



Water quality protection note 104

February 2010

Looking after all our water needs

Aerial spraying of crops with pesticides

Purpose

The use of pesticides is a widespread practice throughout the agricultural community. Pesticides are often used to try achieve blemish-free produce, suppress insects and weeds and control plant pathogen disease outbreaks. However, pesticides require careful management, as even at low concentrations pesticide residues can be harmful to the environment and human health. Many pesticides are persistent and mobile, particularly in sandy soils. When water resources are contaminated with pesticides and regular monitoring is not being conducted, contamination can go undetected for long periods. If contamination of water resources does occur, it is often very costly to remedy.

The application of pesticides on crops may pose a significant risk to the environment, particularly in and adjacent to waters with sensitive ecosystems, public drinking water source areas, recreational waters and residential areas. This risk primarily involves the contamination of water resources with pesticide residues. There are various possible causes of contamination incidents such as operator error, overuse or incorrect formulation, lack of planning, spraying during inappropriate weather conditions, equipment failure which may or may not be associated with poor maintenance, as well as unforeseen accidents. The risk of water source contamination from the aerial spraying of pesticides is considered greater than that from ground based spraying systems. Aircraft spray occurs from a greater height than ground based equipment and on a broad scale, both of these factors may increase the risk of spray drift. In addition, aircraft are able to travel over areas which are highly sensitive and otherwise may be inaccessible. This is in contrast to ground based equipment which usually is operated solely within the area being sprayed or along defined roads.

Contamination of water sources with pesticides can also be caused from point sources such as accidental spillage, leakage from drums and tanks or from the inappropriate disposal of pesticide containers.

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:

- our views on minimising the impacts on water resources from the aerial spraying of crops with pesticides
- guidance on acceptable practices employed to protect the quality of water resources

- a basis for the development of a multi-agency environmental code or guidelines that considers 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.

Key supporting information is provided in the appendices. This information includes a disclaimer on use of this note, description of sensitive water resources, relevant statutes and administering agencies. Appendices also include a checklist and external contacts list.

Scope

This note applies to the spraying of crops and plantations with pesticides using helicopters or fixed wing aircraft on large or inaccessible areas where ground-based spraying is impractical. Pesticides used can include insecticides, herbicides, fungicides, miticides, and any other chemicals designed to control pest species.

The note does not cover the aerial spraying of pesticides on other areas such as turf, gardens or native bushland. However, it may offer some useful guidance on the potential risks pesticides pose to water resources and good practice for the general use of pesticides.

The note also does not apply to the aerial application of substances other than pesticides, such as fertilisers. However, it may offer some useful guidance on good practice for these situations.

Advice and recommendations

- 1 The aerial spraying of crops with pesticides poses various environmental risks including water source contamination. The ideal way to avoid these risks is to use pest management techniques other than chemical treatment. Chemical controls should be employed only in the absence of other suitable pest management techniques, and then they should be used as part of an integrated pest management plan, in conjunction with passive methods of pest control such as crop rotation. Additional methods of pest control other than chemical methods include physical barriers, biological controls and genetic modification of plants or pests.
- 2 If pesticide use is unavoidable, it should be used in combination with other methods of pest reduction and in a way that complements rather than hinders the other pest management elements. Where practical, ground based methods of applying pesticides should be used in preference to aerial application.

Planning and preparation

Location

Within public drinking water source areas (PDWSA)

Background information on the management of PDWSA is provided in Appendix A

- 3 Within P1 PDWSA the aerial spraying of crops with pesticides is incompatible with the state government's management objectives for the water resource. This department will normally oppose the use of pesticides via aerial application within these areas or zones.
- 4 Within P2 PDWSA, the aerial spraying of crops with pesticides is compatible with conditions. Conditions may be applied in regulatory approvals for pesticide application and will require best environmental management practice. Guidance on current best environmental management practice is given in supplier's label instructions, this note, and in any project-specific conditions set by regulatory agencies.
- 5 Within P3 PDWSA, the aerial spraying of crops with pesticides is acceptable, however regulatory conditions may still apply to pesticide application and best environmental management practice should always be used. Guidance on current best environmental management practice is given in supplier's label instructions, this note, and in any project-specific conditions set by regulatory agencies.
- 6 Within designated well-head and prohibited zones (reservoir protection zones), the aerial spraying of crops with pesticides is incompatible with the state government's management objectives for the water resource and will normally be opposed.

Near other sensitive environments

- 7 Other sensitive environments are described in Appendix A including waterways, wetlands and natural bushland
- 8 Adequate separation distances (buffer zone and type) should be defined to avoid or minimise spray drift onto sensitive environments. Suitable methods to help define buffers include test spraying using inert dyes. This can determine the spray paths suited for the aerial spraying operation, depending on the aircraft type, flight height and ambient weather conditions.

Preparation

- 9 Aerial pesticide spraying operations require thorough preparation. There are a number of factors that need to be dealt with to minimise possible adverse effects on sensitive waters. Use of a checklist is recommended to confirm these have been addressed prior to spraying, while it is underway and once it is completed. An example checklist is provided in [Appendix D](#).

At the planning stage, decisions should be made on:

- a which pesticide to use
- b safeguards for sensitive environments
- c the equipment to use
- d maintenance of equipment
- e nozzle calibration requirements
- f how environmental conditions will be monitored
- g the timing of the operation in relation to the stage of crop growth and the life cycle of the pest or weed being treated.

- 10 An 'awareness zone' should be established for the area surrounding the spraying operation. This zone may extend up to five kilometres from the area to be sprayed. Once the awareness zone has been established all areas within the zone that may be pesticide sensitive should be identified. Such areas include animals and animal housing facilities, aquaculture facilities, apiaries, organic food enterprises, water sources, houses, gardens, schools, public areas and pesticide sensitive crops. The width of the awareness zone should be extended if there are known sensitive areas close by or if the local conditions, such as the wind, may increase the impact of the spraying operation. A map of the awareness zone and sensitive areas should be created and used as a reference throughout the operation. 'No-fly' zones should be established over areas that are considered pesticide sensitive and spray aircraft should be prohibited from flying over these areas.

Pesticide impact rating index program

- 11 The pesticide impact rating index (PIRI) program was developed by the CSIRO with support from Land and Water Australia and other agencies. It is described as a simple risk indicator for pesticide impact on water quality. PIRI is designed to assist pesticide users to make informed decisions about the best product to use, given the individual circumstances and the likely impact on the local environment. The PIRI program takes into account the properties of pesticides which affect their environmental fate, ecotoxicological impacts, as well as application rates, soil and environmental conditions, site hydrology, topography and proximity to waterways. The PIRI software is available free online from the CSIRO Land and Water website <www.clw.csiro.au> ([reference 5b](#)).

