WQPN 32, October 2007

Nurseries and garden centres

Purpose

Plant nurseries and garden centres provide an important service to the landscaping industry and community members who appreciate that ornamental plants help enhance the quality of our lives. However there are risks posed to the quality of our water resources if fertilisers, pesticides, water use and waste disposal are poorly managed. Leachate from propagation areas and developing pot plants, chemical enhanced run-off from water falling between pots or onto pathways and equipment washing can contaminate surface and groundwater. Leachate results from either rainfall or excess irrigation percolating through the soil of pot plants. This water flushes out nutrients and pesticide residues within pots. Wastewater or runoff containing nutrients, in particular nitrogen and phosphorus, can promote algal blooms in surface-water resources. Other potential water contaminants from nurseries include soil pH control chemicals, wetting agents, trace minerals and harmful microbes derived from animal manures. Inefficient water use may also contribute to unnecessary draws on the water table and in turn affect the water balance in waterways and wetlands.

The Department of Water is responsible for managing and protecting the state's water resources. It is also a lead agency for water conservation and reuse. This note offers:

- The department's current views on best environmental management of plant nurseries and garden centres.
- Guidance on acceptable practices used to protect the quality of Western Australian water resources.
- A basis for the development of a multi-agency code or guideline designed to balance the views of industry, government and the community, while sustaining a healthy environment.

This note provides a general guide on issues of environmental concern, and offers potential solutions based on professional judgement and precedent. The recommendations made do not override any statutory obligation or government policy statement. Alternative practical environmental solutions to suit local conditions may be considered. Regulatory agencies should not use this note's recommendations without a site-specific assessment of any project's environmental risks. Any conditions set should consider the values of the surrounding environment, the safeguards in place, and take a precautionary approach. The note shall not be used as this department's policy position on a specific matter, unless confirmed in writing.

Scope

This note applies to both new and established plant nurseries (propagation and retail) and garden centres located near sensitive water resources. These premises are collectively termed nurseries in this note. Sensitive water resources are described at Appendix D.

This note is not intended to cover plants grown or propagated by home gardeners, but may offer some useful guidance on potential risks to the environment and good practice.

Advice and recommendations

Location of new or expanded nursery facilities

1. Nurseries should be established in locations where they are likely to have a minimal effect on the quality of water resources. It is recognised that most nurseries require a reliable source of water extracted from the environment to allow for plant irrigation during times of low rainfall. The highest risk of contaminants leaching from nurseries into groundwater, waterways or wetlands occurs where there are permeable soils (e.g. sand or gravel) overlaying a shallow water table (less than ten metres below the surface).

Within public drinking water source areas

Public drinking water source areas (PDWSA) include *underground water pollution control areas*, *water reserves* and *catchment areas* proclaimed under either the *Metropolitan Water Supply, Sewerage and Drainage Act 1909* or *Country Areas Water Supply Act 1947*. PDWSA are a source of water for public potable (scheme) supplies from within managed catchments. Subsidiary by-laws provide the Department of Water with regulatory powers to protect these resources.

The state government endorsed strategy used to protect PDWSA defines three protection (P) classifications of land areas based on land tenure and intensity of use. Management strategies differ for each protection classification. For detailed information, see this department's water quality protection note: *Land Use Compatibility in Public Drinking Water Source Areas.*

2. Nurseries are an incompatible activity in P1 areas, compatible with conditions in P2 areas and an acceptable activity in P3 areas. "Compatible with conditions" means the activity is compatible with water resource management objectives, providing that site-specific environmental best practice management is used (such as that recommended in this note).

3. Within any defined wellhead protection zone or reservoir protection zone (buffer zones around production bores and reservoirs) special constraints apply for chemical storage and use. Refer to this department's note *Land Use Compatibility in PDWSA* note for further information.

4. In *underground water protection control areas* (UWPCA), chemical and fuel storage requires written authorisation from this department.

Operating and monitoring conditions may be imposed to protect water resources, e.g. secondary containment of chemical spills, procedures to manage wastes, limits on pesticides and the amount of fuel that can be stored.

