LPP 4 – Local Planning Policy 4 – Intensive Agriculture

1. Intention

To:

1. Ensure new Intensive Agriculture enterprises pose a low risk to Catchment water quality and are able to meet or improve Catchment standards for water quality improvement.

2. Encourage new types of Intensive Agriculture enterprises to the Policy Area which are compatible with Catchment water quality improvement standards.

3. Encourage high standards in Intensive Agriculture management practices in all parts of the local government area.

4. Ensure strategic and statutory proposals do not compromise existing well-managed intensive agriculture developments, or compromise the potential future development of relatively high capability areas.

2. Scope

This policy applies throughout the district.

3. Definitions

'Bushland' means land on which there is vegetation which is either a remainder of the natural vegetation of the land, or, if altered, is still representative of the structure and floristics of the natural vegetation, and provides the necessary habitat for native fauna (EPA, 2008b).

'Catchment' means the area around the wetland or waterway that contributes surface run-off or groundwater to the wetland or waterway.

'Catchment Water Quality' means the quality of water in ground and surface waters of the Peel-Harvey Coastal Catchment (Figure 1) including drains, creeks, wetlands, rivers and estuarine areas. Water quality parameters include levels of phosphorus, nitrogen, organics, salinity, acidity and total suspended solids. Catchment Water Quality Improvement Standards The threshold levels of nutrients applied to land, or exported from land, as set in Appendix A of this policy.

'Closed system (as in closed system hydroponics)' means hydroponics system in which the nutrient solution is recirculated and the nutrient concentrations are monitored and adjusted accordingly. There is zero or minimal discharge of the solution or water to the environment.

'Coastal Catchment Area' has the same meaning as for Peel-Harvey Coastal Catchment.

'Intensive Agriculture (Agriculture - Intensive)' has the same meaning as 'agriculture - intensive' in the Model Scheme Text.

'Hydroponics' means the process of growing plants using mineral nutrient solutions, without soil. Although hydroponic systems do not involve soil, they may involve a wide variety of growing media, such as perlite, gravel, peat, sand, rockwool and other.

'In-ground horticulture' means horticulture where the crop is grown directly into in-situ soils and landforms, whether the soils have been amended or not.

'Land capability' refers to the ability of land to support a type of land use without causing damage.

'Land suitability' takes land capability information and other information (such as rainfall, environmental sensitivity) and looks at the overall suitability of a piece of land to accommodate a particular kind of development. It is useful for site selection and can also underpin the manner in which a particular type of development is carried out, so that the environmental limitations or constraints are fully recognised (EPA 2008b).

'Nutrient Export Risk Assessment' means an assessment of the nutrient export risk posed by a proposal on a specific site and production area. It should be carried out by a suitably qualified expert and able to be independently verified.

'Peel-Harvey Coastal Catchment' means the catchment area defined in State Planning Policy 2.1 Peel-Harvey Coastal Plain Catchment.

'Production area' means the area under crop production (excluding non-production areas on the Lot or Site).

'Site' means the lot or lots on which the production area is located.

'Site Management Plan' means the plan prepared by the proponent to document how the production area and site will be managed over the lifespan of the operation to reduce nutrient export and manage all aspects of the operation in relation to the natural environment, pollution risk, visual landscape and maintenance of the amenity to neighbouring properties. A checklist to guide preparation of a Site Management Plan is included in Appendix E.

'Soil-landscape systems of the Peel-Harvey Coastal Catchment' means Forrestfield System, Pinjarra System, Bassendean System, Vasse System, Spearwood System and Quindalup System.

'Viticulture or vines' means the growing of grapes for wine; or growing of low yield olives.

'Watercourse' means a river, stream, creek or manmade drainage features in which water flows in a channel, whether permanently or intermittently (EPA, 2008b).

'Wetland' means areas of seasonally, intermittently or permanently waterlogged soils or inundated land, whether natural or artificial, fresh or saline (EPA, 2008b)

4. Statement

4.1 Intensive Agriculture Proposals

In determining or providing advice on strategic or statutory Intensive Agriculture planning proposals, the following provisions shall apply:

1. Proposals should pose a low risk to Catchment water quality, the environment and land resources and aim to achieve the Catchment water quality improvement standards as set out in Appendix A.

2. All proposals for nurseries (potted plants) and closed systems (e.g. closed system hydroponics) should be accompanied by a Site Management Plan sufficiently detailed to ensure that the proposal will pose a low risk to catchment water quality and other environmental values and be well managed.

3. All proposals for annual and perennial horticulture and viticulture in the Coastal Catchment Area which are located on Soil-landscape mapping units which are not potentially suitable for the proposed type of Intensive Agriculture (Appendix B) should be accompanied by a Site

Management Plan which reduces nutrient export risks to achieve Catchment water quality improvement standards, and includes:

(a) Site-specific soil testing

(b) Site-specific land capability assessment

(c) Nutrient Export Risk Assessment.

4. Outside of the Catchment area, where a risk is posed to Catchment water quality or other environmental values, the local government may on the advice of relevant state agencies, require proponents to provide site specific soil testing and land capacity assessment and a Nutrient Export Risk Assessment as part of the Site Management Plan.