Job Safety Analysis

- 12 A job safety analysis (JSA), also called a job hazard analysis, should be prepared by the spraying operator. The aerial spraying of crops with pesticides involves risks, related to both the use of pesticides and the operation of aircraft. A JSA breaks the spraying operation down into steps making it easier to identify both personal or environmental risks.
- 13 Once the risks have been identified, prevention strategies should be implemented. A JSA can also be used to demonstrate that best practice was used throughout the task and to show that operators have fulfilled their duty of care. Further information and guidance on how to prepare a JSA can be found online at WorkSafe ([reference 7](#)) and the University of Western Australia's safety and health site ([reference 13](#)).

Stakeholder identification and notification

- 14 A list should be compiled of all the individuals and organisations who may be affected by the planned aerial spraying operation. These stakeholders may include the Western Australian departments of Agriculture and Food, Health, Water and Environment and Conservation, the Water Corporation, local government, neighbouring landholders, indigenous communities, regional natural resource management groups, community groups and people likely to visit the spray site.

- 15 These individuals and organisations should then be contacted and informed of the details of the aerial spraying operation and any precautions that should be taken. These precautions should include the protection of animal feed and water sources. This process will also help the operator to become aware of any sensitive areas, and minimise the potential for conflict with neighbours. Local residents are often aware of pesticide sensitive areas. Effective communication with stakeholders should be maintained throughout all stages of the aerial spraying operation. Communication methods may include telephone calls, emails, letters, local newspaper notices, local radio, brochures and perimeter signs. The information provided should include the contact details for further advice. Stakeholders should be informed of any unexpected incidents and feedback should be sought from them regarding any specific concerns.
- 16 Warning signs should be erected to prevent people accidentally entering areas where aerial spraying is occurring. Warning signs should be within clear view at access points and be informative. Information displayed should include relevant warnings, extent of the area to be sprayed, the timing of the operation and when it will be safe to re-enter the area, the purpose of spraying, the pesticide used and the contact details for further enquiries. Once it is safe to enter the sprayed area without personal protection equipment, it is important that all signs be removed.

Operation and management

Pesticide use and operator licensing

- 17 Federal and state legislation regulates the application of agricultural chemicals, including pesticides. The use of any chemical should be consistent with the registered label or permits covering that particular product for a specific use. This includes details of application rates, method of application and timing, weather conditions pertaining to drift management and safe chemical handling and application. In no circumstance should a pesticide be applied in a method inconsistent with the label or permit. If such a need is determined, a 'minor use permit' should be obtained from the Australian Pesticides and Veterinary Medicines Authority ([reference 3](#)) before use, or a suitable alternative product chosen. Liaison should also occur with the W.A Department of Health's pesticide safety branch ([Appendix C](#)).
- 18 Aerial operators applying pesticides should be trained and licensed by the Department of Agriculture and Food (WA), while ground pesticide application requires licensing by the Department of Health (WA).

Pesticide transport, storage, preparation and disposal

- 19 Care should always be taken when handling, storing and disposing of pesticides. For further information on dealing with spills and the handling, storage and disposal of pesticides, see our water quality protection note 47 *Pest control depots* ([reference 10b](#)). For further information on the use of pesticides in Western Australia, see our State-wide policy 2 *Pesticide use in public drinking water source areas* ([reference 10a](#)).
- 20 The Department of Agriculture and Food Bulletin 4648 *Code of practice for the use of agricultural and veterinary chemicals in WA* ([reference 6c](#)) provides practical guidance for the safe, responsible and effective use of agricultural and veterinary chemicals.

Information provided includes the responsibilities of the owner, manager and spray operator, how to manage and handle chemicals, occupational safety and health, environmental protection and the control of spray drift.

- 21 Statutory requirements ([Appendix B](#)) should be followed by those planning aerial pesticide spraying. There are additional regulations under the *Occupational Safety and Health Act (WA) 1984* for the use of pesticides containing organophosphates.
- 22 Pesticides are listed as a potential contaminant in the *Potentially contaminating activities, industries and land uses* publication which is part of a series produced by the Department of Environment and Conservation ([reference 8a](#)). It is important to ensure that the storage and transfer of pesticides occurs in weatherproof containment compounds that are designed to minimise the likelihood of pollution and which have sufficient storage capacity and the correct design to allow the effective recovery of any spills. For further information relating to pollution control and contaminated sites, refer to Part C of the Environmental Protection Authority's, Guidance statement 33 – *Environmental guidance for planning and development* ([reference 11](#)).
- 23 Pesticide containers should be in good condition, with clear, undamaged labels. There is a high risk of spillage when filling aircraft tanks. Spillage and pesticide leaks can cause environmental damage, including to drinking water sources. Aircraft being filled should be on an impervious hard stand to catch any spills or leakage. All spills should be cleaned up immediately. All pesticide formulation, mixing and decanting should occur in an approved containment facility on an impervious base. All equipment used should be regularly checked and maintained and records kept for future reference.
- 24 Appropriate personal protection equipment should be used when handling pesticides. During the transfer of pesticides from a tanker or bulk container, into a smaller container, isolation valves, fail safe and automatic control systems should be used to avoid leakage, overfilling or spillage. Bulk containers used to decant pesticides should be fitted with chemical resistant drip trays.
- 25 It is essential to dispose of excess pesticides and empty pesticide containers in the correct way to avoid contaminating water resources. The methods are prescribed in the Western Australian Health (Pesticides) Regulations (WA) 1956. Product labels should always be consulted as they normally provide instructions for disposal. It is preferable to use products that are part of a deposit and recycling program and/or products that are a 'closed' chemical handling system.
- 26 Depleted, liquid pesticide containers should be left to drain into another container (for later use) or the spray tank for at least 30 seconds. The empty container should then be rinsed out three times with an amount of liquid (water or solvent) that is approximately ten per cent of the container capacity and the rinse should be drained into another labelled container or spray tank. All containers should be held within a containment area unless they have been triple-rinsed pending disposal or reuse. Concentrated residues should not be allowed to run to waste on the ground or into wastewater systems. In Public Drinking Water Source Areas (PDWSA), all used pesticide containers should be recycled or removed from the premises to an approved waste facility.