5. For the location of public drinking water source areas, visit this department's website www.water.wa.gov.au, select *Maps, data and atlases* > *Geographic Data Atlas,* then click *environment* > *public drinking water source areas*.

Near waterways

6. Adequate native vegetation buffers should be maintained between nursery operations and estuaries/waterways to minimise the risk of water quality degradation. Guidance on this issue is provided in the Department of Water's *Foreshore Policy No. 1.*

7. If a proposed nursery development is located within a proclaimed *Waterways Management Area*, approval must be sought from this department under the *Waterways Conservation Act 1976*. Our local regional offices can provide advice for the Peel-Harvey, Albany Waterways, Wilson Inlet, Leschenault Inlet and Avon River Management Areas and associated regulatory procedures.

8. A minimum separation distance of 50 metres should apply from the nursery's operational margin to riparian vegetation, or if this vegetation is absent, to the banks of the waterway.

Near the Swan Canning Estuary

9. If a nursery is located where it could potentially affect the Swan–Canning River system, the facility may require approval under the *Swan and Canning Rivers Management Act 2006.* For detailed information, see the Swan River Trust's website www.swanrivertrust.wa.gov.au, select *Resources and publications,* then *brochures.*

Near wetlands

10. Nurseries sited near *conservation* or *resource enhancement* category wetlands (see Appendix D) should maintain an adequate vegetated buffer from their operations to the wetland to ensure that it's ecological value is preserved. Wetland buffers should be determined considering the value of wetland to be protected, the threats posed by the adjacent land use, protection measures employed and the likely impacts of the development proposal. For further information, see the Department of Environment and Conservation's *Wetlands position statement 2001* and the draft EPA guidance statement No 33: *Environmental Guidance for Planning and Development* 2005 (Chapter B4).

11. Groundwater supply bores should be placed so there is no discernible impact on water levels in any wetland resulting from excessive water draw.

12. The Department of Environment and Conservation is the custodian of the Western Australian wetlands data sets (see Appendix D) and is responsible for maintaining and updating the data.

The data sets can be viewed and downloaded at web page www.dec.wa.gov.au, select *Department of Environment > tools, systems and data > Geographic Data Atlas > Inland Waters.* A datasets viewing guide is provided on the same web page select *wetlands > data > wetland mapping > how to view wetland mapping.*

Other location constraints

13. Nurseries should not be located on land subject to seasonal flooding. They should also be located at least two metres above the maximum groundwater table.

14. Nurseries should be located on gently sloping ground where gradients are between one in ten and one in 200. Slopes of more than one in ten are likely to produce excessive run-off and erosion problems. Runoff can increase the potential for contaminant transport into waterways and wetlands.

15. Nursery proposals that could harm sensitive water resources and do not conform to the recommendations made in this note should be referred to this department's regional office for assessment, with supporting technical data. Lesser separation distances may be negotiated where environmental conditions and/or management techniques of the nurseries provide for adequate water resource protection.

16. To gain environmental approval, operators should demonstrate that under a range of operating conditions, on-site materials and processes do not pose a significant risk to the local environment.

17. This department recognises that many activities were approved and established before the introduction of current industry environmental best practice. The department will negotiate with the operators of existing premises with the aim that they implement progressively facilities and management practices that minimise the risk to water resources (while considering practical and economic factors).

Construction issues

Floors and pathways

18. Surfaces that are used to store, decant or apply chemicals, and vehicle access paths in regular use, should be sealed and effectively impervious. Pooling of storm or irrigation water should be avoided. Roadways and paths within and adjacent to production facilities should be properly drained and sealed using bitumen or concrete.

19. Gravel, rolled limestone or forestry by-products over plastic film should be used for walking paths and under benches. These areas should be well drained (e.g. on a slope using a coarse stone aggregate 10 to 25 millimetres in diameter, and laid more than 75 millimetres deep). See Appendix C for a conceptual layout depicting a typical leachate-recovery system.

