

Water Quality Protection Note

Floriculture activities in sensitive environments

Purpose

This agency is responsible for managing and protecting Western Australia's water resources. This note

- provides a consistent, timely and considered view on this topic;
- guides on acceptable practices used to protect the quality of the State's water resources; and
- assist in later development of multi-agency guidelines that seek to balance the views of industry, government and the community, while sustaining a healthy environment.

Methods of producing flowers range from intensive greenhouse or field grown with regular water and nutrient addition, to low water-use farmed native or South African varieties that require limited irrigation or chemical support. The local industry includes fresh-cut exotic and native flowers for local and overseas markets. This note aims to limit the risk of water resource contamination from floricultural activities. Our Water Quality Protection Note (WQPN): *Nurseries and garden centres* compliments the information in this note.

Floricultural activities, especially those conducted intensively without a barrier to chemical leaching into the environment, can pose a threat to the quality of our State's water resources. Our concerns include over-watering, excessive or poorly timed use of fertilisers or pesticides, inappropriate storage of chemicals and disposal of wastes that can leach contaminants. We recommend the development and use of industry best management practice for all floricultural activities. We acknowledge the efforts of the floriculture industry to operate in a way that produces the least practical impact on the environment. In 1998, about 75% of flowers produced in WA were grown in glass or plastic covered structures. These allow the operator more control over climatic effects and pests, produce a more consistent product and potentially lessen the leaching loss of applied chemicals. Recently the use of fully contained hydroponic systems has become popular.

This note provides a general guide on issues of environmental concern, and offers potential solutions based on professional judgement and precedent. Anyone may propose alternative, innovative yet practical environmental solutions suited to local conditions. The note's recommendations should not be used by regulators in place of a site-specific assessment of a project's environmental risks. Any conditions set should consider the values of the surrounding environment, the safeguards in place, and take a precautionary approach. This note may not be used as this agency's policy position on a specific matter, unless confirmed in writing by an authorised officer. The recommendations in the note do not constitute or override the requirements of any Acts, Regulations, By-laws or Government policy. The note may also be varied at our discretion, as standards change or new data becomes available.

The former State Government agencies *Department of Environmental Protection* and the *Water and Rivers Commission* are presently being combined to form the *Department of Environment*. This process will not be complete until enabling legislation has been passed by Parliament and proclaimed. This note aims a generic 'combined agency' position on the nominated topic.

Scope

Floriculture includes all commercially grown flowering and ornamental plants in greenhouse-based pots, trays, troughs, contained beds or in field settings. These notes apply to both new and established operations growing or maintaining plants within sensitive environments. These environments include public drinking water source areas, those draining to conservation-valued wetlands and land draining to aquifers or waterways with significant economic, social and cultural values.

It does not cover the authorised harvest of native flowers that rely on rainfall and nutrients sourced from the natural environment, or the cultivation of specific exotics e.g. Proteas, that require negligible artificial inputs of water, nutrients or other chemicals once established.

Recommendations

Siting within public drinking water supply source areas

Public Drinking Water Source Areas (PDWSAs) include Underground Water Pollution Control Areas, Water Reserves and Catchment Areas declared under the *Metropolitan Water Supply, Sewerage and Drainage Act 1909* or the *Country Areas Water Supply Act 1947*. They provide for public (scheme) water supplies within defined catchments. By-laws under these Acts provide this agency with regulatory powers to protect water resources used for public drinking water supplies. Water resources in these areas are highly susceptible to contamination by sediment, fertiliser and pesticide residues.

Policy used to protect public drinking water source areas includes three priority classifications of land areas based on land tenure and intensity of use. Management strategies differ for each priority classification. For detailed information, refer to our Water Quality Protection Note: *Land Use Compatibility in Public Drinking Water Source Areas*.

1. Within Priority 1 PDWSAs: floriculture is an incompatible land use. Incompatible means the activity is likely to conflict with our policy designed to protect drinking water quality. In P1 areas our objectives are no degradation of water quality and risk avoidance. This agency is opposed to all new or expanded floriculture in P1 areas.
2. In Priority 2 PDWSAs: any intensive non-contained floriculture i.e. involving irrigation and/ or regular additional inputs of chemicals (including fertiliser) to soils connected to the environment is incompatible.

Extensive floriculture such as native plants (involving negligible irrigation, nutrient and pesticide inputs) or fully contained plant growing e.g. hydroponic cultivation with no on-site discharge, is a conditional activity. Provided environmental risks are effectively managed and appropriate best management practice is used, approval with conditions may be given to this form of floriculture.