27 There are programs available for the disposal of excess pesticides or used pesticide containers. CropLife Australia has set up Agsafe, which runs two disposal programs, ChemClear for the removal of excess pesticides and drumMUSTER for the removal of used pesticide containers. DrumMUSTER is a national program that has been set up for the collection and recycling of used chemical containers. For further information on collection sites and advice on how to safely clean used chemical containers in preparation for recycling, see the drumMUSTER website < www.drummuster.com.au >. Bookings for chemical collections can be made, and further advice on the disposal of excess pesticides is available online at < www.chemclear.com.au > (reference 1a).

Safe flying practice

28 Accidents involving aerial spraying aircraft can lead to water contamination. Therefore, aircraft used to spray crops with pesticides should always be in good flying condition and be regularly serviced. The Civil Aviation Safety Authority (CASA) is Australia's air safety regulator. CASA was established under the *Civil Aviation Act 1988*. CASA regulates the safety related activities of the aviation industry through the Civil Aviation Regulations 1988 and the Civil Aviation Safety Regulations 1998. For further online information, visit the CASA website < www.casa.gov.au >.

29 Aerial spraying of pesticides should always be undertaken by an operator with appropriate qualifications, training, experience and licensed under the Aerial Spraying Control Act (WA) 1996. The Aerial Agricultural Association of Australia (AAAA) ([Appendix C](#)) provides information and runs training programs for safe aerial spraying. The Spraysafe program educates and trains pilots in best practice aerial spraying techniques and safe flying.

Aerial spraying technique

30 It is important to get the maximum possible benefit from any aerial spraying operation. A successful operation:

- a treats the pest or weed problem
- b minimises costs
- c minimises the need for further applications
- d poses no significant risk to the environment.

31 To decrease the risk of environmental contamination, it is important to ensure that an effective aerial spraying program is conducted. To undertake a successful and effective aerial spraying program, many aspects need to be considered. The timing of the pesticide application in relation to weed or insect development and growth stage of the crop is an important aspect to consider. The life cycle of a pest needs to be understood so that the pesticide can be applied when the pest is at its most vulnerable stage. The Western Australian Department of Agriculture and Food has published a farm note on effective spraying ([reference 6b](#)).

32 Spray capacity is described as the area sprayed during each aerial session. It can sometimes be increased to finish an aerial spraying job in one day, decreasing the number of flights required and therefore minimising the risk of incidents that may lead to negative environmental effects. Methods such as a large spray boom, maximum tank capacity, more spraying units and fast application all increase the spray capacity.

Increasing field efficiency can also decrease the number of aerial spraying applications required. Field efficiency is described as the ratio of theoretical field time to total time in the field. To increase the field efficiency, effective planning and management techniques should be used.

Documentation

- 33 Under the *Occupational Health and Safety Act (WA) 1984*, it is a legal requirement that records be kept of various aspects of the aerial spraying process. The Act requires maintenance of a database of all chemicals used and/or stored. Each chemical listed must also have an up-to-date material safety data sheet (MSDS) readily available to any operator handling the chemicals. These are available online at < www.msds.com.au >. Written risk assessments on the use of hazardous substances, workplace monitoring or health surveillance results are also all required under Section 10b of the *Occupational Health and Safety Act (WA) 1984*. The product label should list any additional documentation required.
- 34 As well as keeping the records required by law, it is recommended best practice that the following records be kept:
- a equipment maintenance and calibration
 - b maps of sensitive areas
 - c property plans, showing crop or plantation areas
 - d operational plans and checklists
 - e pesticide spray formulation (concentrate and extent of dilution)
 - f chemical application records including weather monitoring
 - g reports of spills and actions taken to remedy them
 - h staff training and development records
 - i pest monitoring information
 - j evidence of responsible chemical disposal, such as receipts from ChemClear or drumMUSTER
 - k records of communication with stakeholders.

Forms for many of the records mentioned and further information on legally required and recommended documentation is available online at ChemCert WA ([reference 4](#)).

Spray drift prevention

Property management planning

- 35 Where practical, preventative steps should be taken to minimise possible spray drift problems during the planning stage of agricultural farming areas. Areas that may be sensitive to spray drift should be identified and buffers defined in advance. Crops that are sensitive to a specific pesticide should not be placed next to crops that may require its use. Crops that may require the aerial application of pesticides should be placed away from aviation hazards such as low powerlines and communication towers. They should also be placed away from pesticide sensitive areas such as reservoirs, lakes, wetlands or waterways.

36 For detailed information on property management planning, see *Spray drift management: principles, strategies and supporting information*, published by the Primary Industries Standing Committee (PISC) ([reference 5a](#)).

Buffer types and zones

37 Buffer zones should be used to minimise the effect of spray drift on surrounding areas. Buffers should be located downwind of the aerial spraying area. There are many different methods of buffering such as field splitting, vegetated buffer strips, fallow and in-crop buffer strips. The appropriate width for a buffer zone depends on factors such as the spraying equipment used, the type of buffer zone, weather conditions, the type of pesticide used, the addition of any spray drift modification agents to the tank mix and the sensitivity of the area at risk (see [Appendix A](#) for a description of sensitive water resources).

38 In areas where aerial spraying is to take place, there should be a minimum vegetated separation distance to the following water sources:

- a full supply level of drinking water supply reservoirs
- b primary feeder streams of the reservoirs
- c production bores or wells which are a source of drinking water.

The recommended distances are given in our water quality protection note 06 *Vegetated buffers to sensitive water resources* ([reference 10b](#)). This note also contains information on the establishment of buffer zones. More information on the establishment of buffer zones is provided in *Spray drift management: principles, strategies and supporting information* ([reference 5a](#)). Pesticide product labels also include either mandatory guidelines or advisory recommendations on buffer distances.

39 An adequate buffer should be maintained between areas to be sprayed and wetlands, natural waterways and their foreshore areas. Foreshore areas are determined on the basis of the waterway values, vulnerability and biophysical criteria as described in our *Foreshore policy 1 -Identifying the foreshore area* ([reference 10a](#)). Certain wetlands have been given a conservation status or identified as a sensitive water resource ([Appendix A](#)). The Department of Environment and Conservation (DEC) is the lead agency for the management and conservation of wetlands.

40 Ground markers should be used to guide the aircraft so spraying does not occur outside the spray zone, and to minimise spray drift. Examples of appropriate markers include electronic swath markers, mechanical signals or GPS systems. If physical markers are used they should be clearly visible from a height and be firmly secured in their correct position. If the use of humans as markers is unavoidable, WorkSafe provides information on additional safety precautions that should be taken. Visit the Department of Commerce website ([reference 7f](#)), for online information. Additional information on the safe use of markers may also be shown on pesticide product labels.