Production and potted growing areas

20. Where the nursery is located on low permeability soils (less than 10 mm soakage per day) or near to ecologically sensitive water resources, nursery operations should contain any contaminated waters to ensure that there is no discernible impact on the environment.

Management measures

Nursery stock

21. Nurseries should not stock plants 'declared' under the *Agriculture and Related Resources Act 1976,* as they are considered environmental weeds*.* For a current list of declared plants see the Department of Agriculture and Food website at www.agric.wa.gov.au, then select *weeds* > *declared plants weeds.*

22. This department supports the propagation and sale of native plants as these require fewer water and chemical resources for survival once established, should grow in harmony with the local environment and help support native animals.

Storage of toxic or hazardous materials

23. Pesticides, fertilisers, manures and soil amendment materials should be stored on impermeable surfaces that are weather-proof and exclude stormwater runoff from other areas. Bulk liquid chemical and any fuel storage should follow this department's *State-wide Policy No. 2: Pesticide use in Public Drinking Water Source Areas* and water quality protection notes *Tanks for above ground chemical storage* and *Toxic and hazardous substances – storage and use.*

Irrigation

24. Nursery operators intending to take water from the environment (i.e. from surface water, wells or bores) for irrigation purposes should contact this department's local regional office to determine if a groundwater or surface water allocation licence is required. Licence applications may be downloaded from www.water.wa.gov.au, select *licensing* > *licensing forms* > *form A* or *form C.*

25. Nursery operators should use an efficient irrigation system that minimises run-off. The following practices are recommended.

    a. Water according to the plant development requirements: Operators should irrigate according to seasonal evaporation losses, variations in plant water needs and the water-holding capacity of the potting media.

    b. Hydro-zoning of pots should be used to match water demand: All plants with similar water requirements should be grouped in common stations and watered at the appropriate frequency for the seasonal plant uptake and evapo-transpiration rates.

    c. Water wastage and chemical leaching should be minimised by limiting the space between plant containers as this maximises the water delivery to pots.

d. Where practical, reduce the amount of leachate produced. Sub-irrigation (bottom watering) and drip irrigation is preferable to overhead sprinkler systems. Consider applying water as a series of timed pulses, as this slows the infiltration rate.

e. Operators should determine the water application rates and operating pressures for each sprinkler type to ensure that the irrigation system delivers a uniform application of water. This will ensure minimum wastage. Sprinkler systems should be selected and maintained to deliver a uniform coverage of water, regardless of wind effects.

f. If fixed overhead sprinklers are used, operators should ensure that the uniformity of water application is high (more than 85 per cent) and the mean application rate is less than 15 millimetres per hour for porous potting soils.

g. Drip irrigation systems in composted beds can be used to reduce leachate and nutrient export.

Fertiliser application

26. Nursery operators should have a thorough understanding of the nutrient needs of each plant species and appropriate fertiliser application rates during the plant growth cycle. Most formulated fertilisers contain both nitrogen (N) and phosphorus (P), which makes it important to understand the composition of the fertilisers. Blending of fertilisers or use of plant-specific formulations can ensure that the correct balance of nutrients is applied.

27. Nursery operators should minimise nutrient losses by only applying fertiliser amounts required by the plant at various stages of its development cycle and adopting measures to reduce leaching. This is particularly the case for nitrogen and potassium (K) as they are readily leached from the soil due to their high solubility and low retention rate.

28. Where practical, nursery operators should use *controlled release fertilisers* (CRF), which provide a consistent rate of nutrient release. These give the operator a choice of types depending on nutrient release characteristics. Operators should not use pellets with a damaged coating as this may produce an initial flush of nutrients. They should also be aware that nutrient release from CRF increases with temperature. CRF should be applied at the supplier's recommended rate (grams or litres per square metre), and matched to the plant nutrient uptake needs for its growth stage.

29. Fertigation (which is the addition of water-soluble fertilisers to the irrigation system) can be beneficial if well timed to suit crop needs. Fertigation is not considered appropriate for sprinkler systems with a low coefficient of uniformity (uneven water spread).

