WQPN 101, October 2007

Tropical Agriculture

Purpose

Tropical agriculture is an important part of the economy for many regional towns in northern Western Australia. Many of the crops cultivated in agriculture are not endemic to the region and require additional inputs to compensate for what is naturally available from the land (e.g. fertilisers, pesticides, irrigation). Without proper management, tropical agriculture can potentially create environmental problems including eutrophication and salinisation of water bodies, chemical contamination, altered flow regimes and pathogen release. The threats to water quality are further described in the National Water Quality Management Strategy Document No. 9 *Rural land uses and water quality - A community resource document*.

Agriculture in tropical regions is characterised by having the majority of its rainfall during the warmer months of the year (November to April) associated with monsoonal weather systems i.e. cyclones and thunderstorms. This creates the potential for significant amounts of stormwater run-off and flooding, which can lead to contaminant transfer, erosion and damage to buildings and facilities. Appropriate management measures can reduce the risk of contaminating sensitive water resources. The increased interest in developing different uses for the water resources of northern West Australia makes the adequate protection of these resources extremely important.

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 tropical agriculture.
- 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 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 agricultural crops, orchards and silviculture operations north of the Tropic of Capricorn, where there are distinct wet and dry seasons and temperatures are typically warm to hot all year round.

The note does not apply to pastoral agriculture in rangelands, for information on managing these activities see this department's water quality protection note *Pastoral activities within rangelands*. Aquaculture projects are also not covered by this note, for guidance on good environmental practices in aquaculture see this department's water quality protection note *Aquaculture*.

Additional information on protecting water quality in rural areas is contained in *Rural land uses and water quality - A community resource document* prepared as part of the National Water Quality Management Strategy (NWQMS) and this department's water quality protection note *Rural land use and water quality*.

Advice and recommendations

(The numbered paragraphs below are the recommendations)

Site selection

Local environmental values (e.g. ecosystem protection, water supplies, tourism, customary indigenous use) should be determined via consultation with local natural resource management (NRM) stakeholders. In remote areas, values may not be adequately recorded or studied for local water resources.

Within Public Drinking Water Source Areas

Public drinking water source area (PDWSA) is the collective name given to any catchment area declared for the management and protection of a water source used for community drinking water supplies. PDWSA include *underground water pollution control areas, water reserves* and *catchment areas* proclaimed under the *Metropolitan Water Supply, Sewerage and Drainage Act 1909* or the *County Areas Water Supply Act 1947*. For details on these statutes and associated regulatory measures in PDWSA, see Appendix B.

Within PDWSA, three protection classification areas for land (P1, 2 and 3) are used based on present land use and vulnerability of the water resource to harm. These areas are each managed in a different way to protect water resource quality.

Protection classifications are assigned in specific drinking water source protection plans prepared by this department. These plans are prepared in consultation with State government agencies, landowners, local government, key industry and community stakeholders.

P1 source protection areas are defined to ensure that there is *no degradation* of the water source. P1 areas are declared over land where the provision of the highest quality public drinking water is the prime beneficial land use. P1 areas would typically include land under government ownership. P1 areas are managed in accordance with the principle of *risk avoidance* and so land development and activities posing risks are generally opposed.

P2 source protection areas are defined to ensure that there is *no increased risk* of pollution to the water source. P2 areas are declared over land where low intensity development (such as rural) already exists. Protection of public water supply sources is a high priority in these areas. P2 areas are managed in accordance with the principle of *risk minimisation*, and so restricted development (with conditions) and low risk activity is accepted.

P3 source protection areas are defined to *manage the risk of pollution* to the water source. P3 areas are declared over land where water supply sources need to coexist with other land uses such as residential, commercial and light industrial developments. Protection of P3 areas is achieved through *management guidelines* (such as these notes) used for defining management measures that limit the risk to water resources from the land use or activity. If the water source were to become significantly contaminated, then water taken from P3 areas may need to be treated or an alternative water source found.

Additional constraints may apply in defined protection zones closest to the point where drinking water is harvested or stored. These are described as wellhead and reservoir protection zones.

Wellhead protection zones are defined areas within the immediate surrounds of drinking water production wells where special restrictions apply. In these zones groundwater moves rapidly towards wells and any contamination leaching from the ground surface could find its way into scheme water supplies (before effective remedial action can take place). *Well-head protection zones* are usually circular, with a radius of 500 metres in P1 areas and 300 metres in P2 and P3 areas. These zones do not extend outside PDWSA.

