with the Shire's Health Local Laws applicable for townsites.
14. An effluent disposal system may be necessary for stables or other buildings associated with the keeping of livestock in instances where the impact of the livestock may detrimentally impact the environment. The impact and management of effluent should be addressed as part of the preparation of the Livestock Management Plan.
15. Stables and shelters are to be constructed of materials and colours that are compatible with and do not detract from the rural residential character and visual amenity of the area.

Manure Receptacles

16. Manure receptacles or other measures are required to mitigate issues such as odour, stable fly and contamination. All manure receptacles shall be screened from neighbouring properties and the street.

Special Use Zone – Racecourse Road - Lots and Special Use Zone - Paceway Court

17. Development shall be in accordance with the Special Provisions of the Scheme, the Shire Local Laws and this Policy.

General

18. The installation of training tracks, dressage areas and the like, will generally be permitted where it can be demonstrated that the use of these areas will not affect the amenity of the area or the environment.
19. Where it is proposed to irrigate paddocks, training tracks, dressage areas and the like the applicant will need to demonstrate that:
- a) a licence has been obtained from the Department of Water allowing sufficient water to be extracted to irrigate the areas identified in the application or otherwise demonstrate the availability of a sufficient water source;
 - b) the nutrient management requirements of SPP 2.1 have been addressed in a Nutrient and Irrigation Management Plan satisfactory to the Shire following advice from the Departments of Water and Agriculture and Food.
20. There is a general presumption against irrigation in circumstances where there is a high risk for nutrient export, unless it can be adequately demonstrated to the satisfaction of the Shire and relevant agencies that adequate nutrient retention management can be put in place to mitigate this risk. 210 A Livestock Management Plan is to be submitted with an application to keep livestock under this policy. The plan is to include, but is not limited to, the following:
- a) livestock rotation and stabling;
 - b) manure management;
 - c) pasture management;
 - d) dust management; and
 - e) effluent management
21. The Shire may take action to ban or reduce stocking in cases where approval has been granted but where environmental or amenity issues arise.

Supporting Documentation

This policy is supported by:

Appendix A Table 1 – Excerpt and Summary of Tables 1 and 2 from the DAFWA Guidelines.

Administration

Directorate		Officer Title	
Planning and Sustainability		Director Planning and Sustainability	
Version	Decision to Advertise	Decision to Adopt/Amend	Current Status
1	OCM16/137 – 23/6/2016	OCM17/034 – 9/3/2017	Adopted

Appendix A: Excerpt and Summary of Tables 1 and 2 from the DAFWA Guidelines, including Supporting Advice

Stocking Rates are calculated in dry sheep equivalents (DSE) per hectare based on the stocking rate land units across the used area of the property. Stocking rate land unit is determined from soil type mapping that can be provided specifically for each property by council upon request and is available to the public.

The following tables are used to determine stocking rates for any property within the Shire of Murray.

Table 1 – Base Stocking Rates for Stocking Rate Units (DSE/hectare)¹

Stocking rate land unit	Unit code	Recommended dry stocking rate ⁴	Recommended irrigated stocking rate ⁵
Well drained yellow to brown sands	SR1	6 DSE/ha	20 DSE/ha
Rapidly drained calcareous sands	SR2	2 DSE/ha	Usually not suitable
Rapidly drained pale sands	SR3	2 DSE/ha	10 DSE/ha
Pale sand flats	SR4	6 DSE/ha	20 DSE/ha
Semi-wet soils ² (swamps and drains) (salty areas)	SR5 SR5.1 SR5.2	6 DSE/ha (0 to 2 DSE/ha) (0 to 2 DSE/ha)	20 DSE/ha (Swamps and salty areas are not usually suitable)
Clay flats	SR6	6 DSE/ha	20 DSE/ha
Loamy flats and terraces	SR7	10 DSE/ha	25 DSE/ha
Gravel slopes (Shallow gravels and ironstone outcrop)	SR8 SR8.1	10 DSE/ha (2 DSE/ha)	25 DSE/ha (Usually not suitable)
Steep slopes ³ (Shallow rocky soils and crests)	SR9 SR9.1	6 DSE/ha (2 DSE/ha)	10 DSE/ha (Usually not suitable)
Loamy slopes	SR10	10 DSE/ha	25 DSE/ha