30. Animal-waste fertilisers that require biological breakdown should be considered as they provide a steady release of nutrients. Stabilised animal manures may also be used, however protective measures should be used to avoid attracting nuisance insects and disease transfer.

31. The use of soluble, inorganic fertilisers should be selective, as the nutrients in these fertilisers are very susceptible to leaching. If water-soluble fertilisers are used, small frequent applications are recommended to minimise nutrient loss. The application should be based on actual plant needs as opposed to a fixed time schedule.

Application rates can be adjusted by measuring the nutrient levels in extracted water or via leaf tissue analysis.

Pesticide application

32. For nurseries located close to sensitive water resources, this department's approval for pesticide storage and use should be sought. Our *state-wide Policy No. 2*: *Pesticide Use in Public Drinking Water Source Areas* covers pesticide use in drinking water catchments. The storage, mixing, application and disposal of pesticides within any water-sensitive environment should be consistent with this policy.

33. Nurseries should evaluate the type of pest species on the property, their densities and their life cycles before a decision is taken on what method of pest control is needed. Where practical, physical and biological methods of pest control are preferable to the use of chemical pesticides.

34. Nursery operators should consider incorporating pest exclusion methods such as controlled drainage, insect-proof housing for susceptible plants, inspection and quarantining of infected stock. If pesticide use is needed, spot application is preferred to blanket spraying. Pesticide application should follow the supplier's recommendations on timing and rates.

35. Mixing of pesticides should be on weather-proof, impermeable surfaces that exclude or contain run-off. Operators should ensure that employees are trained and equipped to deal with emergencies such as chemical spills.

36. Pesticide use, storage, handling and disposal should be conducted in accordance with the *Health (Pesticide) Regulations 1950* (as amended).

Waste management and disposal

Green and solid wastes

37. Reject soil, discarded green waste, sediment from silt traps and spilt media should be contained in a purpose-built, weather-proof storage container, skip or on an impermeable sheltered surface. This ensures that liquids can be collected and stored pending reuse or disposal. Solid waste should not be washed down the drain. It should be disposed of regularly at an authorised disposal facility, e.g. landfill or recycling facility.

Wastewater

38. Wastewater may include stormwater run-off from roofs and car parks, plant growing area leachate, and run-off from the nursery production areas. Nursery operators should manage clean stormwater separately to potentially contaminated water. Clean stormwater may be used for irrigation or discharged to soakage or drain systems.

39. The volume and quality of the wastewater runoff from operational areas should be monitored. This wastewater may contain harmful microbes, pesticides, salts, significant levels of nutrients and trace elements.

Discharge or reuse of wastewater needs careful management. Water treatment by settling, filtration, biological or chemical treatment may be needed prior to discharge.

40. The washing of equipment and machinery should occur on an impervious pad, such as reinforced concrete with a perimeter bund wall or kerbing.

41. Clean stormwater intrusion onto the impervious pad should be minimised. This can be done by constructing a roof over the area or reducing the size of the pad to the smallest practical surface area. The pad should slope toward a collector gully. Wastewater collected from the pad should drain to a sediment trap where soil and other heavy contaminants are removed. The trap should provide a minimum holding capacity of one hour under peak-flow conditions for effective settling of solids.

42. The settled soil material in the sediment trap should be periodically removed and reused, or disposed of at an authorised landfill site. The extent of practical and cost-effective wastewater treatment will depend on the disposal method, the type of contaminants (e.g. nutrients, microbes, salts) and the risks to the local environment.

43. Wastewater recycling or reuse should first be considered for the disposal of production wastewater. These waters can be drained into a lined storage-pond system and disposed of by controlled on-site irrigation. the water may be treated and applied to land in accordance with this department's water quality protection note *Irrigation with nutrient-rich wastewater*. If the wastewater is recycled for use on nursery stock, it may require filtration and disinfection. Care needs to be taken to ensure that salt levels do not build up to the extent that they harm salt-sensitive plants.