Reservoir protection zones are defined areas within the immediate surrounds of public water source reservoirs, where special access and land use restrictions apply.

The aim is to restrict the likelihood of contaminants being deposited, or following rainfall, washing into reservoirs. Reservoir protection zones usually consist of a buffer area up to two kilometres wide around the top water level of a reservoir and include the reservoir itself.

For additional explanatory information on PDWSA, see this department's water quality protection note *Land use compatibility in Public Drinking Water Source Areas*.

In P1 PDWSA, wellhead and prohibited (reservoir protection) zones

1 The establishment or expansion of tropical agriculture is *incompatible* with management objectives for the water resource. This department will oppose development or expansion of agriculture facilities in these areas or zones.

In P2 and P3 PDWSA

2 Tropical agriculture is *compatible with conditions* in P2 and P3 PDWSA (with the exception of exotic floriculture and market gardens in P2 areas), requiring best practice environmental management to be used. Guidance on current best environmental management practice is given in this note, or in project-specific conditions set by regulatory agencies.

Near waterways

Tropical waterways are typically billabongs that can become vast floodplains after storm events during the wet season. Rivers are generally well flushed and estuarine areas remain open and are flushed by the large tidal movements. The river systems and associated flora and fauna have adapted to local conditions.

3 Adequate separation distances should be maintained, where practical, between all land use facilities 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 A, reference 10 for supporting information). For advice on buffer selection, see this department's water quality protection note *Vegetation buffers to sensitive water resources*. The variation in tropical waterways between wet and dry seasons needs to be taken into consideration when determining buffers.

4 The planting of exotic species (such as those used for fodder crops) can have significant impacts on waterway ecosystems. Introduction of plants that could become environmental weeds should not be established close to waterways.

Near conservation valued wetlands

The Department of Environment and Conservation aims to ensure that chemicals or contaminated waters do not enter the environment close to sensitive waters (see Appendix C) providing an aquatic habitat such as wetlands.

Wetlands in northern areas of the State are relatively poorly studied and categorised increasing the risks of contamination and environmental degradation.

5 Wetlands require an adequate buffer to protect their ecology from potential harm (e.g. impacts of nutrients and pollutants), to maintain ecological processes and wetland functions. The width of the buffer should be determined based on the

values of the wetland, the threats posed by the adjacent land use and the protective management techniques used at the facility to maintain or improve wetland values. A minimum buffer width in tropical regions to wetland margins of 100 metres is recommended.

Additional information on identifying wetland buffers is contained in Chapter B4 of the Environmental Protection Authority's *Draft Guidance Statement No. 33 Environmental Guidance for Planning and Development*, (see Appendix A Reference 5).

6 Details of development proposed within 500 metres of any wetland (e.g. lakes, sumplands, damplands and billabongs) should be forwarded to the nearest regional office of the Department of Environment and Conservation for assessment, with supporting information addressing the environmental risks.

Floodplains

7 Changes in floodwater behaviour can result from management practices including vegetation clearing and the construction of channels. The CSIRO's *Floodplain management in Australia: Best practice principles and guidelines* provides guidance on siting and constructing projects to reduce the risks associated with flood events (see Appendix A, reference 11). Land uses that are not essential to operation or maintenance, particularly those storing dangerous goods and substances, should be located outside areas prone to flooding.

Contaminated sites

8 The *Contaminated Sites Act 2003* and the *Contaminated Sites Regulations 2006* create responsibilities and procedures relating to managing environmental contamination in Western Australia. Agriculture has been identified as a land use that could potentially cause a site to become contaminated. Under the legislation, there is an onus on the owner, occupier or the person who caused contamination to report known or suspected contaminated sites.

For further information about this new legislation or the management of contaminated sites in general, contact the Land and Water Quality Branch in the Department of Environment and Conservation or visit www.dec.wa.gov.au/contaminatedsites.

Buffers

9 Operational areas (where compatible) should have minimum vegetated separation distances to the full supply level of reservoirs, their primary feeder streams, and production bores or wells used as a source of drinking water, as recommended in this department's water quality protection note *Vegetation buffers to sensitive water resources.*

10 A minimum vertical separation buffer of two metres between infrastructure and the maximum (wet season) groundwater table for free-draining soils will help avoid

water-logging and allow for soil filtration and aerobic microbial degradation of contaminants.