- 1 See Table 2 for the animal equivalents.
- 2 Semi-wet soils range from plains with high seasonal water tables to seasonal drainage depressions, which include seasonal swamps and wetlands. These are rated low or not recommended for livestock. Permanent swamps with standing water are usually mapped as water features and are not suitable for livestock. Most salty areas are also poorly suited to livestock.
- 3 Shallow rocky soils and crests are rated at 2 DSE/ha.
- 4 Livestock increases in excess of the base stocking rate require a management plan which includes measures to minimise nutrient export.

5. Due to the high risk to sensitive waterways and wetlands, DAFWA does not recommend irrigating pastures to increase stocking rate on a number of land units inside the Peel-Harvey coastal catchment policy area. Refer Table 3 for the list of units within the policy area and their potential suitability for irrigated pastures due to high risk of phosphorous export.

Using Table 2, an equivalent stocking rate for other animals can be determined.

Table 2. Animal equivalents for the calculation of stock rates

Type of livestock Weight (kg) and animal type	Dry sheep equivalent (DSE)
Sheep 50 kg Wether, ewe 40-45 kg Lambing ewe (ewe and lamb) 75 kg Rams	 1.0 1.5 1.5
Cattle 425 kg Milking cow 425 kg Dry cows, yearling, steer or heifer 300 kg Yearling, heifer 200 kg Smaller cattle (Dexter, Lowline) 750 kg Bull, cow with calf Cow with young calf	 10.0 8.0 6.0 4.0 15.0 10.0
Horses 450 kg Light 1000 kg Draught 250 kg Pony	 10.0 20.0 5.0
Goats 30-35 kg Dry Angora 35-40 kg Cashmere goat 50-60 kg Dry milk goat Milking goat	 0.7 1.0 1.5 2.0
Deer 120 kg Red Deer 50 kg Fallow Deer	 2.2 1.0
Other 55-120 kg Ostrich average (assumes half introduced) 55 kg Emu average (assumes half introduced feed) 150-210 kg Llama 60-70 kg Alpaca	 1.4 0.7 3.0 0.8

Note: Stocking rates are based primarily on the potential for pasture damage which depends on feeding patterns and foot structure.
A 50 kg wether is the accepted standard for Dry Sheep Equivalents (DSE).

Emus and ostriches are not purely grazing animals and require supplementary feeding, hence estimates are conservative to allow for additional manure on the paddocks. Emus require a licence from State Government.

Example: A property with 22 DSE could support either 22 sheep, 2 light horses, one draught horse or 31 dry Angora goats, or any combination of these.

Table 3: Nutrient export risk and suitability for irrigated pastures for keeping of livestock on different land units in the Peel-Harvey Coastal Catchment.

NB If a unit is listed as potentially suitable for irrigated pasture this does not mean that water is available for irrigation. Contact the Department of Water for information about irrigation license. A Nutrient and Irrigation Management Plan will still be required.

Map Unit Symbol	Map Unit Description	> 50% High, Very High or Extreme risk of Phosphorus Export?	Stocking Rate Land Unit Code	Base stocking rate (DSE/ha)	Is the map unit potentially suitable for irrigated pasture?
B1	Extremely low to very low relief dunes, undulating sandplain and discrete sand rises with deep bleached grey sands sometimes with a pale yellow B horizon or a weak iron-organic hardpan at depths generally greater than 2 m; banksia dominant.	Yes	SR3	2	No
B1a	Extremely low to very low relief dunes, undulating sandplain and discrete sand rises with deep bleached grey sands with an intensely coloured yellow B horizon occurring within 1 m of the surface; marri and jarrah dominant.	No	SR3	2	Yes
B2a	Flat to very gently undulating sandplain with well to moderately well drained deep bleached grey sands with an intensely coloured yellow B horizon usually well within 1 m of the surface.	No	SR3	2	Yes