44. If reuse or recycling is not a practical option, wastewater should be discharged to soak pits, however this wastewater must not contain significant concentrations of nutrients or persistent toxic substances. Soak pits should be designed to foster aerobic, (presence of air) biological breakdown of residual contaminants. Wastewater incompatible with the local environment may be disposed of by solar evaporation in a pond with a low permeability liner. Such liners may consist of a plastic membrane at least 0.5 millimetres thick, conforming to this department's water quality protection note *Liners for containing pollutants, using synthetic membranes* or a low permeability soil liner described in the note *Liners for containing pollutants, using engineered soils.*

45. Operational wastewater (treated or otherwise) should not be:

    a. Discharged by drains or pipes into waterways or wetlands.

    b. Discharged into stormwater pipes or drains connected to off-site facilities unless prior written approval is obtained from the owner or operator of the drain (normally the local government council, or the Water Corporation for main drains). Any disposal of wastewater to the environment should at the outfall comply with guidance criteria for sustaining the values of local water resources. These criteria are described in the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000* and *Australian Drinking Water Guidelines 2004.*

c. Released indirectly into a waterway or drain, unless it has been tested as compatible with the receiving environment and first passes through a vegetated filter zone, designed and maintained to appropriate standards. Operators should consult this department's *Stormwater Management Manual for Western Australia* for best management practices for the treatment of wastewater before discharge.

46. Pits, pathways, paved areas and drains should be regularly inspected and maintained so that wastes are contained as designed.

47. Used plastic plant pots can be taken to Pot Recyclers (depot at 116 Kurnall Rd Welshpool, phone 131335 or visit web page www.potrecyclers.com) or via a similar commercial venture. Recyclers can supply cages to nurseries for the collection of used pots. The cage will be collected regularly, the pots shredded and disinfected, and new plastic pots and rakes made.

Development applications

48. Nursery development proposals should include descriptions of practices to minimise nutrient leaching, such as soil moisture controlled irrigation and leaching barriers. When selecting a potting media, consider the type of irrigation system planned or in use, so that the permeability of the potting media is compatible with the irrigation methods.

49. Proposals should describe and show via diagrams the methods of containment and reuse or recycling of wastewater. Otherwise trays should be placed under pots to retain nutrient-rich leachate for later plant uptake.

More Information

We welcome your views on this note. Feedback provided on this topic is held on file No. **13901**.

This note will be updated periodically as new information is received or industry/activity standards change. Updates are placed on the Department's Internet site www.water.wa.gov.au, select *Water quality* > *Publications* > *Water Quality Protection Notes.*

To comment on this note or for more information, please contact the Water Source Protection Branch at our Atrium offices in Perth, phone (08) 6364 7600 (business hours), fax 6364 6516 or use *Contact us* at the department's website, citing the note topic and version.

Where a conflict arises between the Department 's recommendations and any proposed activity that may affect a sensitive water resource, this note may be used to assist negotiations with stakeholders. Any negotiated outcome should not result in a greater contamination risk to local water resource quality than if the department's recommended protection measures were used.

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Appendices

Appendix A - References and further reading

1. Australian Government – National Water Quality Management Strategy
   a. *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* 2000.
   b. *Australian Guidelines for Water Quality Monitoring and Reporting* 2000, see web page www.environment.gov.au/water/quality/nwqms/index.html.
   c. *Australian Drinking Water Guidelines* 2004, see web page www.nhmrc.gov.au/publications/synopses/eh19syn.htm.
   d. *Policies and Principles* 1994.
   e. *Implementation guidelines* 1998.
   f. *Rural land uses and water quality – a community resource* 2000, see www.awa.asn.au, email bookshop@awa.asn.au, or request from a library service.

2. Cresswell G.C., Huett, D.O., 1996, *Reducing nutrient leaching from pots*, Nursery Industry Association of Australia (Nursery and Garden Industry Australia), Epping, New South Wales. To obtain this paper, refer to the web page www.ngia.com.au, select > *publications and resources > nursery papers > full list > 1996*.