Site water supply

11 A water abstraction licence is required in most locations where it is necessary to provide a site water supply drawn from a bore, waterway or wetland.

Licensing is conducted under the provisions of Part III of the *Rights in Water and Irrigation Act 1914*. Proponents should contact this department's local regional office for information about licensing allocations and procedures.

12 Uncontained fuel spillage from diesel driven pumps poses a risk of contamination of water supplies. Fuel for pumps should be managed in accordance with this department's water quality protection note *Toxic and hazardous substances–storage and use*.

13 If a dam is required for site water supply (or for any other reason), its siting, construction and operation should comply with this department's water quality protection note *Dam construction and operation in rural areas*. The high evaporation rates experienced in tropical areas should be considered when managing dams, for example salinity levels in dams will increase quicker than would be expected in cooler climates. In addition, where there is sparse vegetation or overgrazing, silt deposit in dams may occur.

Site access

14 Property owners should recognise that theft and vandalism of property can lead to environmental damage e.g. damage to chemical storage tank resulting in leakage into the environment. Adequate security should be installed and maintained for the facility such as lockable buildings/cages and fenced enclosures. This ensures that intruders cannot misuse equipment or materials and potentially cause environmental harm.

Existing activities

15 This department recognises that many activities were approved and established before the introduction of present environmental regulations and guidelines. It will negotiate with the operators of non-conforming activities with the aim that they progressively implement management practices that minimise the risks to water resources (as practical and economic constraints allow).

New or expanded activities

16 Any proposed new or expanded activities that may impact on water resources should be referred to this department's nearest regional office for assessment and written response. The department may support the proposal (with or without conditions), seek additional supporting information prior to making a decision or reject the proposal due inadequate protective measures to safeguard nearby environmental values. In order to gain environmental approval, operators will need to demonstrate that under both normal and abnormal operating conditions the

materials and processes used on site do not pose a significant risk to the local environment. The Department of Water is more supportive of agricultural activities that are planned for already degraded ecosystems rather than on land which is considered in good condition.

Other location and development considerations

17 Tropical agriculture should be located on land with the following attributes:

- Site zoned for the activity in the local government (council) planning scheme.
- Access to essential services, including waste treatment and recycling facilities.
- Sufficient on-site area and site gradient to provide for safe and effective management of raw materials, produce and waste products.
- Sufficient area provided for likely future premises expansion.
- Located outside of those sensitive environments where the activity is excluded by statute, government plan or policy, or it cannot be demonstrated that there is insignificant risk to environmental values.
- Appropriate protective separation distances to sensitive environments.

A feasibility assessment should be considered to determine whether the activity is viable, both biophysically and economically.

18 A comprehensive environmental management plan (EMP) should be used for the establishment and management of projects to limit the impact on natural resources. The EMP should include:

- A map of the project and neighbouring areas showing existing and proposed activities.
- Location of any sensitive water resources.
- The needs of the farm business, and any potential impacts on neighbours and surrounding areas.
- Analysis of soil characteristics and climatic factors and how these influence management practices.
- Details of the farm's establishment and operation including management systems, with reference to best industry management practice, market influences and financial overview.
- Provide for effective management of ongoing risks.

19 All tropical agriculture facilities need to comply with the Western Australian Planning Commission's State planning policy 2.5 *Agriculture and rural land use planning.* The objectives of this policy are to protect agricultural land resources, plan and provide for rural settlement, minimise land use conflict and manage natural resources, including water resources such as PDWSA.

Operation and Management

Nutrient management

20 Nutrient and irrigation management plans should be developed that are consistent with this department's water quality protection note *Nutrient and irrigation management plans* (see Appendix A, reference 10).

Irrigation systems utilising nutrient-rich wastewater (known as fertigation) should be managed in accordance with this department's water quality protection note *Irrigation with nutrient rich wastewater.* Fertigation of land subject to flooding should be avoided.

As a general rule, land that is seasonally underwater or may be flooded for more than 24 hours (following storm events) is unsuited to fertigation.

Basic nutrient management practices include:

- Use of fertilisers according to manufacturers instructions and crop requirements.
- Maintenance of vegetation buffers around agricultural projects (see this department's water quality protection note V*egetation buffers to sensitive water resources*).
- Manage run-off to prevent nutrients being transported into water resources.
- Avoid using fertilisers two to three days before heavy rain is forecast.
- Installation and use of septic tanks according to this department's water quality protection note *Wastewater treatment – onsite domestic systems*. Septic systems need to comply with Local Government and Department of Health requirements.