3. In Priority 3 PDWSAs: intensive non-contained floriculture is conditional, i.e. will be approved subject to adoption of management practices that demonstrate the activity can be conducted without excessive contamination risk to local water resources, while extensive floriculture is a compatible activity.
4. The separation distance from non-contained floriculture (where conditional or compatible) to drinking water source bores, the full supply level of storage reservoirs and their feeder streams, should be at least 100 metres.

Siting close to natural waterways, within defined Waterways Management areas or the Swan River Trust management area

5. We recommend that adequate separation distances be maintained between floriculture and natural waterways to minimise the risk of degradation of water quality. These separation distances are determined on the basis of the waterway values, vulnerability and biophysical criteria (see **Appendix C** reference 4, and **Appendix D** for supporting information). If a development is located within a Waterways Management Area, approval must be sought from this agency under the *Waterways and Conservation Act (1976)* or within Swan River Trust Area from the Trust in accordance with *Swan River Trust Act (1988)*. Information on waterway values and the location of these management areas can be obtained by contacting our regional offices. Our regional staff normally follow a standard assessment protocol supported by the information provided at **Appendices C and D**.

Siting close to conservation valued wetlands

6. Any floriculture proposed within 500metres of a wetland (included lakes, swamps, marshes and damp-land) should be referred to this agency's regional office for assessment, with supporting information addressing the environmental risks Separation distances will be negotiated based on wetland values, vulnerability and local bio-physical factors (see Appendix D) and management techniques at the facility to provide for adequate protection of the quality of water resources and adjoining wetland vegetation. For more information see Appendix C, Reference 4 including *Foreshore Policy 1- Identifying the foreshore area*.

Other siting constraints

7. A minimum vertical separation distance of 2 metres to the maximum (wet season) groundwater table is recommended for free-draining soils, to avoid waterlogging and allow for soil contaminant filtration / aerobic microbial action.
8. Floriculture should be sited on gently sloping ground where gradients are between 1 in 10 and 1 in 200. Slopes with gradients of more than 1 in 10 can produce excessive run-off with potential for soil erosion problems. Run-off and boggy areas can become medium for the transport of contaminants to water bodies.

Development or expansion approvals

9. Plans for floriculture development or expansion may require approval from appropriate State government agencies and your local government council (see Appendix A).
10. Proposed commercial land development in most areas of the State requires a licence to take water from the environment (from wells or surface waters). Contact our local regional office (see Appendix B) for location of licence areas and licensing requirements.
11. Extensive floriculture close to any sensitive environments (including those previously described in this note), may require written approval from this agency. Proponents should contact our local regional office for details.

Operation and management

Irrigation

12. We recommend the use of controlled water application around the plants e.g. trickle irrigation or low level micro sprinklers. Water should be applied at a rate matched to soil moisture and seasonal evapotranspiration losses . Sufficient water should be applied to wet the top-soil profile, but prevent drainage below the flower's root zone. Overhead watering is not recommended as it is wasteful and water splash on the soil may result in damage to flowers, spotting on petals and fostering disease e.g. mildew, *Botrytis*, or *Alternaria*. Irrigation should be turned off after any rainfall provides adequate soil moisture.
13. The operator should have a thorough understanding of the irrigation system's capabilities and the flower's water needs, as excess watering can leach fertilisers into the groundwater or run-off into surface water bodies. This both wastes resources and harms the environment. The system should be developed and constructed by a competent and experienced irrigation system designer to achieve even wetting.

Fertiliser use

14. Flowerbeds should be well drained. Careful nutrient management is needed to limit leaching. If organic matter is used (e.g. well-digested compost), it should be incorporated into the topsoil bed (normally 30 centimetres maximum depth) to achieve an even spread of nutrients and obtain the maximum benefit with least waste. Soil nutrient concentrations (N, P and K) in the bed should be regularly monitored, and fertilisers added when necessary. Operating managers can minimise cost and nutrient loss by testing the soil prior to planting and managing the soil pH, humus containing carbon that is essential to sustain useful soil microorganisms, salinity and variable nutrient and trace element requirements of plants during their growth cycle.
15. Fertigation (the controlled application of soluble fertiliser in irrigation water) is recommended. However if this is not practical, regular application of small amounts of fertiliser should occur to suit the growth stage of the plants. Computer based programs (e.g. *Fertijet* and *Fertigal*) or plant leaf tests could be used to determine the appropriate amount of fertiliser required. Operators should produce Nutrient and Irrigation Management Plans (NIMPS) for their premises (see Appendix C, Reference 5).
16. Australian and South African native plant growing can require as little as 10% of the nutrient input of many northern hemisphere flowers. Water requirements for native plants are generally significantly less than exotics. Some intensive floriculturists rotate cropping between exotic and native plants to rest the land. We recommend adoption of practices that sustain the fertility of the land, without the risk of substantial soil damage due to over-cultivation, nutrient leaching, wild-fire, drought or severe storm events. For regulatory purposes, any occasional flower growing in sensitive environments involving application of irrigated water and chemicals will be regarded as intensive floriculture.