5. Unless otherwise demonstrated through site specific studies the Shire of Waroona shall consider a proposal likely to pose a significant risk to Catchment water quality and likely to substantially vary with the objectives and provisions of SPP2.1 and the Peel-Harvey Environmental Protection Policy where the site's soil-landscape unit(s) is not potentially suitable for the proposed annual or perennial horticulture or viticulture as denoted in Table 2, Column 5.

6. Where on-site soil-landscape conditions vary from the mapped land units shown in Regional-scale soil-landscape unit mapping prepared by DPIRD, then this may be demonstrated through site-specific soil testing and site-specific land capability assessment for the proposed type of horticultural land use. This site-specific testing and assessment shall be included in the Site Management Plan, carried out by an appropriately qualified expert and supported by the relevant state government departments. The standards of soil testing and land capability assessment should be generally in accordance with Appendix C, or as otherwise advised.

7. Based on all available evidence, proposals which pose a significant risk to Catchment water quality and are very likely to substantially vary with the objectives and provisions of SPP2.1 and the Peel-Harvey Environmental Protection Policy should be refused, even in a modified form, with reasons given. Available evidence includes Table 2, Site Management Plan including site specific soil testing and land capability assessment and the advice of relevant agencies.

8. Due regard shall be given to the 'Other Considerations' listed in Appendix D and any other relevant matters, when assessing all proposals for Intensive Agriculture.

9. When determining proposals, the local government may give consideration to imposing conditions, among others, so as to minimise the ongoing risk that the development may pose to Catchment water quality, such as:

(a) Placing a finite time limit on the Development Approval;

(b) Conditioning the ongoing operation of the development on the results of surface and groundwater monitoring.

(c) Conditioning the ongoing operation of the development on the implementation of contingency measures, as triggered by the results of surface and groundwater monitoring.

4.2 All Proposals

1. All strategic and statutory proposals should give due regard to the impact on existing enterprises, and should aim to protect potential future areas with relatively high capability soils.

2. Following a review of any relevant technical information or advice provided by a state government agency, where a proposal is likely to compromise the buffer requirements of an established operation then there should be a presumption against approval of the proposal unless the proponent can satisfactorily demonstrate that the proposal is compatible with the operation.

3. Due regard shall be given to accepted buffer requirements set by government, including:

   (a) Guidelines for Separation of Agricultural and Residential Land Uses (Department of Health, 2012);
   (b) Protection of buffer areas as set out in the Peel Region Scheme Strategic Agricultural Resource Policy and Greater Bunbury Region Scheme Strategic Agricultural Resource Policy.

5. Site Management Plan

The purpose of the Site Management Plan is to document how the production area and site will be established and managed over the lifespan of the operation to reduce nutrient export and manage all aspects of the operation in relation to the natural environment, pollution risk, visual landscape and neighbourhood amenity. In doing so, the Site Management Plan should demonstrate ongoing compliance with:

- Catchment Water Quality Improvement Standards (Appendix C), and
- Other Considerations (Appendix D).

Where appropriate, the Site Management Plan can be provided in the format of a Nutrient and Irrigation Management Plan, as potentially required by other decision-making authorities such as the Department of Water.

6. Nutrient Export Risk Assessment

The purpose of the Nutrient Export Risk Assessment is to provide evidence to the local government (and experts advising the local government) that given the specific site conditions, production system and management practices, the proposal will likely pose a low risk to Catchment water quality and other environmental values.

The Assessment should draw upon details specific to the site and proposal (or refer to other sections of the Site Management Plan where information can be found):

(a) Site conditions:

   (i) Soil types and mapping of soil types
   (ii) Location of vegetation, watercourses and wetlands
   (iii) Depth to groundwater in winter

(b) Site-specific land capability assessment for the proposed land use

(c) Crop and cultivation details

(d) Fertiliser regimes, nutrient content and distribution methods

(e) An analysis of nutrient pathways on the site and areas of greatest risk.

(f) Soil and water nutrient monitoring regimes

(g) Contingency actions to be undertaken by proponent if monitoring reveals site is exporting unacceptable nutrient loads. (i.e. What management actions will the proponent undertake to ensure nutrient export is reduced to an acceptable amount).