Groundwater monitoring

21 Water used for irrigation has the potential to enter groundwater and increase water table levels as well as provide a pathway for contaminants to enter the groundwater. Installation of monitoring bores will be expected in certain situations to assess impacts on groundwater levels and quality.
Bores should be constructed in accordance with the criteria laid out in this department's water quality protection note *Groundwater monitoring bores.*

Stormwater management

Rainfall in tropical areas is typically of high intensity over short periods, creating the potential for significant stormwater run-off. The volume of stormwater may be estimated using the procedures given in *Australian Rainfall and Run-off* published by the Institution of Engineers, Australia (see Appendix A, Reference 3).

22 Uncontaminated stormwater should be kept separate from contaminated water and should not come in contact with any stockpiled fertilisers or chemicals. Run-off or discharge from stockpiled fertilisers or chemicals is prohibited under the *Environmental Protection (Unauthorised Discharges) Regulations 2004*. Diversion

channels, bunding, vegetation buffers and/or drains should be used to prevent stormwater from becoming contaminated. Erosion and sediment control devices such as sumps or silt traps should be installed along roads and infrastructure to prevent sediment leaving the site and entering waterways.

23 Any contaminated stormwater should be captured and treated before being released to the environment or reused.

This department's *Stormwater Management Manual for Western Australia* (see Appendix A, reference 10) provides detailed information on the design and operation for the different treatment options available.

24 Any disposal of stormwater should be capable of sustaining or improving the values of local water resources. These values are described in the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000* (see Appendix A, Reference 1).

25 Stormwater should be considered as a potential resource. Stormwater use options include capture for use in processing or seasonal storage to supplement irrigation supplies.

Erosion and sediment management

26 Earthworks or other activities involving soil disturbance should be carried out during the dry season to allow settling and compaction of soils when run-off is unlikely. Earthworks should not be carried out if wind velocities are likely to create airborne dust problems.

27 Windbreaks should be established using a combination of trees and under-storey vegetation consisting of native species endemic to the area. Previously cleared land that is no longer being utilised should be rehabilitated to limit erosion.

28 Erosion caused by flowing water (e.g. run-off) can be reduced by using drains, banks and other methods. The Department of Agriculture and Food's Resource Management Technical Report No. 185 *Common conservation works used in Western Australia* and the Department of Water's *Stormwater Management Manual for Western Australia* highlight a number of different ways for controlling water movement on properties to prevent erosion (see Appendix A, References 7 and 10).

29 Areas of existing gully and landslip erosion should be rehabilitated.

30 Where practical, existing roads and tracks should be used to minimise erosion and to prevent changes to surface hydrology and drainage. Unpaved roads should be constructed parallel to the land contour, avoiding slopes exceeding one in ten to limit erosion and turbid water run-off. Waterway crossings should be minimised. Any roads no longer required should be closed and rehabilitated. For further information, see this department's Water Quality Protection Notes *Roads near*

sensitive water resources and *Vegetated buffers to sensitive water resources* (see Appendix A, reference 10).

Salinity management

Tropical agriculture can contribute to increased salinity through land clearing and changed hydrological flow regimes.

The National Action Plan for Salinity and Water Quality has identified the Ord Catchment as one of the priority regions in Australia most affected by salinity and water quality issues. The Rangelands Natural Resource Management (NRM) Coordinating Group has developed a draft NRM strategy for the Rangelands region. Section III of this strategy deals specifically with salinity and water quality issues in the Ord River catchment. To view the strategy visit the Rangelands NRM website at www.rangelandswa.info.

For detailed information; refer to the *Salinity Strategy,* published by the State Salinity Council in 2000, which states some of the goals for salinity control along with methods to achieve them. These goals include reducing the rate of land degradation occurring within agricultural and public land, restoration and protection of water resources to ensure safe potable water supplies, and protection of high value wetlands and natural vegetation to maintain natural diversity.