Map Unit Symbol	Map Unit Description	> 50% High, Very High or Extreme risk of Phosphorus Export?	Stocking Rate Land Unit Code	Base stocking rate (DSE/ha)	Is the map unit potentially suitable for irrigated pasture?
B3	Closed depressions and poorly defined stream channels with moderately deep, poorly to very poorly drained bleached sands with an iron-organic pan, or clay subsoil. Surfaces are dark grey sand or sandy loam.	Yes	Swamp (SR5.1)	2	No
B4	Broad poorly drained sandplain with deep grey siliceous sands or bleached sands, underlain at depths generally greater than 1.5 m by clay or less frequently a strong iron-organic hardpan.	Yes	SR5	6	No
B5	Shallowly incised stream channels of minor creeks and rivers with deep grey siliceous sands or bleached sands, underlain at depths generally greater than 1.5 m by clay or less frequently a strong iron-organic hardpan.	Yes	SR4	6	No
B6	Sandplain and broad extremely low rises with imperfectly drained deep or very deep grey siliceous sands.	Yes	SR4	6	No
F1a	1-15% lower slopes with well drained shallow to moderately deep, very gravelly acidic yellow duplex soils and common laterite.	No	Other (SR8)	6	Yes
F1b	1-15% lower slopes with well drained moderately deep to deep, gravelly acidic yellow duplex soils and rare laterite.	No	SR8	10	Yes

Map Unit Symbol	Map Unit Description	> 50% High, Very High or Extreme risk of Phosphorus Export?	Stocking Rate Land Unit Code	Base stocking rate (DSE/ha)	Is the map unit potentially suitable for irrigated pasture?
F1c	1-15% lower slopes with well drained deep uniform yellowish brown sands which are generally free of laterite or gravel.	No	Other (SR1)	6	Yes
F2a	Low slopes and foot slopes up to 5- 10% with well drained shallow to moderately deep, very gravelly acidic yellow duplex soils and common laterite.	No	Other (SR8, SR8.1)	6	Yes
F2b	Low slopes and foot slopes up to 5- 10% with well drained moderately deep to deep, gravelly acidic yellow duplex soils and rare laterite.	No	SR8	10	Yes
F2c	Low slopes and foot slopes up to 5- 10% slopes with well drained deep uniform yellowish brown sands which are generally free of laterite or gravel.	No	Other (SR1)	6	Yes
F3	1-3% foot slopes with deep, imperfectly drained yellow and, less commonly, acidic gley duplex soils.	No	SR8	10	Yes
F4	Incised stream channels within gentle slopes with deep acidic yellow duplex soils and sandy alluvial gradational brown earths.	Yes	Other (SR8)	6	No
F5	Poorly defined stream channels on lowest slopes with deep acidic yellow duplex soils and sandy alluvial gradational brown earths.	Yes	Other (SR8)	6	No
Ff1	Foot and low slopes < 10% with deep rapidly drained siliceous yellow brown sands, and pale or bleached sands with yellow-brown subsoil. Shrubland of unidentified species.	No	SR1, SR3	2	Yes