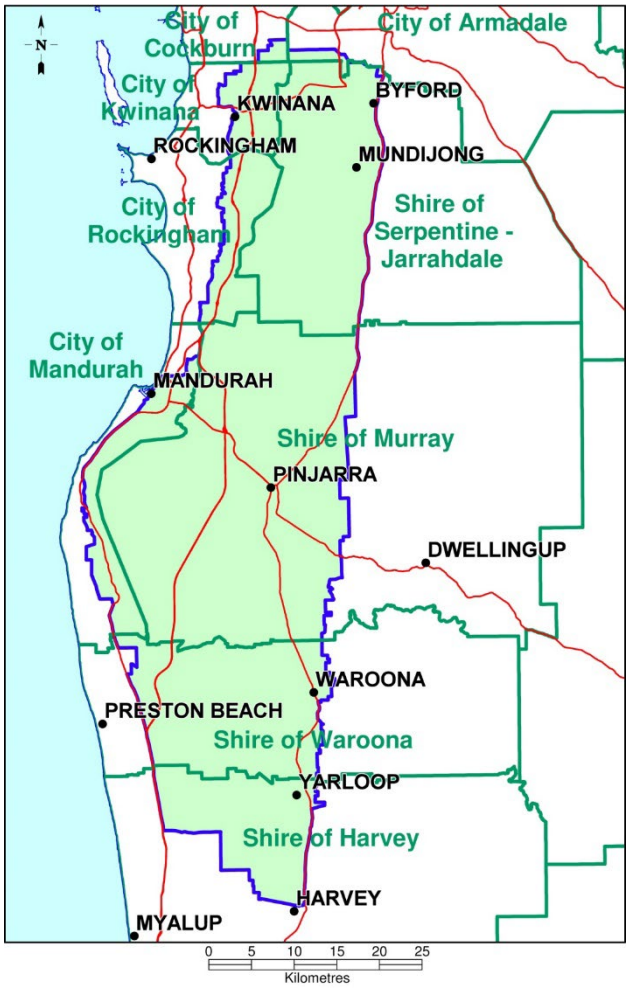
(h) Links to the strategies in the Site Management Plan that will reduce nutrient inputs, increase nutrient harvesting or reduce nutrient exports from the production area or the site.

Where on-site soil-landscape conditions vary from the mapped land units shown in Regional-scale soil-landscape unit mapping prepared by DAFWA, then this must be demonstrated through site-specific soil testing and site-specific land capability assessment for the proposed type of Intensive Agricultural land use. The standards of soil testing and land capability assessment should be generally in accordance with Appendix C, or as otherwise advised by the Department of Agriculture and Food WA.

Where appropriate, the Nutrient Export Risk Assessment may be provided in the format of a Nutrient and Irrigation Management Plan (NIMP), such as in cases where a NIMP is required by other agencies such as the Department of Water. All information and claims presented in the Assessment should be able to be independently verified by an expert in an appropriate field such as agronomy, agricultural science, environmental science, natural resource management or related area.

7. Figures

Figure 1: Peel-Harvey Coastal Catchment Area



Boundary of the Peel-Harvey Coastal Plain Catchment, and area to which State Planning Policy 2.1 applies

8. Appendices

Appendix A: Peel Harvey Catchment Water Quality Improvident Standards and Guidance

Appendix B: Table 1 Indicative risk of horticultural proposals to catchment water quality and soil resources

Appendix C: Suitability of soil-landscape mapping units in the Shire of Waroona for annual horticulture, perennial horticulture and viticulture

Appendix D: Other considerations

9. Legislative and Strategic Context

The *Planning and Development Act 2005* and the associated subsidiary legalisation provide the broad framework within which this policy operates.

10. Review

This policy is to be reviewed every 5 years.

11. Associated Documents

Nil.

Division	Planning				
Policy Number	PP004				
Contact Officer	Manager Planning				
Related Legislation	Planning and Development Act 2005 Planning and Development (Local Planning Schemes) Regulations 2015				
Related Shire Documents	Nil				
Risk Rating	Medium	**Review Frequency**	Every 5 years	**Next Review**	2024
Date Adopted	26/03/2019				OCM19/03/017

Amendments		
Date	**Details of Amendment**	**Reference**
22/06/2021	Updated as part of major review and reformatted.	OCM21/06/071
Previous Policies		
PR009 – Intensive Agriculture		

Appendix A: Peel Harvey Catchment Water Quality Improvident Standards and Guidance

A1. Phosphorus - For proposals within the Peel-Harvey Coastal Plain Catchment Area (Figure 1)

Phosphorus application rates

To meet targets for phosphorus reduction established in the Peel-Harvey EPP (EPA, 1992) and supported in SPP2.1, proposals for new horticulture should not apply phosphorus at rates exceeding 6.5 kg P/ha/yr (Kelsey *et al,* 2011).

Phosphorus export rates

The following export rates of phosphorus from the Coastal Catchment Area have been determined by State Government (Kelsey *et al*, 2011) to ensure that catchment targets for phosphorus reduction are met:

- 0.29 kg P/ha/yr for sites in the Serpentine River Sub-catchments
- 0.28 kg P/ha/yr for sites in the Murray River Sub-catchments
- 0.47 kg P/ha/yr for sites in the Harvey Basin.[1]

These export rates of phosphorus from the Coastal Catchment Area are end of sub-catchment targets (measured at the end of the sub-catchment). Phosphorus export rates measured at each Site would be higher due to dilution and in-stream losses. However, the actual loss rate that is acceptable will vary depending upon the location of the site taking into account distance to the receiving water body, shape of sub-catchment, slope of the land amongst other factors.

A.2 Phosphorus – For all proposals in the Shire of Waroona

All other proposals in the Shire of Waroona should demonstrate, through a Site Management Plan including a Nutrient Export Risk Assessment, how the proposal will minimise the application and export of phosphorus from the production area and site.