The following Internet sites that provide salinity information and advice:

- www.water.wa.gov.au, search *salinity* for publications, programs and other links
- www.nrm.gov.au
- www.ndsp.gov.au
- www.nlwra.gov.au

Clearing native vegetation

The *Environmental Protection Act 1986* (as amended) protects all native vegetation in Western Australia. Clearing of native vegetation is prohibited unless a clearing permit has been granted by the Department of Environment and Conservation or the clearing is of a kind exempt under Schedule 6 of the Act or under the *Environmental Protection (Clearing of Native Vegetation) Regulations, 2004.* For more information on constraints on the clearing of native vegetation, contact the Department of Environment and Conservation's nearest regional office or refer to the brochure *Protecting Native Vegetation – New laws for Western Australia,* available at www.dec.wa.gov.au, select *Department of Environment > Land > Native vegetation protection.*

Water use efficiency

The efficient and sustainable use of water will become increasingly important as demand for water resources increases in tropical parts of Western Australia.

31 Operators should begin to implement water use efficiency procedures in all aspects of their business. For general information on water saving options, see this department's website www.water.wa.gov.au select *Wise water use.*

Also see the Water Corporation's *waterwise program* website at http://www.watercorporation.com.au/W/waterwise_index.cfm., or the State Government's *Wise Water Ways for WA* website www.wisewaterwaysforwa.wa.gov.au*.*

32 Water use efficiency options that should be investigated for their suitability for particular projects include wastewater recycling, irrigation management plans, appropriate crop selection, managed aquifer recharge and regular maintenance of tanks, pipes etc to ensure there are no leaks.

Acid sulphate soils

33 Significant parts of tropical Western Australia are at risk of developing acid sulphate soils (ASS). Parts of the Pilbara, Kimberley and Gascoyne regions have been identified as ASS risk areas. Acid sulphate soil conditions can be caused when naturally occurring sulphide minerals, predominantly iron sulphides (pyrites) in the soil, are exposed to air after the watertable is lowered. Dewatering should not take place in ASS risk areas unless effective measures are adopted to prevent soil acidification. Exposure of ASS may cause the release of arsenic or other toxic metals into the environment in addition to sulphuric acid. For more information see Appendix A, Reference 8, or contact the Department of Environment and Conservation's Land and Water Quality branch.

Further information about acid sulphate soils can be found in the Western Australian Planning Commission's Bulletin 64 *Acid Sulphate Soils* (see Appendix A, Reference 6).

34 Soil acidity should be minimised by:

- Planning and testing before development to determine the likelihood of ASS developing as a result of agricultural projects.
- Regular soil testing to keep track of changes to acidity/alkalinity (pH).
- Controlling the application of acidifying fertilisers. Soil pH is frequently altered by application of chemical fertilisers.
- Adopting the management measures given in the Department of Agriculture and Food's Farmnote 80/2000 *Management of soil acidity in agricultural land.*
- Require all drainage works or dewatering projects to be carried out in accordance with best management practice for dewatering.

Soil Amendment

35 Soil amendment materials may be used to try and improve the productivity of agricultural land. Soil amendment using industrial by-products should be carried out according to this department's water quality protection note *Soil amendment using industrial by-products to improve land fertility* (see Appendix A, Reference 10).

Fuel and chemical contaminants

Chemicals play an important role in modern agriculture, however they need to be managed and used appropriately. The use of pesticides for agriculture has been implicated in the contamination of waterways in tropical Western Australia. Leakage of fuel, oils and solvents can also pose a serious contamination risk to water resources. Chemicals should be used, stored and handled in accordance with the regulatory requirements of the Department of Health, the Department of Consumer and Employment Protection Dangerous Goods Regulations (see recommendation 46 below) and the supplier's directions.

The Pesticide Impact Rating Index is a free software package developed by the CSIRO to predict the off-site impacts of different pesticides and land uses. It provides a rating of the relevant risk to water quality of different pesticides based on toxicity, chemical properties, application rate and frequency with local site specific conditions including soil and weather incorporated in the analysis. The software package is available from the CSIRO's website at www.clw.csiro.au/research/biogeochemistry/assessment/projects/piri.html.

36 Operators should ensure that all chemical storage, mixing and application is carried out in accordance with the manufacturer's specifications and best management practice. When applying chemicals, landowners should ensure that weather conditions are suitable (i.e. sufficiently dry and not windy) to minimise chemical spray drift or wash-off into water resources. Landowners should seek professional advice on the type and quantity of chemicals that should be applied, and check labels for warnings about impacts on human health and aquatic species before application near waterways or sensitive waters.