Map Unit Symbol	Map Unit Description	> 50% High, Very High or Extreme risk of Phosphorus Export?	Stocking Rate Land Unit Code	Base stocking rate (DSE/ha)	Is the map unit potentially suitable for irrigated pasture?
Ff10	Alluvial fans on lower slopes <5-10% with variable poorly drained soils.	Yes	Other (SR5)	6	No
Ff2	Foot and low slopes < 10%. Well drained gravelly yellow or brown duplex soils with sandy topsoil. Woodland of E.marginata, E. calophylla and some B.grandis.	No	SR8	10	Yes
Ff3	Foot and low slopes <10%. Well drained gravelly yellow or red duplex soils with sandy loam to loam topsoil. Woodland of E. wandoo and E. marginata.	No	SR10	10	Yes
Ff7	Alluvial fans on slopes <5- 10%. Variable, imperfectly drained soils comprising layers of sand, sandy loam, clay, grit and weathered granitic detritus. Low woodland of E. calophylla, Banksia attenuata and grandis and some Casuarina spp.	Yes	Other (SR4)	6	No
Ff9	Seepage areas and non-incised drainage channels on foot slopes <3% with poorly drained bleached grey sands over an iron-organic hardpan.	Yes	SR4, SR5	6	No
P1a	Flat to very gently undulating plain with deep acidic mottled yellow duplex (or "effective duplex") soils. Shallow pale sand to sandy loam over clay; imperfect to poorly drained and generally not susceptible to salinity.	No	SR4, SR5	6	Yes

Map Unit Symbol	Map Unit Description	> 50% High, Very High or Extreme risk of Phosphorus Export?	Stocking Rate Land Unit Code	Base stocking rate (DSE/ha)	Is the map unit potentially suitable for irrigated pasture?
P1b	Flat to very gently undulating plain with deep acidic mottled yellow duplex (or "effective duplex") soils. Moderately deep pale sand to loamy sand over clay; imperfectly drained and moderately susceptible to salinity in limited areas.	No	SR4	6	Yes
P1c	Flat to very gently undulating plain with deep acidic mottled yellow duplex (or "effective duplex") soils. Deep pale brown to yellowish sand to sandy loam over clay; imperfectly drained and moderately susceptible to salinity in limited area.	No	SR4	6	Yes
P1d	Flat to very gently undulating plain with deep acidic mottled yellow duplex (or "effective duplex") soils. Shallow pale sand to sandy loam over clay; imperfect to poorly drained and moderately susceptible to salinity.	No	SR4, SR5	6	No
P1e	Flat to very gently undulating plain with deep acidic mottled yellow duplex (or "effective duplex") soils. Shallow pale sand to sandy loam over very gravelly clay; moderately well drained.	No	SR4	10	Yes
P2	Flat to very gently undulating plain with deep alkaline mottled yellow duplex soils which generally consist of shallow pale sand to sandy loam over clay.	No	SR4	6	No
P2a	Flat to very gently undulating plain with deep alkaline mottled yellow duplex soils which generally consist of shallow pale sand to sandy loam with a silcrete hardpan at 50-100 cm depth generally on top of an olive-grey clay.	No	Other (SR5.2)	2	No
P3	Flat to very gently undulating plain with deep, imperfect to poorly drained acidic gradational yellow or grey- brown earths and mottled yellow duplex soils, with loam to clay loam surface horizons.	No	SR5, SR6	6	No

Map Unit Symbol	Map Unit Description	> 50% High, Very High or Extreme risk of Phosphorus Export?	Stocking Rate Land Unit Code	Base stocking rate (DSE/ha)	Is the map unit potentially suitable for irrigated pasture?
P4	Poorly drained flats, sometimes with gilgai microrelief and with moderately deep to deep black, olive grey and some yellowish brown cracking clays and less commonly non-cracking friable clays with generally acidic subsoils.	No	SR5, SR6	6	No
P4a	Poorly drained flats. Cracking clays similar to P4 with a thin veneer of grey sand.	No	SR6	6	No
P5	Poorly drained flats, commonly with gilgai microrelief and with deep black- grey to olive-brown cracking clays with subsoils becoming alkaline.	No	SR5, SR6	6	No
P5a	Poorly drained flats. Cracking clays similar to P5 with a thin veneer of grey sand.	No	SR6	6	No
P7	Seasonally inundated swamps and depressions with very poorly drained variable acidic mottled yellow and gley sandy duplex and effective duplex soils.	Yes	Swamp (SR5.1)	2	No
P7a	Seasonally inundated swamps and depressions with very poorly drained variable acidic mottled yellow and gley duplex soils becoming alkaline with depth.	Yes	Swamp (SR5.1)	2	No
P7b	Seasonally inundated swamps and depressions or seepage areas near the base of the foothills with very poorly drained deep bleached siliceous sands.	Yes	Swamp (SR5.1)	2	No
P8	Broad poorly drained flats and poorly defined stream channels with moderately deep to deep sands over mottled clays; acidic or less commonly alkaline gley and yellow duplex soils to uniform bleached or pale brown sands over clay.	No	SR4, SR5	6	No