Weather conditions

41 Weather conditions may significantly affect the risk of spray drift from aerial pesticide applications. The conditions that are optimum for the aerial application of pesticides on crops are quite specific.

People who undertake aerial spraying should be made aware of the conditions suited for spraying and have the appropriate equipment and training to test and continually monitor the weather throughout the spraying period. Weather aspects that should be monitored include local wind speed and direction, temperature, humidity and atmospheric stability. Internet-based weather monitoring data can also be of assistance. The Nufarm company runs *Spraywise decisions*, a web site available online at < www.spraywisedecisions.com.au >, which helps sprayers to plan and match the timing of the spray operation with local weather conditions. Spraywise does this by providing predictions of estimates for rainfall, temperature, wind direction, wind speed and relative humidity for up to fourteen days.

- 42 In summary, favourable aerial spraying conditions include a light wind (variable in strength) with a wind speed ranging from three to fifteen kilometres/hour (for most spraying equipment), mild temperatures (< 28 °C) and a wet bulb depression higher than 10 °C (commonly termed *delta 10*). Atmospheric conditions should be neutral with no surface temperature inversion present. More information on the appropriate weather conditions for aerial spraying and monitoring instructions is provided in *Spray drift management: principles, strategies and supporting information* (reference 5a).

Spray application technology

- 43 Aerial spraying equipment should be tailored to its specific application. Spraying equipment should be designed to vary the size and distribution of the pesticide droplets produced during aerial spraying. The size and distribution of the spray droplet affects both the effectiveness of the aerial spraying and the risk of spray drift. Manufacturers supply nozzle charts showing recommended application volumes for combinations of nozzle size, nozzle pressure and travel speed. Best practice also requires other equipment such as smoke devices be attached to the aircraft. Smoke devices assist in monitoring changes in weather conditions and therefore the possibility of spray drift. For more information on the various types of aerial spraying equipment and their applications, see *Spray drift management: principles, strategies and supporting information* (reference 5a).
- 44 The aircraft chosen to undertake the aerial spraying operation can also affect spray drift. Both helicopters and fixed wing aircraft can be used for the aerial spraying of pesticides. Due to the greater visibility from them and their ability to fly at lower speeds, helicopters are able to spray from a lower operational height. This means that larger pesticide droplets can be produced, reducing the possibility of spray drift. However, when helicopters are flown below certain velocities the airflow around them is changed and droplets can be carried up by rotor vortices, resulting in a higher risk of spray drift. Therefore, the decision to use a helicopter or fixed wing aircraft needs to be appropriate for the specific operation. Factors such as the pesticide used, operator experience, topography, risk of spray drift and locality of sensitive areas must all be taken into account.

Legislation and regulations

45 The *Aerial Spraying Control Act (WA) 1966* and the Aerial Spraying Control Regulations 1971 control a number of aspects of aerial spraying. These include the control of spray drift, the equipment used, height of spray application, proximity to susceptible crops and volatility of the active chemical used. Other legal requirements include:

- a each individual spray nozzle must be fitted with a positive and effective leak-proof cut-off valve
- b keeping of records.

For the Act and regulations, see the State law publisher's website ([Appendix B](#)).

Contaminated Sites Act (WA) 2003

46 The *Contaminated Sites Act (WA) 2003* provides a legal framework for the management of contaminated sites in Western Australia, and requires owners, occupiers and polluters to report known or suspected contaminated sites to the Department of Environment and Conservation. Contaminated sites will be classified by the department, in consultation with the Department of Health, based on the risk the sites pose to human health and the environment. In relation to land, water or a site, the Act defines 'contaminated' as '*having a substance present in or on that land, water or site at above background concentrations that presents, or has the potential to present, a risk of harm to human health, the environment or any environmental value.*'

Monitoring and reporting

47 The operator should comply with any monitoring protocol defined by regulatory agencies ([Appendix B](#)).

48 In the absence of regulatory monitoring requirements the operator should:

- a carry out surveys to record the effectiveness of the spraying in suppressing the pest species
- b in sensitive areas, take soil and water samples and arrange laboratory analysis to determine the presence of any pesticide residues
- c maintain records of the areas sprayed, dates of application, pesticide formulation, pesticide batch number and date of manufacture, pesticide operator and subsequent site inspection and analysis results.

Contingency planning and reporting

49 A contingency plan should be prepared and held on-site to address foreseeable emergency situations such as accidents, fires and pesticide spills that could have an impact on water resources. People involved in aerial spraying operations should be trained and assigned roles in conducting effective emergency response procedures. For further information on emergency response procedures for contaminated spills see our water quality protection note 10 *Contaminant spills – emergency response* ([reference 10b](#)). Product labels provide a 24-hour contact number for emergency advice.

- 50 In addition to any routine reporting of monitoring data gathered to meet the needs of regulators, any chemical spill or contaminated fluid that escapes to the environment should immediately be reported to the WA Department of Environment and Conservation (phone 1300 784 782).
- 51 If the spill is within a public drinking water source catchment, the Water Corporation (or other relevant water service provider) should be advised immediately (phone: 1800 652 897, all hours). All affected landholders should also be contacted immediately. Information that should be provided to the relevant agencies and/or property owners includes:
- a the date and time of the incident
 - b the location of the incident
 - c the description of the escaped chemicals
 - d their quantity
 - e actions already taken to deal with the problem.

Appendix A - Key supporting information

Sensitive water resources

Uncontaminated 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. Natural water resources should remain within specific quality limits to retain their ecological, social and economic values. They therefore require stringent and conservative protection measures.

Information on water quality parameters and processes to maintain water values are published in the Australian government's *National water quality management strategy guidelines*. These papers are available online at < www.environment.gov.au >, select *water > publications and resources > water quality publications*.

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 sustain acceptable water resource quality. Human activity and many land uses pose a risk to water quality if contaminants are washed or leached into sensitive water resources in significant quantities. Sensitive waters include estuaries, natural waterways, wetlands and unconfined groundwater.

Sensitive waters support one or more of the environmental values described below:

1 Public drinking water sources

Public drinking water source area (PDWSA) is the collective name given to any area proclaimed 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* administered under the provisions of the *Metropolitan Water Supply, Sewerage and Drainage Act (WA) 1909* or the *Country Areas Water Supply Act (WA) 1947*.