Spray plans should also be kept up to date and shall identify locations of sensitive areas and crops. For further details, see the Department of Agriculture and Food's *Code of Practice for the Use of Agricultural and Veterinary Chemicals in Western Australia* 2002, and the Department of Water's water note 22 *Herbicide use in wetlands* 2001.

37 Herbicide and pesticide use in drinking water source areas should comply with the Department of Health's PSC 88 *Use of herbicides in water catchment areas* and this department's state-wide policy No.2 *Pesticide use in Public Drinking Water Source Areas.* The Department of Health's Environmental Health Branch should be contacted for advice on the safe use of pesticides where these chemicals may come into contact with waterways and drinking water supplies.

38 Chemicals should be stored in accordance with Standards Australia AS 2507-1998 *The storage and handling of agricultural and veterinary chemicals,* in secure weather-proof containers with contained and bunded floors to limit pilferage, spillage into the environment, flooding or storm damage.

39 Incompatible materials (e.g. acids and alkalis), pesticides and fuel oil should be stored separately. For more information, see this department's Water Quality Protection Note *Toxic and hazardous substances – storage and use.*

40 Chemical storage tanks should not be located close to drinking water tanks, dams, wetlands, waterways and within wellhead protection zones or reservoir protection zones. Tanks should be installed properly to minimise the risk of leakage. For further information, see this department's Water Quality Protection Notes *Tanks for above ground chemical storage; Tanks for underground chemical storage* and relevant Department of Consumer and Employment Protection guidance notes. A licence may be required from the Department of Consumer and Employment Protection for the storage of 5,000 litres or more of diesel, and 500 litres or more of petrol. For further information, see the Internet site www.docep.wa.gov.au, select *Resources Safety > Dangerous Goods > Guidance Material and Publications.*

41 Chemical storage facilities should be inspected regularly (e.g. quarterly) to ensure any deterioration or leakage is identified and remedied at an early stage.

42 The re-fuelling areas of vehicles, helicopters or fixed-wing aircraft should be located away from water resources and bunded to prevent any spillage from contaminating soil or seeping into groundwater. Spillage should be directed towards a fully contained collection sump and then disposed off at an appropriate location.

Mechanical servicing

43 Mechanical servicing of farm equipment should be managed in accordance with the recommendations of this department's water quality protection note *Mechanical servicing and workshops.*

Feral animal control

44 Feral animals pose a risk to water resources by introducing pathogens and nutrients, damaging riparian vegetation and creating turbidity problems. Feral animal control should be carried out in accordance with this department's water quality protection note *Feral animal control* (currently in draft). Protection measures include ensuring baits are not used within 100 metres of wetlands, watercourses or reservoirs.

Wildfire control

Wildfires not only present a severe risk to human life, crops, stock and infrastructure, they may damage fragile ecosystems and cause pollution of water resources. Wildfires pose a risk to water resources by eliminating vegetation buffers and increasing surface water run-off and erosion. Contaminant spills may result from damage caused by the fire and from the use of chemicals during fire fighting.

45 A fire management plan should be developed that includes measures to be taken to protect water resources before and after fires, including:

- Location of firebreaks for sites that need permanent protection from fire.

- Conducting controlled fuel reduction burn-offs (cold burn) on site bushland to reduce the risk of wild-fires. These should be carried out based on Department of Environment and Conservation's and the Fire and Emergency Services Authority's (FESA) recommended conditions for lighting fires north of the 26th parallel. Prescribed burns generally occur early in the dry season.
- Assessing sites following fires to determine the need for turbidity mitigation works.
- Changing land management practices as a result of fire e.g. no application of fertilisers until damaged vegetation buffers are repaired.

For more information, consult your local Government authority, the Water Corporation, Department of Environment and Conservation or FESA.

Natural Resource Management (NRM)

The Rangelands NRM region covers all of tropical Western Australia, including the Kimberley, Pilbara and Gascoyne-Murchison sub-regions. NRM projects are designed to achieve a more sustainable use of land, bush, rivers, coastal and marine environments. For information about NRM projects in your local area, including possible funding for tropical agriculture NRM projects, or to view Rangelands NRM strategies visit the Rangelands NRM coordinating group website at http://www.rangelandswa.info.

Inspection of facilities

46 Regular inspection and maintenance of facilities and equipment should be carried out to ensure efficient, proper and safe operation. When determining how regularly this occurs, regard should be given to the type of facility/equipment, how often it is used and the potential consequences should failure occur.