A3 - Nitrogen – For proposals within the Peel-Harvey Coastal Plain Catchment Area (Figure 1)

To meet targets for nitrogen reduction, proposals for new horticulture should not apply nitrogen (in all forms) at rates exceeding 45 kg N/ha/yr or on average not discharge nitrogen at rates above 1.2 mg/L (Total Nitrogen) (Kelsey *et al*, 2011).

A4 - Nitrogen – for all proposals in the Shire of Waroona

All other proposals in the Shire of Waroona should demonstrate, through a Site Management Plan including a Nutrient Export Risk Assessment, how the proposal will minimise the application and export of nitrogen from the production area and site.

[1] Based on the river basin phosphorus targets from the Peel-Harvey EPP, and quoted in Kelsey *et al* 2011, page 80.

Appendix B Table 1 Indicative risk of horticultural proposals to catchment water quality and soil resources

Soil-landscape systems	**Overall nutrient export risk**	**Suitability for horticulture**			
		Annual e.g. vegetable gardens, turf farms, flowers seedling nurseries	**Perennial** e.g. citrus, orchards table grapes, other fruits and high yielding olives, retail nurseries	**Viticulture** e.g. wine grapes, low yield olives	**Closed System Horticulture** and nurseries (potted plants[1]
The **Forrestfield System (213Fo)** consists of undulating foot slopes of the Darling Scarp on colluvium over granitis and sedimentary rocks in the eastern margin of the Swan Coastal Plain.	Moderate Very high along streams and poorly drained areas	Potentially Suitable			
The **Pinjarra System (213Pj)** is a poorly drained coastal plain on alluvium over sedimentary rocks.	Moderate on better drained sandy duplex soils, deep loams and clays on river terraces Very high on deep bleached sands and poorly drained soils	Potentially suitable away from low lying areas and deep bleached sands (Note: Many elevated areas within the Pinjarra System are associated with deep bleached Bassendean sands)			Potentially Suitable

The **Bassendean System (212Bs)** is sand dunes and sand plains with flats and swamps on sandy alluvium over sedimentary rocks	Very high on deep bleached sands, very small areas of yellow sands with moderate risk	Not suitable due to nutrient export risk	Potentially Suitable
The **Vasse System (211Va)** is poorly drained estuarine flats and swampy depressions of the Swan Coastal Plain.	Very high	Not Suitable due to risk of flooding (tidal), waterlogging and nutrient export risk	Not suitable due to flooding (tidal)
The **Spearwood System (211Sp)** is sand dunes and plains on windblown sand and limestone over sedimentary rocks in the western edge of the Swan Coastal Plain.	Moderate on yellow/brown sands and duplex soils Very high on deep bleached sands	Potentially suitable	

[1] where closed system hydroponics/glasshouse may be suitable, the management of discharge waters is important to ensure that the risk to groundwater and waterways remains low

Appendix C

Suitability of soil-landscape mapping units in the Shire of Waroona for annual horticulture, perennial horticulture and viticulture.

Table 2 provides summary advice from the Department of Agriculture and Food WA on the potential suitability of mapped soil-landscape units in the Shire of Waroona for in-ground horticulture (Column 5). Mapping of soil-landscape units is available from the Peel Harvey Catchment Council website.

The advice is based on two major assessments:

- The risk of phosphorus export from the soil-landscape unit (Column 3); and
- The land capability class rating of the soil-landscape unit for annual horticulture (A), perennial horticulture (P) and vines (V) (Column 4). Land capability refers to the ability of land unit to support a type of land use without causing damage (Austin and Cocks, 1978).

Land capability class ratings (Column 4) are denoted in Table 2 using the following symbols: A1 A2, B1, B2, C1 OR C2. These symbols represent the following:

A1 More than 70% of the unit has high capability land (class 1 and 2).

A2 50-69% of the unit has high capability land (class 1 and 2).

B1 More than 70% of the unit has moderate or high capability land (Class 1, 2 or 3).

B2 50-69% of the unit has moderate or high capability land (Class 1, 2 or 3).

C1 50-69% of the unit has low capability land (class 4 and 5).

C2 More than 70% of the unit has low capability land (class 4 and 5).

Further information on land capability assessment and land capacity classes is provided in Table 2.

Note: Land capability ratings are designed for broad-scale map units in which proximity to waterways has not been considered. Any on-site assessment should consider this.

Table 2- Nutrient export risk and suitability for in-ground horticulture in different land units of the Peel-Harvey Coastal Catchment

Column 1	Column 2	Column 3	Column 4			Column 5
Soil –landscape mapping unit		**Greater than 50% of the map unit classed as a High, Very High or Extreme risk of Phosphorus Export?**	**Capability Class Rating for In-ground Horticulture**			**Is the map unit potentially suitable for in-ground horticulture?**
Map unit symbol	**Map unit description**		Annual (A)	Perennial (P)	Vine V)	A=Annual P = Perennial V = vine
The **Forrestfield System (213Fo**) consists of undulating foot slopes of the Darling Scarp on colluvium over granitic and sedimentary rocks in the eastern margin of the Swan Coastal Plain. Soils include duplex sandy gravels, pale deep sands and grey deep sandy duplexes. Native vegetation is jarrah-marri forest and woodland.						
F1a	1-15% lower slopes with well drained shallow to moderately deep, very gravelly acidic yellow duplex soils and common laterite.	No	B2	B2	B2	Yes APV
F1b	1-15% lower slopes with well drained moderately deep to deep, gravelly acidic yellow duplex soils and rare laterite.	No	B1	B1	B1	Yes APV