For online information on the location of PDWSA, see < www.water.wa.gov.au >, select *tools and data > maps and atlases > geographic data atlas*, then open *environment > public drinking water source areas*.

For land planning and development purposes, three protection classification areas (P1, P2 and P3) have been defined for use within PDWSA. They are assigned based on present land use, tenure and the vulnerability of the water body to harm.

These areas are each managed with a different strategy to provide for effective protection of the water resource. P1, P2 and P3 areas are assigned in *drinking water source protection plans* or *land use and water management strategies*. These documents are prepared in consultation with government agencies, landowners, industry and the community.

P1 areas are defined to ensure that there is *no degradation* of the water source. These areas are declared over land where the provision of the high quality drinking water for public use is the prime beneficial land value. P1 areas typically cover land under state agency control. P1 areas are managed in accordance with the principle of *risk avoidance* and so most land development and activity is normally opposed.

P2 areas are defined to ensure that there is *no increased risk of pollution* to the water source once a source protection plan has been published. These areas are declared over land where low intensity development (such as rural use) 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 intensity development (with management conditions) and activities with a low contamination risk are accepted.

P3 areas are defined to *manage the risk of pollution* to the water source. These areas are declared over land where public water supply sources must coexist with other land uses such as residential, commercial and light industrial development. Protection of P3 areas is achieved through management measures defined via environmental guidelines (such as these notes) or via site-specific conditions that limit the contamination risk to water resources from the land use or activity. If, however, the water source becomes significantly contaminated, then water supplied from P3 sources may need to be treated or an alternative water source found.

Protection zones are also defined close to the point where drinking water is harvested or stored. Additional constraints apply to activities in these zones to safeguard the area immediately surrounding these vulnerable water sources. These zones are known as *wellhead protection zones (WHPZ)* and *reservoir protection zones (RPZ)*.

WHPZ are assigned within the immediate surrounds of water production wells and special land use restrictions apply. In these zones groundwater moves rapidly towards wells due to aquifer depressurisation from pumping. Any contamination leaching from the ground surface could rapidly migrate into scheme water supplies (before effective remedial action can occur). In sedimentary basins, WHPZ 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 boundaries.

RPZ are defined over and around public water supply reservoirs or pipe-heads. Special access and land use restrictions apply. The aim is to restrict the likelihood of contaminants being deposited or washing into water sources following rainfall. RPZ within state controlled land cover an area of up to two kilometres from the reservoir top water level.

For additional explanatory information on PDWSA, see this department's water quality protection note 25 Land use compatibility in public drinking water source areas and note 36 Protection of public drinking water source areas – an overview.

Buffers to water supply sources

Operational areas (where compatible) should have minimum vegetated separation distances to the full supply level of reservoirs, their primary feeder streams and production bores used as a source of drinking water. Buffer assignment advice is provided in our water quality protection note 6 *Vegetated buffers to sensitive water resources*.

Clearing control catchments

Special controls on vegetation clearing for salinity management purposes are provided under part IIA of the *Country Areas Water Supply Act (WA) 1947*. These controls apply in the Wellington Dam, Harris River Dam, Mundaring Weir and Denmark River catchment areas and the Kent River and Warren River water reserves. Details on clearing controls may be obtained from our regional offices, see < www.water.wa.gov.au >, select *contact us*.

Established activities in PDWSA

Many land use activities were approved and established before publication of a source protection plan or strategy. This department encourages the operators of non-conforming activities to ensure that they progressively improve environmental management facilities and practices to minimise the risk to water resources (while considering practical and economic constraints).

New or expanded activities in PDWSA

Any proposed new or expanded activities that could affect drinking water sources should be referred to this department's regional office for assessment and written response. The development proposal may be approved (with or without conditions); additional relevant information sought prior to making a decision; or rejected due to a policy conflict or inadequate protective measures to safeguard the water source. To facilitate environmental approval, operators should demonstrate that under all operating conditions the materials and processes used on site do not pose a significant contamination risk to the local waters.

2 Private water supply sources

These include the following:

- a human or stock (animal) drinking water sources

- b commercial or industrial water sources (requiring specific qualities that support activities such as aquaculture, cooling, food or mineral processing or crop irrigation)
- c urban or municipal irrigation sources (where water quality may affect vegetation performance or people's health or wellbeing).

3 Underground ecological functions

Important ecological functions that may apply include fauna and microorganisms in sedimentary and gravel soils and groundwater aquifers (such as cave fauna).

4 Waterway ecological and social values

- a Maintenance of waterways of high conservation significance described in the WA Environmental Protection Authority's guidance statement 33 *Environmental guidance for planning and development* (section B5.2.2). This statement is available online at < www.epa.wa.gov.au > select *EIA* > *guidance statements*.
- b Waterways managed by the Department of Water under the *Waterways Conservation Act (WA) 1976* (including the Avon River, Peel-Harvey Inlet, Leschenault Inlet, Wilson Inlet and Albany waterways), or Section 9 of the *Water Agencies (Powers) Act (WA) 1984*. For online advice, see < www.water.wa.gov.au > select *waterways health* > *looking after our waterways*.
- c Waterways managed by the Swan River Trust under the *Swan and Canning Rivers Management Act (WA) 2006*. For online advice, see < www.swanrivertrust.wa.gov.au >.
- d Social values in natural waterways include their aesthetic appeal, use of watercraft, fishing, tourism, swimming and other aquatic activities.

Engineered drains and constructed water features are normally not assigned ecological values because their function and operational factors override these water values.

5 Wetland ecology

- a Ramsar wetlands, described online at < www.ramsar.org >.
- b Wetlands defined by the Australian government in *A directory of important wetlands in Australia*, available online at < www.environment.gov.au > select *water* > *water for the environment* > *wetlands* > *wetlands publications, resources and links* > *books, reports directories*.
- c High conservation significance wetlands as described in the WA Environmental Protection Authority's guidance statement 33 *Environmental guidance for planning and development* (section B4.2.2). This is available online at < www.epa.wa.gov.au > select *environmental impact assessment* > *guidance statements*.
- d Wetlands identified of conservation value or for resource enhancement in:
 - *Geomorphic wetlands of the Swan coastal plain* dataset
 - *South coast significant wetlands* dataset
 - *Geomorphic wetlands Augusta to Walpole* dataset.

The Augusta to Walpole wetland dataset awaits a detailed evaluation process. The Department of Environment and Conservation (DEC) is the custodian of state wetland datasets. DEC is responsible for maintaining and updating the information.