Pesticide use

17. The use of pesticides (i.e. insecticides, herbicides, or fungicides) should be consistent with our *Water Quality Protection Policy No. 2- Pesticide Use in Public Drinking Water Source Areas*. Manufacturer/supplier application recommendations should be followed. Within sensitive environments, further limitations on the pesticide type and dosage, withholding periods, formulation and storage may be required. These should be defined during the approval stage of any development proposal.
18. Where practical, the use of a combination of good land use practice, natural predators and chemicals that are target-species specific (called integrated pest management) is recommended for insect control, rather than broad spectrum pesticide use.
19. The use of anti-fog plastic coverings on greenhouses and ground level plastic coverings is recommended. Benefits include climate control that helps prevent disease, especially in greenhouses. For additional information see the W.A. Department of Agriculture's farm notes or Internet site-
<http://www.agric.wa.gov.au>.

Accidents and emergency response

20. Within or near any sensitive environment, floriculture operators should have an emergency response plan covering foreseeable emergencies e.g. disease control and chemical spills. Staff should be trained and assigned roles in the plan's implementation.
21. Our local regional office should be notified as soon as practical (within 48 hours) of any significant chemical spill or leakage to the environment where there is the potential to contaminate surface water or groundwater (see Appendix B for contact details).

Disposal of wastes

Green waste

22. Green waste, sediment from water-filters and waste growing media should be accumulated into purpose-built weather-proof storage containers held on an impermeable surface. The waste should be recycled or disposed of regularly to an approved putrescible waste management facility. Green waste may be composted and applied to the flowerbeds as carbon-rich humus. (See Appendix C, reference. 4)

Liquid waste

Liquid waste and leachate from floriculture activities may contain high levels of nutrients, pesticides and other chemicals derived from the following sources:

- a. Process area wash-down and contaminated stormwater run-off from bulk storage areas;
 - b. Disinfectants e.g. mild bleach solution used on knives, shears and harvesting equipment;
 - c. Glycerine solution or a silica gel that may be used as drying agents for preserved flowers;
 - d. Dyes used to colour dried flowers; and
 - e. Floral preservative used to enhance the flower's vase life while in storage. Flower preservative solutions normally contain carbohydrate, usually in the form of sucrose, plus a bactericide, fungicide, and a wetting agent. These latter chemicals prevent organisms developing in the water and blocking the cut stems, and improve water uptake. Some long used floral preservatives may also contain heavy metals, however there are now alternative low toxicity preservatives available.
23. Any liquid waste that cannot be reused or recycled should be collected and stored in an impermeable container or solar evaporation pond. The waste residue should be transported offsite for safe disposal at a local council-approved waste facility, remote from any sensitive environment.

Solid waste

24. All packaging, washed chemical drums and bags should be recycled, or disposed of outside any sensitive environment at a government-approved putrescible waste disposal facility.
25. Any inert waste material e.g. clean soil or rock should be disposed at an approved inert landfill facility.

Storage and handling of potentially harmful materials

26. Potting mixes, fertilisers, fungicides and insecticides should be stored on an impermeable surface in a secure weather-proof area e.g. shed with a reinforced concrete floor. Storage of bulk chemicals and any fuel should follow practices recommended in our Water Quality Protection Note: *Toxic and hazardous substances- storage and use*.

Mechanical servicing

27. Mechanical servicing of tractors, cultivators etc. should be managed in accordance with our Water Quality Protection Note *Mechanical Servicing and Workshop Facilities*. Any liquid waste should be disposed of at a local government-approved facility outside of any sensitive environment.