Column 1	Column 2	Column 3	Column 4			Column 5
Soil –landscape mapping unit		**Greater than 50% of the map unit classed as a High, Very High or Extreme risk of Phosphorus Export?**	**Capability Class Rating for In-ground Horticulture**			**Is the map unit potentially suitable for in-ground horticulture?**
Map unit symbol	**Map unit description**		Annual (A)	Perennial (P)	Vine V)	A=Annual P = Perennial V = vine
F1c	1-15% lower slopes with well drained deep uniform yellowish brown sands which are generally free of laterite or gravel.	No	B1	A2	A2	Yes APV
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	B1	B2	B2	Yes APV
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	A2	A2	A2	Yes APV
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	B1	A1	A1	Yes APV
F3	1-3% foot slopes with deep, imperfectly drained yellow and, less commonly, acidic grey duplex soils.	No	B1	B2	B1	Yes APV

Column 1	Column 2	Column 3	Column 4			Column 5
Soil –landscape mapping unit		**Greater than 50% of the map unit classed as a High, Very High or Extreme risk of Phosphorus Export?**	**Capability Class Rating for In-ground Horticulture**			**Is the map unit potentially suitable for in-ground horticulture?**
Map unit symbol	**Map unit description**		Annual (A)	Perennial (P)	Vine V)	A=Annual P = Perennial V = vine
F4	Incised stream channels within gentle slopes with deep acidic yellow duplex soils and sandy alluvial gradational brown earths.	Yes	C1	C1	C2	No
F5	Poorly defined stream channels on lowest slopes with deep acidic yellow duplex soils and sandy alluvial gradational brown earths.	Yes	C2	C2	C2	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	B1	A2	A1	Yes APV
Ff10	Alluvial fans on lower slopes <5-10% with variable poorly drained soils.	Yes	C1	C1	C1	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	B1	A2	A2	Yes APV

Column 1	Column 2	Column 3	Column 4			Column 5
Soil –landscape mapping unit		**Greater than 50% of the map unit classed as a High, Very High or Extreme risk of Phosphorus Export?**	**Capability Class Rating for In-ground Horticulture**			**Is the map unit potentially suitable for in-ground horticulture?**
Map unit symbol	**Map unit description**		Annual (A)	Perennial (P)	Vine V)	A=Annual P = Perennial V = vine
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	B1	A2	A2	Yes APV
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 *B. grandis* and some Casuarina spp.	Yes	C1	C2	C1	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	B2	C2	B2	No
The **Pinjarra System (213Pj)** is a poorly-drained coastal plain on alluvium over sedimentary rocks. Soils include semi-wet soils, grey deep sandy duplexes, brown loamy earths, pale sands and clays. Native vegetation is mainly jarrah-marri-wandoo-paperbark forest and woodland.						

Column 1	Column 2	Column 3	Column 4			Column 5
Soil –landscape mapping unit		**Greater than 50% of the map unit classed as a High, Very High or Extreme risk of Phosphorus Export?**	**Capability Class Rating for In-ground Horticulture**			**Is the map unit potentially suitable for in-ground horticulture?**
Map unit symbol	**Map unit description**		Annual (A)	Perennial (P)	Vine V)	A=Annual P = Perennial V = vine
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	B1	B1	B1	No
B2	Flat to very gently undulating sandplain with well to moderately well drained deep bleached grey sands with a pale yellow B horizon or a weak iron-organic hardpan 1-2 m.	Yes	B1	B1	B1	No
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	B1	A1	A1	Yes APV
B3	Closed depressions and poorly defined stream channels with moderately deep, poorly to very poorly drained	Yes	C2	C2	C2	No

Column 1	Column 2	Column 3	Column 4			Column 5
Soil –landscape mapping unit		**Greater than 50% of the map unit classed as a High, Very High or Extreme risk of Phosphorus Export?**	**Capability Class Rating for In-ground Horticulture**			**Is the map unit potentially suitable for in-ground horticulture?**
Map unit symbol	**Map unit description**		Annual (A)	Perennial (P)	Vine V)	A=Annual P = Perennial V = vine
	bleached sands with an iron-organic pan, or clay subsoil. Surfaces are dark grey sand or sandy loam.					
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	C2	C2	C2	No
B6	Sandplain and broad extremely low rises with imperfectly drained deep or very deep grey siliceous sands.	Yes	C2	C2	C2	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	B2	C2	C1	Yes A
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:	No	B2	C2	B2	Yes for AV

Column 1	Column 2	Column 3	Column 4			Column 5
Soil –landscape mapping unit		**Greater than 50% of the map unit classed as a High, Very High or Extreme risk of Phosphorus Export?**	**Capability Class Rating for In-ground Horticulture**			**Is the map unit potentially suitable for in-ground horticulture?**
Map unit symbol	**Map unit description**		Annual (A)	Perennial (P)	Vine V)	A=Annual P = Perennial V = vine
	imperfectly drained and moderately susceptible to salinity in limited areas.					
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 are	No	B1	C2	B1	Yes for AV
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	C2	C2	C2	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	B1	B2	B1	Yes for APV