These datasets can be viewed online at < www.dec.wa.gov.au > search *maps wetlands* or select *management and protection > wetlands > wetlands data*. Guidance on viewing the wetlands is provided on the DEC website at *water > wetlands > data* or by phoning their nature conservation division for assistance on 08 9334 0333.

Wetlands that are highly disturbed by rural land use, or have been landscaped to provide a social amenity or drainage control function in urban settings, may not have ecological conservation values unless they are being actively managed to restore these values.

Many aquifers, waterways and wetlands in Western Australia require detailed scientific evaluation and their values remain unclassified. Unless proven otherwise, any natural waters that are lightly disturbed by human activity are considered to have sensitive values.

Community support for water values, the setting of practical management objectives, providing sustainable protection strategies and effective implementation are vital to protecting or restoring our water resources for current needs and those of future generations.

Note interpretation

This note provides a general guide on issues of environmental concern, and offers solutions based on professional judgement and precedent. Recommendations made in this note do not override any statutory obligation or government policy statement. Alternative practical environmental solutions suited to local conditions may be considered.

This note shall not be used as this department's policy position on a specific matter, unless confirmed in writing. The note may be amended as needed, when new data is available.

Regulatory agencies should not use recommendations made in this note in place of site-specific conditions based on a project's environmental risks. Any regulatory conditions should consider the values of the surrounding environment, the safeguards in place and take a precautionary approach.

Where a conflict arises between recommendations made in this note 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 would apply if our recommended protection measures were used.

This note will be updated as new information is received or industry/activity standards change. The currently approved version is available online at < www.water.wa.gov.au > select *publications > find a publication > series browse > water quality protection notes*.

Appendix B - Statutory approvals relevant to this note include:

What's regulated?	Statute	Regulatory office
Wetlands, drinking water catchments and estuaries	<i>Environmental Protection Act (WA) 1986</i> , Part III Environmental protection policies	Minister for the Environment advised by the Environmental Protection Authority www.epa.wa.gov.au
Impact of significant development proposals on the values and ecology of land or waters	<i>Environmental Protection Act (WA) 1986</i> , Part IV Environmental impact assessment	
Prescribed premises that could pollute	<i>Environmental Protection Act (WA) 1986</i> - Part V Environmental regulation	Department of Environment and Conservation www.dec.wa.gov.au
Discharge of specified contaminants prohibited	Environmental Protection (unauthorised discharges) Regulations 2004	
Land and waters that have been contaminated by human activity	<i>Contaminated Sites Act (WA) 2003</i> and associated regulations 2006	
Discharge of waters to managed waterways	<i>Waterways Conservation Act (WA) 1976</i>	Department of Water - regional office www.water.wa.gov.au
Industrial sites in proclaimed public drinking water source areas	<i>Metropolitan Water Supply, Sewerage and Drainage Act (WA) 1909</i> <i>Country Areas Water Supply Act (WA) 1947</i>	
Discharges into the Swan-Canning Estuary	<i>Swan and Canning Rivers Management Act (WA) 2006</i>	Swan River Trust www.swanrivertrust.wa.gov.au
Storage of fuels, solvent, explosive and dangerous goods	<i>Dangerous Goods Safety Act (WA) 2004</i> Dangerous goods safety regulations 2007	Department of Mines and Petroleum www.dmp.wa.gov.au
Workplace safety	<i>Occupational Safety and Health Act (WA) 1984</i>	Department of Commerce www.commerce.wa.gov.au
Community health issues and pesticide use	<i>Health Act (WA) 1911</i> Health (Pesticides) Regulations 1956	Local Government Department of Health www.health.wa.gov.au
Emergency response planning	<i>Fire and Emergency Services Authority of WA Act (WA) 1998</i>	Fire and Emergency Services Authority www.fesa.wa.gov.au
Discharge to sewer (industrial waste permit) or to main drain	<i>Metropolitan Water Supply, Sewerage and Drainage Act (WA) 1909</i> <i>Country Towns Sewerage Act (WA) 1948</i>	Water Corporation www.watercorporation.com.au Designated water services provider
Licensing of spraying pilots, pesticide spraying, control of spray drift, equipment and chemicals used, record keeping	<i>Aerial spraying Control Act 1966</i> Aerial Spraying Control Regulations 1971	Department of Agriculture and Food WA www.agric.wa.gov.au

Relevant statutes are available from the *state law publisher* at <www.slp.wa.gov.au>.

Appendix C -Useful contacts

Aerial Agricultural Association of Australia (AAAA)

<www.aerialag.com.au/site/index.asp>

PO Box 353 Mitchell,
ACT 2911

Phone: (02) 6241 2100

Fax: (02) 6241 2555

ChemCert WA

<www.chemcertwa.com.au>

88 Westview St, Scarborough,
W.A. 6019

Phone/ Fax: (08) 9341 5325

Email: farmcarewa@bigpond.com.au

ChemClear

<www.chemclear.com.au>

GPO Box 816,
Canberra City,
ACT 2601

Phone: (02) 6230 4799

Fax: (02) 6230 6710

Email: chemclear@agsafe.com.au

Civil Aviation Safety Authority (CASA)

<www.casa.gov.au/index.htm>

GPO Box 2005,
Canberra, ACT 2601

Phone: 131 757 (local call cost within Australia)

For individual offices, please see website <www.casa.gov.au/index.htm>

Department of Agriculture and Food

<www.agric.wa.gov.au>

Head Office

3 Baron-Hay Court,
South Perth, WA 6151

Phone: (08) 9368 3333

Fax: (08) 9474 2405

Email: enquiries@agric.wa.gov.au

Department of Environment and Conservation

<www.dec.wa.gov.au>

The Atrium

168 St Georges Terrace,
Perth, WA 6000

Phone: (08) 6467 5000

Fax: (08) 6467 5562

Email: info@dec.wa.gov.au

Department of Health

<www.health.wa.gov.au>

Pesticide Safety Branch

PO Box 8172,

Perth Business Centre,

WA 6849

Phone (Main): (08) 9222 4222

Fax: (08) 9383 1819

DrumMuster

<www.drummuster.com.au>

GPO Box 816,

Canberra City,

ACT 2601

Phone: (02) 6230 6712

Fax: (02) 6230 6713

Email: drummuster@drummuster.com.au

Spraywise Decisions (Nufarm)