3. Department of Agriculture Water and Rivers Commission, Nursery and Garden Industry WA, Curtin University, Perth WA 2006, *Environmental management best practice guidelines for the nursery industry*; see internet site www.agric.wa.gov.au, select *horticulture > floriculture > environmental management.*

4. Nursery and Garden Industry Australia

   Nursery industry water management best practice guidelines, 2005, edited by Ian C. Atkinson; see web page www.ngia.com.au, select > *Publications and Resources*.

5. Nursery Industry Association of Western Australia and Department of Agriculture Perth WA 2003 *Nursery and Garden industry biosecurity plan*, see Internet site www.agric.wa.gov.au, select *horticulture > floriculture > environmental management.*

6. Environmental Protection Authority (WA)

   Draft guidance statement No 33: *Environmental Guidance for Planning and Development* 2005,
   see web page www.epa.wa.gov.au, select *EIA* > *Guidance statements*.

7. Department of Environment and Conservation (WA)

   Position Statement: *Wetlands* 2001,
   see web page www.dec.wa.gov.au, select *Department of Environment* > *water* > *wetlands,* then *policy*.

8. Department of Water (WA)

   a Policies

   - *Pesticide use in public drinking water source areas*, State-wide policy no.2, 2000
   - Foreshore Policy 1: *Identifying the foreshore area,* 2000

   see Internet page www.water.wa.gov.au, select *policy* or *waterways* > *foreshore policies.*

   b Water quality protection notes

   - *Tanks for above ground chemical storage*
   - *Irrigation with nutrient-rich wastewater*
   - *Floriculture*
   - *Land use compatibility in public drinking water source areas*
   - *Washing of mechanical equipment*
   - *Soil liners to contain low hazard waste*
   - *Toxic and hazardous substances storage and use*

   see web page www.water.wa.gov.au, select w*ater quality* > *publications* > *water quality protection notes.*

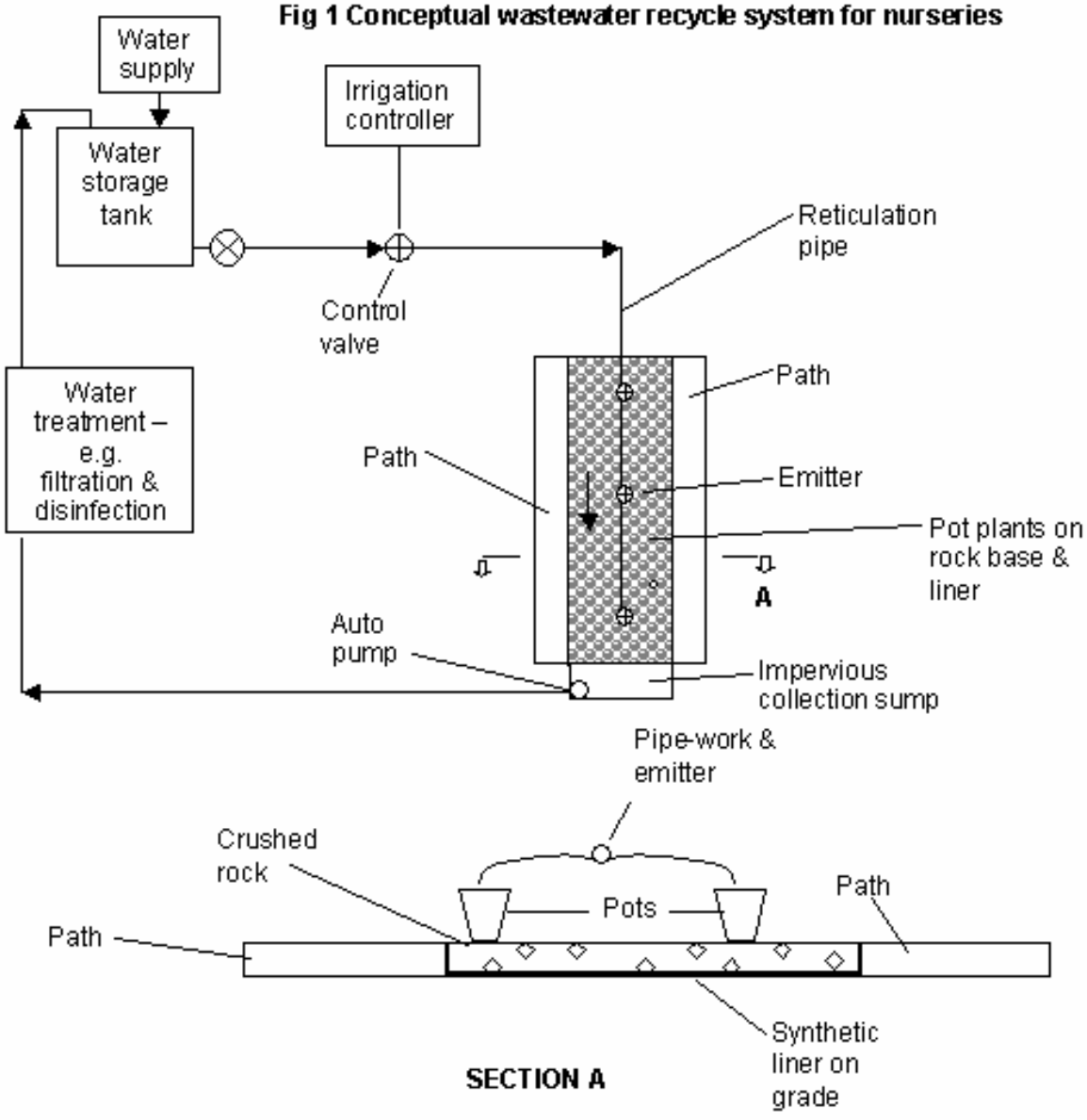
   c. *Stormwater Management Manual for Western Australia*
   see web page www.water.wa.gov.au, select *stormwater* > *publications* > *stormwater management manual.*