Incidents and Emergency Response

Spill containment

47 Any spilt chemicals or fuels should drain to a sealed collection sump. These wastes should then be pumped to a sullage tank pending disposal to an off-site, HAZMAT (Hazardous Materials) approved processing facility.

A contingency plan and Material Safety Data Sheets (MSDS) for chemicals should be available on-site to address foreseeable emergency situations, e.g. accidents, fires, chemical spills and vandalism. Staff should be trained and assigned roles in conducting effective emergency response procedures.

Absorbent materials such as sand or inert absorbent litter (attapulgite or "kitty litter") should be kept on-site to absorb any chemicals spilt on floors. Spills should initially be cleaned up using absorbents prior to any wash-down. Chemical contaminated litter should then be stored for disposal at an appropriate facility.

Environmental monitoring and reporting

48 In addition to any routine reporting of monitoring data gathered to meet the needs of regulators, any chemical spill or contaminated water that escapes to the environment should immediately be reported to the Department of Environment and Conservation (phone 1300 784 782). If the spill is within a public drinking water source catchment, the Water Corporation should be advised immediately (phone: 1800 652 897, all hours).

Data required will include date and time of incident, name of person reporting the incident, description of the escaped chemicals, their quantity, loss location and action taken to remedy the problem on discovery.

More Information

We welcome your views on this note. Feedback provided on this topic is held on this department's file No. **WT1009**.

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 in Perth, phone (08) 6364 7600 (business hours), fax 6364 7601 or use *Contact us* at the department's internet site, citing the note topic and version.

Where a conflict arises between the Department of Water's recommendations and any proposed activity that may affect a sensitive water resource, this note may be used to assist negotiations with stakeholders. The negotiated outcome should not result in a greater risk to water 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

- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality,* 2000
- *Australian Guidelines for Water Quality Monitoring and Reporting,* 2000

  see webpage www.environment.gov.au/water/quality/nwqms/index.html.
- *Australian Drinking Water Guidelines,* 2004;

  see webpage www.nhmrc.gov.au/publications/synopses/eh19syn.htm.
- *Policies and Principles,* 1994
- *Implementation guidelines,* 1998
- *Rural land uses and water quality- a community resource,* 2000;

  see internet site www.awa.asn.au, email bookshop@awa.asn.au, or request from a library service.

2 Standards Australia

AS 5667 *Water Quality – Sampling* see webpage www.saiglobal.com/shop/script/search.asp.

3 Institution of Engineers Australia

Australian Rainfall and Runoff
see webpage www.engaust.com.au/bookshop/eabookspub.html.

4 Natural Resource Management Ministerial Council (Australia)

Minimum construction requirements for water bores in Australia, September 2003
see webpage www.iah.org.au/pdfs/mcrwba.pdf.

5 Environmental Protection Authority (WA)

- Guidance statement No 3 *Industrial-residential buffer guidelines*
- Draft Guidance Statement No. 33 *Environmental Guidance for Planning and Development,* June 2005

see Internet site www.epa.wa.gov.au, select *Guidance statements.*

6 Western Australian Planning Commission

- Bulletin 64 *Acid Sulphate Soils*

State Planning Policies

- Policy 2.5 *Agriculture and rural land use planning.*

- Policy 2.7 *Public drinking water source policy.*
- Policy 2.9 *Water resources.*

see Internet site www.wapc.wa.gov.au, select *Publications* > *State planning policies.*

7 Department of Agriculture and Food (WA)

Farmnotes

- Farmnote 80/2000 *Management of soil acidity in agricultural land*

Resource management technical reports

- Report 185 *Common conservation works used in Western Australia* 1998;

Codes of practice

- *Code of practice for the use of agricultural and veterinary chemicals in Western Australia*
- *Code of practice for environmentally sustainable vegetable and potato production in Western Australia*

see Internet site www.agric.wa.gov.au, search <desired topic>

8 Department of Environment and Conservation (WA)

Wetlands policy and guidelines

- *Position statement: Wetlands,* WRC 2001;

  see internet site www.dec.wa.gov.au, select *Department of Environment* > *Water* > *Wetlands* > *Publications* > *Policy* > *Wetlands Position Statement.*

Waste management

- *Guidelines for acceptance of solid waste to landfill,* 2001;
- *Landfill Waste Classification and Waste Definitions,* as amended;
- *Western Australian Waste Reduction and Recycling Policy,* 1997;

see internet site www.zerowastewa.com.au, select *Communication* > *Publications.*

Contaminated sites

Contaminated site guidance series

see webpage www.dec.wa.gov.au/contaminatedsites.