<www.spraywisedecisions.com.au>

Nufarm Australia Limited

Lot 51, Mason Road,

Kwinnana, WA 6167

Phone: (08) 9411 4000

Fax: (08) 9411 4040

Email: westernausregion@au.nufarm.com

WorkSafe WA

Locked Bag 14,

Cloisters Square,

WA 6850

Online information: <www.commerce.wa.gov.au/WorkSafe/>

Customer help centre, phone: 1300 307 877

To report an incident, phone: 1800 678 198

Email: safety@commerce.wa.gov.au

Appendix D - Checklist for the aerial pesticide spraying of crops

a Planning and pre-spray procedures

Action to be taken	Explanation	Checked
Consider other pest control methods as alternatives to pesticide use	Consider physical, biological and genetic pest control methods. Pesticides should only be used if other controls are not suitable	
Assess site characteristics	Assess the topography, soil stability, soil type and soil pH of the area to be sprayed	
Establish an awareness zone and identify sensitive areas	Establish an awareness zone and thoroughly inspect the surrounding landscape for pesticide sensitive areas such as waterways and wetlands, sensitive crops, animals, aquaculture, beehives, organic food enterprises, houses, gardens, schools and public areas	
Check if the area is suited to aerial spraying	Check if there are any factors that make the area unsuitable for pesticide application such as any pesticide sensitive areas within close proximity	
Research legal requirements	Research the legislation relevant to the aerial spraying of pesticides, some guidance is given in Appendix B	
Identify stakeholders and compile a contact list	Identify all stakeholders. Major stakeholders may include the departments of Agriculture and Food, Environment and Conservation, Health, Water, and Local government, the Water Corporation, private landholders, indigenous communities and community groups	
Develop a communication plan	Create a plan that demonstrates the best way to effectively communicate with stakeholders	
Plan pre- and post -spray monitoring	Monitoring should be undertaken both before and after aerial spraying. Outline the area to be monitored and determine how the results will be documented and used	
Consult stakeholders	Consult stakeholders via phone calls, emails, letters, media, meetings or signs. Ensure that all the appropriate information such as spraying location, purpose, risks and pesticide to be used, is provided	
Respond to any stakeholder enquiries	Ensure any stakeholders with questions are given adequate information	
Choose appropriate pesticide	Consider the pesticides available and make sure the pesticide chosen is suited to the target crop as well as surrounding areas that may be affected. Read the product labels to help you choose the correct pesticide	

Action to be taken	Explanation	Checked
Choose method of pesticide application	Consider the application methods available and decide on the most appropriate application equipment to use, including the aircraft type. Read pesticide label to confirm that the application method is appropriate. Consult with the spray contractor/operator	
Use the PIRI program to calculate the risk involved	Download the PIRI program from the CSIRO website and use it to calculate the risk involved for the aerial spray operation. If the risk is significant, cancel the aerial spraying operation and seek other pest control options	
Determine the appropriate buffer type and zone	Research if there are any required buffer zones and then investigate the most appropriate type and size of the buffer for the specific aerial spraying operation. Read the pesticide label for any advice provided	
Plan spray timing in relation to crop and pest development	Research when spraying will be most effective, for example when weeds are not fully established or when pests are first observed feeding on the crop. Advice can sometimes be found on the pesticide label	
Create an incident action plan	Plan responses to any incidents that may occur, including instructions on how to notify relevant regulatory agencies of any spills	
Notify the public	Notify the public about the aerial spraying via local newspapers, local radio, perimeter signs or by directly contacting people who may be potentially affected	
JHA (Job Hazard Analysis)	Analyse the job process to find the hazards involved with the task and then implement actions to minimise any of the risks found	
Determine the aerial spraying timetable	Plan the aerial spraying for an appropriate time and estimate how long the job will take. Consult with the operator/contractor. Also take into account weather forecasts	
Carry out pre-spray monitoring	Check the area to be sprayed for any recent changes or any factors that may cause the area to be unsuitable for spraying and record the results. Also ensure that short term weather forecasts are favourable	
Check all relevant MSDS	Check all the relevant <i>material safety data sheets</i> and keep them readily available for further reference	
Check aerial spraying qualifications	When contracting an aerial sprayer, check their qualifications to ensure they are sufficiently licensed and experienced to comply with legislation	

Action to be taken	Explanation	Checked
Assess and calibrate equipment (if required)	Check all equipment is in working order and for any wear and tear. Where necessary calibrate equipment to ensure an effective spray application	
Organise records	Check what documentation is required, then draft documents or gather prepared forms to comply with requirements	
Check personal protection equipment (PPE) requirements	Purchase or gather any required PPE and ensure that it is correctly fitted. See pesticide label and MSDS for guidance	
Check condition of any PPE to be used	Check that the PPE is in working order and ensure there is no wear and tear that may affect it functioning correctly	

b Checks during the spray operation

Action to be taken	Explanation	Checked
Assess current weather conditions and plan for continuous monitoring	Assess and monitor local wind speed and direction, temperature inversion, stability, humidity, expected rainfall timing, intensity and duration and plan how these aspects will continue to be monitored throughout the spraying. Check weather predictions on Nufarms Spraywise Decisions site < www.spraywisedecisions.com.au > or other internet real time data sites	
Remind stakeholders of the spraying to occur	Directly contact stakeholders and/or use appropriate signage/media announcements to remind stakeholders of the time, location and warnings related to the operation	
Mark out buffer areas	Define buffer areas and ensure that markers are clearly visible from the air and if relevant, that markers are well secured	
Set up warning signs	Set up warning signs that clearly inform people about the details of the aerial spraying operation, including any precautions advised	
Record and retain pesticide information	Information related to pesticide use should be recorded and held for up to 24 months. Records should be sufficient to describe the spraying operation, including the chemical formulation, application rates, environmental conditions, carrier type and the batch number of pesticide container used	
Clear the spray zone of people	Ensure no unprotected people are in the spray zone	
Monitor spray drift	Continuously monitor for spray drift and ensure weather conditions stay favourable.	