Appendices

A. Statutory requirements and approvals

What is regulated	Statute	Regulatory agency
Development approval	<i>Town Planning and Development Act, 1928</i>	Local Government Authority (council)
Impact on the values and ecology of the environment	<i>Environmental Protection Act, 1986</i>	Department of Environmental Protection/ Water and Rivers Commission– regional office
Licence to use surface water and groundwater	<i>Rights in Water and Irrigation Act, 1914</i>	
Land use activity in a public drinking water source area	<i>Metropolitan Water Supply, Sewerage and Drainage Act, 1909; Country Areas Water Supply Act, 1947</i>	
Land use activity in a Waterways Management area	<i>Waterways Conservation Act 1976</i>	
Activities likely to affect the Swan –Canning estuary or drainage entering the estuary	<i>Swan River Trust Act 1988</i>	Swan River Trust

B. Our regional office contact details

See our Internet site: www.wrc.wa.gov.au, - *About the Commission*, refer to the phone book white pages business listings or phone our head office in East Perth on 9278 0300 for regional office contact details.

C. References and further reading

1. Agriculture Western Australia- *Greenhouse Roses for Cut Flower Production* 1995;
2. Floriculture Market Development Group- *A Plan for the Development of the Western Australian Cut Flower Industry* 1998;
3. Sell, Randy-Alternative Agriculture Series: *Dried and Fresh-Cut Flowers*, No 13, North Dakota 1993;
4. EPA, Department of Environmental Protection / Water and Rivers Commission documents:
 - a. *A Manual for Managing Urban Stormwater Quality in Western Australia* , WRC (current draft)
 - b. *Encouraging Wise Use of Perth's Wetlands*, (broadsheet) 1995
 - c. *Environmental Protection (Swan Coastal Plain Lakes) Policy*, 1992
 - d. *Foreshore Policy 1- Identifying the Foreshore Area*, WRC November 2002
 - e. *Guidelines for acceptance of solid waste to landfill*, DEP, January 2001
 - f. *Water Note 4- Wetland buffers*, WRC January 2000
 - g. *Water Note 11- Identifying the riparian zone*, WRC January 2000
 - h. *Water Note 22- Herbicide use in wetlands*, WRC 2001
 - i. *Water Note 23- Determining foreshore reserves*, WRC October 2001
 - j. *Position statement: Wetlands*, WRC 2001
 - k. *Wetlands of the Swan Coastal Plain*, WRC, DEP1996
 - l. *Draft Strategy for the management of Green and Solid organic waste in Western Australia* DEP, December 1997
5. Water and Rivers Commission publications-
 - a. Policy: *Pesticide Use in Public Drinking Water Source Areas*, 2000.
 - b. Water Quality Protection Notes (see our Internet site: <http://www.wrc.wa.gov.au/protect/policy>)
 - *Industrial sites near sensitive environments*;
 - *Irrigation of vegetated land with nutrient-rich wastewater*;

5b. Water Quality Protection Notes (continued)

- *Land use compatibility in Public Drinking Water Source Areas;*
- *Soil liners to contain low hazard wastes;*
- *Mechanical servicing and workshop facilities;*
- *Nurseries and garden centres;*
- *Nutrient and irrigation management plans;*
- *Toxic and hazardous substances- storage and use.*

D. Biophysical criteria

These are used to determine separation distances from disturbed land to sensitive water based ecosystems.

Biophysical criterion	Definition
Vegetation	Fringing vegetation, particularly remnant native vegetation, associated with or influencing the waterway, and its condition, and values.
Hydrology	Flow regime and changes in water levels and flow regimes; flood-prone land and areas subject to changes in channel location over time.
Soil type	Soil types that influence the extent of foreshore vegetation, active channel processes, and/ or the fate of potential contaminants.
Erosion	Soil types prone to erosion
Geology	Geological features which influence the waterway
Climate	Climatic variations and the resultant changes in waterway flow regimes, and riparian vegetation.
Topography	Landscape features including slope, shape, relief and diversity that influence, or are influenced by, the waterway.
Function/ uses	The function of the waterway and foreshore– flood protection, recreation or habitat conservation and related values.
Habitat	Habitat for flora and fauna such as river pools, woody debris, riffles and riparian vegetation and their condition and values
Land Use	Land uses, activities and/ or associated contaminants that influence, or are influenced by, the waterway and riparian area (i.e. how the pressure/ contaminant may affect the buffer/ waterway and how the buffer/ waterway may affect the pressure/ contaminant); management response to contamination
Heritage	Archaeological and ethnographic sites

More information

We welcome your comment on these notes. They will be updated from time to time as feedback is received or recommended practices change. Updates are posted on our Internet web-site. If you wish to comment or require more information, please contact our Resource Quality Branch at the Water and Rivers Commission.



**Water and Rivers
Commission**

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