Map Unit Symbol	Map Unit Description	> 50% High, Very High or Extreme risk of Phosphorus Export?	Stocking Rate Land Unit Code	Base stocking rate (DSE/ha)	Is the map unit potentially suitable for irrigated pasture?
P9	Shallowly incised stream channels of minor creeks and rivers with deep acidic mottled yellow duplex soils.	Yes	SR5	6	No
P9a	Generally shallow incised stream channels of minor creeks and rivers with poorly drained deep mottled yellow duplex soils, becoming alkaline with depth.	Yes	SR5	6	No
P11	Shallow brown loamy soils or less commonly, very shallow sands over ironstone pavement which is a clear barrier to drainage.	No	Other	6	No
P11a	Shallow sand to sandy loam over lateritic material; imperfect to moderately well-drained.	No	Other	6	No
SW2	Low level, occasionally flooded, alluvial terraces with imperfectly drained variable alluvial soils with loamy surfaces.	Yes	SR5	6	No
SWP10	Gently undulating to flat terraces adjacent to major rivers, but below the general level of the plain, with deep well drained uniform brownish sands or loams subject to periodic flooding.	No	SR7	10	Yes
jSWP10a	Flat terraces adjacent to major rivers with deep black cracking clays with alkaline subsoils; soils similar to P5.	Yes	SR5, SR6	6	No
SWP6a	Very gently undulating alluvial terraces and low rises contiguous with the plain, with deep moderately well to well drained soils associated with major current river systems and larger streams. Acidic red and yellow duplex soils, less common	No	SR6	6	Yes

Map Unit Symbol	Map Unit Description	> 50% High, Very High or Extreme risk of Phosphorus Export?	Stocking Rate Land Unit Code	Base stocking rate (DSE/ha)	Is the map unit potentially suitable for irrigated pasture?
jSWP6b	Very gently undulating alluvial terraces and low rises contiguous with the plain, with deep moderately well to well drained soils associated with prior stream deposits. Soils are uniform brownish sands.	No	SR6	6	Yes
2SWP6c	Very gently undulating, alluvial terraces and fans. Moderate to moderately well-drained uniform friable brown loams, or well-structured gradational brown earths.	No	SR7	10	Yes
V1	Saline tidal flats composed of grey, black and brown foetid muds and humic sandy clays with locally common shell and limestone fragments.	Yes	Not suitable	0	No
V2	Samphire covered sand and mud flats marginally higher than V1 and frequently inundated; with deep alkaline alluvial sands and clayey sands.	Yes	Not suitable	0	No
V3	Sand flats marginally higher than V2. Frequently inundated; with deep alkaline alluvial sands and clayey sands, commonly supporting stands of <i>Melaleuca</i> spp.	Yes	Other (SR5.1)	2	No
V4	Low level storm beach ridges and terraces with shallow to moderately deep uniform alkaline black sandy loams to loams overlying unconsolidated shell beds or clayey marl.	No	SR5, SR7	6	No