Column 1	Column 2	Column 3	Column 4			Column 5
Soil –landscape mapping unit		**Greater than 50% of the map unit classed as a High, Very High or Extreme risk of Phosphorus Export?**	**Capability Class Rating for In-ground Horticulture**			**Is the map unit potentially suitable for in-ground horticulture?**
Map unit symbol	**Map unit description**		Annual (A)	Perennial (P)	Vine V)	A=Annual P = Perennial V = vine
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	C2	C2	C2	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	C2	C2	C2	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	C2	C2	C2	No
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	C2	C2	C2	No

Column 1	Column 2	Column 3	Column 4			Column 5
Soil –landscape mapping unit		**Greater than 50% of the map unit classed as a High, Very High or Extreme risk of Phosphorus Export?**	**Capability Class Rating for In-ground Horticulture**			**Is the map unit potentially suitable for in-ground horticulture?**
Map unit symbol	**Map unit description**		Annual (A)	Perennial (P)	Vine V)	A=Annual P = Perennial V = vine
P4a	Poorly drained flats. Cracking clays similar to P4 with a thin veneer of grey sand.	No	C2	C2	C2	No
P5	Poorly drained flats, commonly with gilgai microrelief and with deep black-grey to olive-brown cracking clays with subsoils becoming alkaline.	No	C2	C2	C2	No
P5a	Poorly drained flats. Cracking clays similar to P5 with a thin veneer of grey sand.	No	C2	C2	C2	No
P7	Seasonally inundated swamps and depressions with very poorly drained variable acidic mottled yellow and grey sandy duplex and effective duplex soils.	Yes	C2	C2	C2	No
P7a	Seasonally inundated swamps and depressions with very poorly drained variable acidic mottled yellow and grey duplex soils becoming alkaline with depth.	Yes	C2	C2	C2	No

Column 1	Column 2	Column 3	Column 4			Column 5
Soil –landscape mapping unit		**Greater than 50% of the map unit classed as a High, Very High or Extreme risk of Phosphorus Export?**	**Capability Class Rating for In-ground Horticulture**			**Is the map unit potentially suitable for in-ground horticulture?**
Map unit symbol	**Map unit description**		Annual (A)	Perennial (P)	Vine V)	A=Annual P = Perennial V = vine
P7b	Seasonally inundated swamps and depressions or seepage areas near the base of the foothills with very poorly drained deep bleached siliceous sands.	Yes	C2	C2	C2	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 grey and yellow duplex soils to uniform bleached or pale brown sands over clay.	No	C2	C2	C2	No
P9	Shallowly incised stream channels of minor creeks and rivers with deep acidic mottled yellow duplex soils.	Yes	C2	C2	C2	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	C2	C2	C2	No
SW2	Low level, occasionally flooded, alluvial terraces with imperfectly drained variable alluvial soils with loamy surfaces.	Yes	C2	C2	C2	No

Column 1	Column 2	Column 3	Column 4			Column 5
Soil –landscape mapping unit		**Greater than 50% of the map unit classed as a High, Very High or Extreme risk of Phosphorus Export?**	**Capability Class Rating for In-ground Horticulture**			**Is the map unit potentially suitable for in-ground horticulture?**
Map unit symbol	**Map unit description**		Annual (A)	Perennial (P)	Vine V)	A=Annual P = Perennial V = vine
P11	Shallow brown loamy soils or less commonly, very shallow sands over ironstone pavement which is a clear barrier to drainage.	No	C2	C2	C2	No
P11a	Shallow sand to sandy loam over lateritic material; imperfect to moderately well-drained.	No	C1	C2	C1	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	B2	B1	A2	Yes APV
jSWP10a	Flat terraces adjacent to major rivers with deep black cracking clays with alkaline subsoils; soils similar to P5.	Yes	C2	C2	C2	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 commo	No	A1	B1	A1	Yes APV

Column 1	Column 2	Column 3	Column 4			Column 5
Soil –landscape mapping unit		**Greater than 50% of the map unit classed as a High, Very High or Extreme risk of Phosphorus Export?**	**Capability Class Rating for In-ground Horticulture**			**Is the map unit potentially suitable for in-ground horticulture?**
Map unit symbol	**Map unit description**		Annual (A)	Perennial (P)	Vine V)	A=Annual P = Perennial V = vine
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	B1	B1	A1	Yes APV
2SWP6c	Very gently undulating, alluvial terraces and fans. Moderate to moderately well-drained uniform friable brown loams, or well-structured gradational brown earths.	No	A1	B1	A2	Yes APV
The **Bassendean System (212Bs)** is sand dunes and sand plains with flats and swamps on sandy alluvium over sedimentary rocks. Soils include pale deep sand, semi-wet soil and wet soil. These soils have low fertility and are susceptible to leaching. In the Peel, these soils may become waterlogged because of high groundwater levels and may become flooded in some areas. Native vegetation is mainly banksia-paperbark woodlands and mixed heaths.						
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	Yes	B1	B1	B1	No