Appendix B - Statutory requirements and approvals relevant to this note include:

What's regulated	Statute	Regulatory body/ agency
Subdivision of land	*Planning and Development Act 2005*	Western Australian Planning Commission Department for Planning and Infrastructure Local government (council)
Land zoning and development approval		
Impact of significant development proposals on the values and ecology of land or natural waters	*Environmental Protection Act 1986, Part IV - Environmental Impact Assessment*	Minister for the Environment advised by the Environmental Protection Authority
Licensing of prescribed premises that may pollute	*Environmental Protection Act 1986 Part V Environmental Regulation* *Environmental Protection (Unauthorised Discharges) Regulations 2004*	Department of Environment and Conservation - regional office
Licence to discharge waters into managed waterways.	*Waterways Conservation Act 1976*	
Licence to take surface water and groundwater	*Rights in Water and Irrigation Act 1914*	Department of Water – regional office
Industrial sites in existing public drinking water source areas	*Metropolitan Water Supply, Sewerage and Drainage 1909*	
	Country Areas Water Supply Act 1947	
Discharges into the Swan–Canning Estuary	*Swan and Canning Rivers Management Act 2006*	Swan River Trust
Storage of fuels, solvent, explosive and dangerous goods	*Explosive and Dangerous Goods Act 1961* and associated regulations	Department of Consumer and Employment Protection
Management of human wastes, Community health issues	*Health Act 1911* *Health (Pesticide) Regulations 1950* (as amended).	Local government (council) Department of Health
Emergency response planning	*Fire and Emergency Services Authority of WA Act, 1998*	Fire and Emergency Services Authority
Discharge to sewer (industrial waste permit) or to main drain	*Metropolitan Water Supply, Sewerage and Drainage 1909*	Water Corporation; or designated water services provider
	Country Towns Sewerage Act 1948	

Appendix C

Fig 1 Conceptual wastewater recycle system for nurseries



Appendix D - Sensitive water resources

Clean water resources used for drinking, sustaining aquatic and terrestrial ecology, industry and aesthetic values, along with breathable air, rank as the most fundamental and important needs for viable communities. Water resources should remain within specific quality limits to retain their values, and therefore require stringent and conservative protection measures. Guidance on water quality parameters necessary to maintain water values are published in the Australian Government's *National Water Quality Management Strategy Guidelines* (see web page http://www.environment.gov.au/water/quality/nwqms/index.html).