9 Department of Health (WA)

Safe use of household chemicals; see webpage http://www.population.health.wa.gov.au/Environmental/index.cfm, search *Household chemicals or Pesticide.*

10 Department of Water (WA)

Water source protection policies

Pesticide use in public drinking water source areas 2000
see Internet site www.water.wa.gov.au, select *Policy*

Water Quality Protection Notes

- *Aquaculture.*
- *Contaminant spills – emergency response*.
- *Dam construction and operation in rural areas*.
- *Floriculture.*
- *Groundwater monitoring bores.*
- *Irrigation with nutrient-rich wastewater.*
- *Land use compatibility in public drinking water source areas.*
- *Mechanical servicing and workshops.*
- *Nutrient and irrigation management plans.*
- *Pastoral activities within rangelands.*
- *Roads near sensitive water resources.*
- *Rural land use and water quality.*
- *Soil amendment using industrial by-products to improve land fertility.*
- *Tanks for above ground chemical storage.*
- *Tanks for underground chemical storage.*
- *Toxic and hazardous substances - storage and use.*
- *Vegetation buffers to sensitive water resources.*
- *Wastewater treatment – onsite domestic systems.*

see Internet site www.water.wa.gov.au, select *Water quality > Publications > Water Quality Protection Notes.*

Waterways policy and guidelines

- Foreshore Policy 1 – *Identifying the Foreshore Area,* WRC 2002.
- Water Note 10 – *Protecting riparian vegetation*.
- Water Note 11 – *Identifying the riparian zone*.
- Water Note 22 – *Herbicide use in wetlands*.
- Water Note 23 – *Determining foreshore reserves*.

see Internet site www.water.wa.gov.au, select *Policies or Water quality > Publications > Water Notes.*

Stormwater Management Manual for Western Australia

see Internet site www.water.wa.gov.au, select *Water management* > *Stormwater*.

Environmental Water Report Series

Environmental Water Report Series No.1 *Environmental values, flow related issues and objectives for the lower Ord River,* Western Australia 2006.

11 Commonwealth Scientific and Industrial Research Organisation

Standing Committee on Agriculture and Resource Management Report 73 *Floodplain management in Australia: Best practice principles and guidelines,* 2000, CSIRO Publishing, Victoria.

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 (DPI)
Land zoning and development approval		Local Government (Council); DPI
Impact 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 pollute	*Environmental Protection Act 1986, Part V Environmental Regulation*	Department of Environment and Conservation – regional office
Land clearing	*Environmental Protection (Clearing of Native Vegetation) Regulations 2004*	
Control of declared animals and plants	*Agriculture and Related Resource Protection Act 1976*	Department of Agriculture and Food
Licence to take surface water and groundwater Permit to interfere with bed and banks of a waterway	*Rights in Water and Irrigation Act 1914*	Department of Water – regional office
Development in Public Drinking Water Source Areas	*Metropolitan Water Supply, Sewerage and Drainage Act 1909* *Country Areas Water Supply Act 1947*	
Licence to discharge waters into managed waterways.	*Waterways Conservation Act, 1976*	
Management of human wastes, Community health issues Pesticides use, storage, handling and disposal	*Health Act 1911* *Health (Pesticides) Regulations 1956*	Local Government; Department of Health
Possession and use of poisons	*Poisons Act 1964*	Department of Health
Storage of fuels, solvent, explosive and dangerous goods	*Explosive and Dangerous Goods Act, 1961*	Department of Consumer and Employment Protection
Emergency response planning	*Fire and Emergency Services Authority of WA Act, 1998*	Fire and Emergency Services Authority

Note: Copies of relevant statutes are available from the State Law Publisher at Internet site www.slp.wa.gov.au.

Appendix C - 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 webpage www.deh.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:

- 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*;
- 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);
- groundwater aquifers that sustain important ecological functions such as cave ecology;
- 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.);

- 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 Heritage (Australia) in:

    A Directory of important wetlands in Australia, (see webpage www.deh.gov.au/water/wetlands/databases.html; or

    the Department of Environment and Conservation webpage http://www.naturebase.net/content/view/813/861/); and
  - 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 9334 0333.