Column 1	Column 2	Column 3	Column 4			Column 5
Soil –landscape mapping unit		**Greater than 50% of the map unit classed as a High, Very High or Extreme risk of Phosphorus Export?**	**Capability Class Rating for In-ground Horticulture**			**Is the map unit potentially suitable for in-ground horticulture?**
Map unit symbol	**Map unit description**		Annual (A)	Perennial (P)	Vine V)	A=Annual P = Perennial V = vine
	weak iron-organic hardpan at depths generally greater than 2 m; banksia dominant.					
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	B1	B1	A1	Yes APV
B2	Flat to very gently undulating sandplain with well to moderately well drained deep bleached grey sands with a pale yellow B horizon or a weak iron-organic hardpan 1-2 m.	Yes	B1	B1	B1	No
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	B1	A1	A1	Yes APV

Column 1	Column 2	Column 3	Column 4			Column 5
Soil –landscape mapping unit		**Greater than 50% of the map unit classed as a High, Very High or Extreme risk of Phosphorus Export?**	**Capability Class Rating for In-ground Horticulture**			**Is the map unit potentially suitable for in-ground horticulture?**
Map unit symbol	**Map unit description**		Annual (A)	Perennial (P)	Vine V)	A=Annual P = Perennial V = vine
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	C2	C2	C2	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	C2	C2	C2	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	C2	C2	C2	No
B6	Sandplain and broad extremely low rises with imperfectly drained deep or very deep grey siliceous sands.	Yes	C2	C2	C2	No
The **Vasse System (211Va)** is poorly drained estuarine flats and swampy depressions of the Swan Coastal Plain. Soils include tidal						

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Soil –landscape mapping unit		**Greater than 50% of the map unit classed as a High, Very High or Extreme risk of Phosphorus Export?**	**Capability Class Rating for In-ground Horticulture**			**Is the map unit potentially suitable for in-ground horticulture?**
Map unit symbol	**Map unit description**		Annual (A)	Perennial (P)	Vine V)	A=Annual P = Perennial V = vine
flat soil, saline wet soil and pale deep sand. Native vegetation includes samphire, sedges and paperbark woodland.						
V1	Saline tidal flats composed of grey, black and brown foetid muds and humic sandy clays with locally common shell and limestone fragments.	Yes	C2	C2	C2	No
V2	Samphire covered sand and mud flats marginally higher than V1 and frequently inundated; with deep alkaline alluvial sands and clayey sands.	Yes	C2	C2	C2	No
V3	Sand flats marginally higher than V2. Frequently inundated; with deep alkaline alluvial sands and clayey sands, commonly supporting stands of *Melaleuca* spp.	Yes	C2	C2	C2	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	C1	C2	C2	No

Column 1	Column 2	Column 3	Column 4			Column 5
Soil –landscape mapping unit		**Greater than 50% of the map unit classed as a High, Very High or Extreme risk of Phosphorus Export?**	**Capability Class Rating for In-ground Horticulture**			**Is the map unit potentially suitable for in-ground horticulture?**
Map unit symbol	**Map unit description**		Annual (A)	Perennial (P)	Vine V)	A=Annual P = Perennial V = vine
V5	Upper level sandy terrace and gently undulating beach ridges with shallow to moderately deep grey siliceous sands overlying soft shelly limestone or shell beds.	No	B2	A2	A2	Yes APV
V6	Upper level sandy terrace and gently undulating beach ridges with deep grey or bleached pale brown siliceous sands overlying soft shelly limestone.	Yes	C2	C2	C2	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	C1	C2	C2	No
V7	Very broad shallow depression with deep, poorly drained, fine textured alkaline estuarine alluvium.	Yes	C2	C2	C2	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	Yes	C2	C2	C2	No

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Soil –landscape mapping unit		**Greater than 50% of the map unit classed as a High, Very High or Extreme risk of Phosphorus Export?**	**Capability Class Rating for In-ground Horticulture**			**Is the map unit potentially suitable for in-ground horticulture?**
Map unit symbol	**Map unit description**		Annual (A)	Perennial (P)	Vine V)	A=Annual P = Perennial V = vine
	saline soils. Commonly, these are mottled yellow duplex soils over calcar					
V9	Areas of former swamps which have been artificially drained, with uniform loamy or peaty sands.	Yes	C2	C2	C2	No
The **Spearwood System (211Sp)** is sand dunes and plains on windblown sand and limestone over sedimentary rocks in the western edge of the Swan Coastal Plain. Soils include yellow deep sands, pale deep sands and yellow/brown shallow sands. Native vegetation includes tuart-marri forest and woodland in south changing to heath and open woodland in north.						
S1a	Dune ridges with shallow to moderately deep siliceous yellow-brown sands, very common limestone outcrop and slopes up to 15%.	Yes	C2	B2	C2	No
S1b	Dune ridges with deep siliceous yellow brown sands or pale sands with yellow-brown subsoil and slopes up to 15%.	No	B1	A2	A1	Yes APV