Map Unit Symbol	Map Unit Description	> 50% High, Very High or Extreme risk of Phosphorus Export?	Stocking Rate Land Unit Code	Base stocking rate (DSE/ha)	Is the map unit potentially suitable for irrigated pasture?
V5	Upper level sandy terrace and gently undulating beach ridges with shallow to moderately deep grey siliceous sands overlying soft shelly limestone or shell bds.	No	SR4	6	No
V6	Upper level sandy terrace and gently undulating beach ridges with deep grey or bleached pale brown siliceous sands overlying soft shelly limestone.	Yes	SR3	2	No
V6a	Gently undulating beach ridges similar to V6, but formed from reworked Pleistocene Bassendean sands. Deep bleached grey acidic siliceous sands with iron-organic hardpan.	Yes	SR3	2	No
V7	Very broad shallow depression with deep, poorly drained, fine textured alkaline estuarine alluvium.	Yes	SR5	6	No
V8	Flat poorly drained plains forming the margins of the estuarine deposits which border and partially overlie the Pinjarra Plain with variable, moderately deep to deep saline soils. Commonly, these are mottled yellow duplex soils	Yes	SR5	6	No
V9	Areas of former swamps which have been artificially drained, with uniform loamy or peaty sands.	Yes	SR5	6	No
S1a	Dune ridges with shallow to moderately deep siliceous yellow- brown sands, very common limestone outcrop and slopes up to 15%.	Yes	SR1	6	No

Map Unit Symbol	Map Unit Description	> 50% High, Very High or Extreme risk of Phosphorus Export?	Stocking Rate Land Unit Code	Base stocking rate (DSE/ha)	Is the map unit potentially suitable for irrigated pasture?
S1b	Dune ridges with deep siliceous yellow brown sands or pale sands with yellow-brown subsoil and slopes up to 15%.	No	SR1	6	Yes
S1c	Dune ridges with deep bleached grey sands with yellow-brown subsoils, and slopes up to 15%.	No	SR3	2	Yes
S1d	Dune ridges with moderately deep to very deep siliceous yellow-brown sands, rare limestone outcrop and slopes 3-20% occurring on the eastern slip face.	Yes	Other (SR1)	2	No
S2a	Lower slopes (1-5%) of dune ridge with moderately deep to deep siliceous yellow-brown sands or pale sands with yellow-brown subsoils and minor limestone outcrop.	No	SR1	6	Yes
S2b	Lower slopes (1-5%) of dune ridge with shallow to deep siliceous yellow- brown sands and common limestone outcrop.	No	SR1	6	Yes
S2c	Lower slopes (1-5%) of dune ridge with bleached or pale sands with a yellow-brown or pale brown subsoil (like S1c). Usually occurs on the eastern edge of the Spearwood Dunes.	No	SR3	2	Yes
S3	Inter-dunal swales and depressions with gently inclined side slopes and deep rapidly drained siliceous yellow- brown sands.	No	SR1	6	Yes
S4a	Flat to gently undulating sandplain with deep, pale and sometimes bleached, sands with yellow-brown subsoils.	No	SR1	6	Yes

Map Unit Symbol	Map Unit Description	> 50% High, Very High or Extreme risk of Phosphorus Export?	Stocking Rate Land Unit Code	Base stocking rate (DSE/ha)	Is the map unit potentially suitable for irrigated pasture?
S4b	Flat to gently undulating sandplain with shallow to moderately deep siliceous yellow-brown and grey-brown sands with minor limestone outcrop.	No	SR1	6	Yes
S4c	Flat to gently undulating sandplain with deep, yellow-brown or dark brown siliceous sands that are seasonally inundated.	Yes	SR1, SR5	6	No
S6	Flat stony plain with poorly drained shallow siliceous sands and large areas of bare limestone pavement.	No	Other	2	No
Qf2	Relict fore dunes and gently undulating beach ridge plain with deep uniform calcareous sands.	No	SR2	2	Yes
Qp1	Complex of nested low relief parabolic dunes with moderate to steep slopes and uniform calcareous sands showing variable depths of surface darkening.	No	SR2	2	Yes

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