The Department of Water strives to improve community awareness of catchment protection measures for both surface water and groundwater as part of a multi-barrier protection approach to maintain the quality of water resources.

To be considered sensitive, water resources must support one or more of the environmental values described below. Human activity and land uses pose a risk to water quality if contaminants could be washed or leached into sensitive water resources in discernible quantities. These water resources include shallow groundwater accessed by water supply wells, waterways, wetlands and estuaries. Community support for these values, setting of practical management objectives and implementation of sustainable protection strategies are seen as key elements in protecting and restoring the values of these water resources.

Sensitive water resource values include:

a. Public drinking water source areas (i.e. *water reserves*, *catchment areas* or *underground water pollution control areas*) proclaimed or assigned under the *Metropolitan Water Supply, Sewerage and Drainage Act 1909*, the *Country Areas Water Supply Act 1947* or the *Health Act 1911.*

b. Private water supply sources, including the following uses:
   - human or stock consumption;
   - commercial or industrial water supplies (with specific qualities that support the activities e.g. aquaculture, cooling, food or mineral processing or crop irrigation); and
   - garden or municipal water supplies (which can affect people's health or wellbeing).

c. Groundwater aquifers that sustain important ecological functions e.g. cave ecology.

d. Waterways (excluding engineered drains or constructed features) with ecological and / or social values such as aesthetic appeal, boating, fishing, tourism, and swimming, including:
   - waterways of *high conservation significance* as described in the Environmental Protection Authority's draft guidance statement 33 *Environmental Guidance for Planning and Development* (Section B5.2.2) see www.epa.wa.gov.au , select *EIA* > *guidance statements*;

- waterways managed under the *Waterways Conservation Act 1976*, ie the Avon, Peel-Harvey, Leschenault, Wilson Inlet and Albany Waterways Management Areas; and
- waterways managed under the *Swan and Canning Rivers Management Act, 2006*.

Note: many waterways in the state remain to be scientifically evaluated and their value classified. Any such waterways that are substantially undisturbed by human activity, should be considered to have high conservation value unless proven otherwise.

e. Wetlands possessing recognised or probable conservation values (generally excluding those *highly disturbed*, unless subject to active management to restore specified environmental values), and including:

- RAMSAR wetlands (see Internet site www.ramsar.org).
- Wetlands of *high conservation significance* as described in the Environmental Protection Authority's draft guidance statement 33 *Environmental Guidance for Planning and Development* (section B4.2.2), see www.epa.wa.gov.au , select EIA > *guidance statements*.
- Wetlands described by Department of the Environment and Water (Australia) in *A Directory of important wetlands in Australia;* see the Department of Environment and Water Resources web page http://www.environment.gov.au/water/publications/environmental/wetlands/directory.html);
- *Conservation* and *resource enhancement* category wetlands identified in the *Geomorphic Wetlands of the Swan Coastal Plain* dataset, all wetlands identified in the *South Coast Significant Wetlands* dataset and high value wetlands identified in the *Geomorphic Wetlands Augusta to Walpole* dataset.

  Note: many wetlands in the state remain to be scientifically evaluated and classified. Any such wetlands that are generally undisturbed by human activity, should be considered to have high conservation value, unless proven otherwise. The Augusta to Walpole wetland dataset to date has not been subject to a detailed evaluation process.

  The Department of Conservation and Environment is the custodian of wetland datasets and is responsible for maintaining and updating the information within them. The datasets ban be viewed or downloaded from the internet site www.dec.wa.gov.au, select *Department of Environment > Tools, systems and data > Geographic Data Atlas > inland waters > wetlands.* Guidance on viewing the wetlands is provided on the same website at *water > wetlands > data > wetland mapping > How to view wetland mapping;* or phone the Department on 6364 6500.