Column 1	Column 2	Column 3	Column 4			Column 5
Soil –landscape mapping unit		**Greater than 50% of the map unit classed as a High, Very High or Extreme risk of Phosphorus Export?**	**Capability Class Rating for In-ground Horticulture**			**Is the map unit potentially suitable for in-ground horticulture?**
Map unit symbol	**Map unit description**		Annual (A)	Perennial (P)	Vine V)	A=Annual P = Perennial V = vine
S1c	Dune ridges with deep bleached grey sands with yellow-brown subsoils, and slopes up to 15%.	No	B1	B1	A2	Yes APV
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	C2	B1	C2	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	B1	A2	A1	Yes APV
S2b	Lower slopes (1-5%) of dune ridge with shallow to deep siliceous yellow-brown sands and common limestone outcrop.	No	B1	B1	A1	Yes APV
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	B1	A1	A1	Yes APV

Column 1	Column 2	Column 3	Column 4			Column 5
Soil –landscape mapping unit		**Greater than 50% of the map unit classed as a High, Very High or Extreme risk of Phosphorus Export?**	**Capability Class Rating for In-ground Horticulture**			**Is the map unit potentially suitable for in-ground horticulture?**
Map unit symbol	**Map unit description**		Annual (A)	Perennial (P)	Vine V)	A=Annual P = Perennial V = vine
S3	Inter-dunal swales and depressions with gently inclined side slopes and deep rapidly drained siliceous yellow-brown sands.	No	A1	A1	A1	Yes APV
S4a	Flat to gently undulating sandplain with deep, pale and sometimes bleached, sands with yellow-brown subsoils.	No	B1	A2	A1	Yes APV
S4b	Flat to gently undulating sandplain with shallow to moderately deep siliceous yellow-brown and grey-brown sands with minor limestone outcrop.	No	B1	B1	A1	Yes APV
S4c	Flat to gently undulating sandplain with deep, yellow-brown or dark brown siliceous sands that are seasonally inundated.	Yes	C2	C2	C2	No
S6	Flat stony plain with poorly drained shallow siliceous sands and large areas of bare limestone pavement.	No	C2	C2	C2	No
The **Quindalup System (2111Qu)** is coastal dunes with sand flats on wind-blown sand over sedimentary rocks on the western						

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Soil –landscape mapping unit		**Greater than 50% of the map unit classed as a High, Very High or Extreme risk of Phosphorus Export?**	**Capability Class Rating for In-ground Horticulture**			**Is the map unit potentially suitable for in-ground horticulture?**
Map unit symbol	**Map unit description**		Annual (A)	Perennial (P)	Vine V)	A=Annual P = Perennial V = vine
margin of the Swan Coastal Plain. Soils are mainly calcareous sands with native vegetation of mixed coastal scrub.						
Qf2	Relict fore dunes and gently undulating beach ridge plain with deep uniform calcareous sands.	No	B1	B1	B1	Yes, APV
Qp1	Complex of nested low relief parabolic dunes with moderate to steep slopes and uniform calcareous sands showing variable depths of surface darkening.	No	C1	B2	C1	Yes, P

Appendix D: Other considerations

Planning matter	Consideration
Protection of groundwater and surface waters	• *Potential impacts of dam or drain construction (note: Approvals are generally required for dams and drain construction)* • *Storage of hydrocarbons, pesticides and other chemical* • *Levels of total suspended solids and organics in discharge waters (e.g. hydroponics) or drains/watercourses on the site* • Levels of salinity and acidity of discharge waters (e.g. hydroponics).
Stormwater management	• Management of runoff from hard surfaces • Management of runoff from production area and site
Wetlands	Proposals should comply with State Government policy in regard to: • protection and management of Conservation Category Wetlands • protection and management of Resource Enhancement Wetlands, and \ • management of Multiple Use Wetlands (Water and Rivers Commission, 2001) (EPA, 2008b)
Wetland Buffers	• Wetland buffers should be determined in accordance with the Draft Guideline for the Determination of Wetland Buffer Requirements (WAPC, 2005
Watercourse protection	• Identification of suitable buffers to watercourses • Physical delineation and protection of the buffer area • Restoration of vegetated buffers
Native vegetation and bushland protection	• Protection of: o Peel Regionally Significant Natural Areas, o Bush Forever Sites o Known location of Declared Rare and listed species of flora and fauna o Threatened Ecological Communities o Priority Ecological Communities o Other significant vegetation and flora o Other habitat for wildlife o Buffers to native vegetation and bushland protection.
Weeds, pests and diseases	• Compliance with control and management of species listed under the Biosecurity and Agricultural Management Act and Regulations • Other weed management • Other feral animal management
Odours	• Storage and use of manures
Visual amenity	• Existing vegetation • Proposed revegetation and landscaping
Noise	• Operating hours • Types and standards of machinery or motors

Management of effluent	• Workers ablution facilities • Effluent treatment systems
Transport impact assessment	• To consider road access standard and property access standards to local roads.
Other matters	• Dam construction approval • Drain construction approval • Groundwater abstraction licence • Building approvals • Buffers to sensitive premises • Setbacks