Action to be taken	Explanation	Checked
Monitor spray drift	Also monitor any smoke devices for an indication of possible spray drift. Smoke devices should be either attached to the aircraft or at ground level within good view	
Monitor flight path and the area sprayed	Throughout the spray operation, use a global positioning system (GPS) to monitor the flight path. Also monitor the sprayed area for any changes such as stray animals	
Maintain communication	Maintain open communication between any ground monitoring and the aerial sprayer throughout the aerial spraying operation	

c Checks after the spray operation

Action to be taken	Explanation	Checked
Complete and store monitoring records	Complete monitoring records and store them appropriately	
Remove any warning signs	Once the aerial spraying is complete and the area is safe for re-entry, remove all the relevant warning signs	
Safely dispose of any excess pesticides	Research the process required for the legal and safe disposal of excess pesticides. For assistance in disposing of excess pesticides contact ChemClear, the Department of Environment and Conservation or the relevant Local Government Authority	
Safely dispose of used pesticide containers	Research the process for the legal and safe disposal of used pesticide containers. For assistance to recycle used pesticide containers, contact drumMuster	
Monitor the re-entry period	Wait for the recommended re-entry period to pass before entering the sprayed area. The re-entry period is often given on the pesticide container. If the re-entry period is not on the pesticide container, wait at least twenty-four hours or until the pesticide has dried before entering the area. If stock are involved, check the pesticide label to ensure it is safe before reintroducing the animals to the area. The re-entry period may also cover any required slaughter interval issues	
Survey the area sprayed	Survey the area and monitor the results of the spray operation, record the effectiveness of the spray and record any spray drift that may have occurred. If significant spray drift has occurred, advise the relevant authorities and affected land managers and/or landholders	
Record and store spray results	Record spraying and survey results and retain them for future reference	

References and further reading

- 1 Agsafe (CropLife Australia), information available online at < www.agsafe.com.au > follow the link to the relevant site or information is directly available online at the following sites:
 - a ChemClear < www.chemclear.com.au >
 - b DrumMuster < www.drummuster.com.au >.
- 2 Australian government, Civil Aviation Safety Authority (CASA) information available online at < www.casa.gov.au/index.htm >.
- 3 Australian government, Australian Pesticides and Veterinary Medicines Authority, publications available online at < www.apvma.gov.au >, select *spray drift*
 - a *APVMA Operating Principles in Relation to Spray Drift Risk*, July 2008
 - b *How the APVMA Determines the Size of Protective No-Spray Zones*, September 2008.
- 4 Chemcert WA, information and example documents are available online at < www.chemcertwa.com.au >, select *record keeping*
 - a Written risk assessments of use of hazardous substances
 - b Chemical storage register
 - c Records of training of chemical users
 - d Health monitoring records
 - e Records of accidents and incidents (Incident report form)
 - f Chemical application records (Spray Diary-Paddock)
 - g Chemical store stock control records (Chemical Storage Manifest/Inventory)
 - h Operational plan checklist
 - i Report of spills (Incident report form)
 - j Risk Assessment checklist (Risk assessment of farm chemical management - check sheet).
- 5 CSIRO publications available online at < www.publish.csiro.au/home.htm >
 - a Primary Industries Standing Committee *Spray Drift Management Principles, Strategies and Supporting Information (SCARM) (PISC) Report 82*, 2002
 - b The Pesticide Impact Rating Index (PIRI) Program- the PIRI program is available online at the CSIRO Land and Water division website at <www.clw.csiro.au> select *modelling/software products > PIRI*.
- 6 Department of Agriculture and Food (WA), publications available online at < www.agric.wa.gov.au >, select *publications*
 - a Farmnote 39/2002, *Legislation controlling the use of agricultural chemicals in Western Australia*, select *farmnotes > all farmnotes by title > K to P*

- b Farmnote 59/90, *Effective spraying* (reviewed Oct 2007), select *farmnotes > all farmnotes by title > A to E*
 - c Bulletin 4684, *Code of practice for the use of agricultural and veterinary chemicals in Western Australia*, select *bulletins > A to E*.
- 7 Department of Commerce (Western Australia), WorkSafe, further information and documents available online at < www.commerce.wa.gov.au > select *worksafe*
- a Pesticides in agriculture - recommended specific control measures for spraying
 - b Agricultural industry fact sheet, general requirements for storage facilities for hazardous substances
 - c Working with pesticides
 - d Agricultural safety and health checklist
 - e Pesticides in agriculture - safe spraying
 - f For human markers, select *worksafe > safety topics > hazardous substances > pesticides in agriculture – recommended specific control measures for spraying > 3: human markers for aerial spraying*.
- 8 Department of Environment and Conservation, Contaminated Sites Management Series (2004) further information and documents available online at < www.dec.wa.gov.au >
- a Contaminated Sites Management Series - *Potentially contaminating activities, industries and land uses*
 - b Contaminated Sites Series – *Assessment levels for soil, sediment and water (draft)*.
- 9 Department of Health (Western Australia) publications available online at < www.health.wa.gov.au >
- a *Management of pesticides in Western Australia, 2006*, select *publications and reports > browse by subject > poisons*
 - b *Review of Pesticide Legislation and Policies in Western Australia-Discussion Paper, 2005*, select *publications and reports > browse by subject > legal and legislation*
 - c *Using pesticides safely, 2006*, select *health hazards in the environment > chemicals and pesticides > hazardous chemicals*
 - d *Guide to obtaining a pesticide operator's licence, 2008*, select *health hazards in the environment > chemicals and pesticides > pesticide licenses*.
- 10 Department of Water (Western Australia)
- a Water resource management policies, available online at < www.water.wa.gov.au >, select *publications > find a publication*
 - Foreshore policy 1 - *Identifying the foreshore area, 2002*
 - State-wide policy 2 - *Pesticide use in public drinking water source areas*
 - b Water quality protection notes available online at < www.water.wa.gov.au >, select *publications > find a publication > series browse > water quality protection notes*
 - WQPN 06 *Vegetated buffers to sensitive water resources*
 - WQPN 07 *Chemical blending*

- WQPN 10 *Contaminant spills - emergency response*
- WQPN 28 *Mechanical servicing and workshops*
- WQPN 47 *Pest control depots*
- WQPN 68 *Mechanical equipment wash down*

11 Environmental Protection Authority (Western Australia). *Guidance Statement 33- Environmental Guidance for Planning and Development*, available online at < www.epa.wa.gov.au >, select *EIA > guidance statements*

12 Material Safety Data Sheet publications are available online at < www.msds.com.au >.

13 University of Western Australia safety and health, publications available online at < www.safety.uwa.edu.au >, select *policy > job safety analysis*:

- a *Working with a Job Safety Analysis*
- b *Blank JSA Form*
- c *Example JSA 1*
- d *Example JSA 2*

More information

We welcome your views on this note. All feedback is retained on our file number WT5505.

To comment on this note or for more information, please contact our water source protection branch as shown below, citing the note topic and version.

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