Government of Western Australia
Department of Water

Looking after all our water needs

Water quality protection note 12
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Dairy processing plants

Purpose

Dairy processing plants are long-standing and valued contributors to the Western Australian community and the state economy. They convert fresh milk into a range of commodities such as pasteurised milk, butter, cheese, yoghurt and desserts. Like other Western Australian industries, they should operate in harmony with the environment and comply with statutes, to ensure their sustainability and the support of the community.

Dairy processing plants pose the following risks to the environment:

- Discharge of harmful substances such as unstable organic matter, suspended solids and cleanser residues. Effective containment and treatment systems are therefore needed to protect the environmental values of surface water and groundwater, including ecosystems.
- Changes to soils resulting from irrigation with treated wastewater, including acidification, chemical and biological contamination, nutrient leaching, salinity increases, soil loss via erosion, decline in soil structure, waterlogging and decrease in soil permeability.

This note is designed to complement the National Water Quality Management Strategy paper 16b titled *Wastewater management guidelines for dairy processing plants* (reference 1d).

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 current views on the environmental management of dairy processing plants
- guidance on acceptable practices used to protect the quality of our water resources
- a basis for the development of a multi-agency code or guidelines designed to balance the views of industry, government and the community, while sustaining a healthy environment.

This note is intended to inform industry operators, government officers, environmental consultants and the community on water quality protection aspects of dairy processing plants, from initial design, through construction, operation and possible eventual closure.

Appendices provide additional advice relevant to this note, including:

A. Information on sensitive water resources, note limitations and updates
B. Relevant statutes and administering agencies
C. Sources of waterborne waste

D. Wastewater treatment flow diagram for a small dairy plant
E. Data needed to support project assessments, followed by references, note disclaimer and how to provide feedback.

Scope

This note applies to dairy processing operations within Western Australia including those producing butter, cheese and other milk products, their wastewater treatment facilities and associated irrigated land near sensitive water resources (see Appendix A).

Dairy farm milk production is not covered in this note, since this activity is linked to agricultural practice and covered by other guidelines. Similarly, the distribution and retail sale of dairy products are not covered.

Introduction

The dairy industry, including dairy farms and dairy processing plants, is Australia's fourth largest rural industry in terms of gross value of production. In 2004, Western Australia was responsible for about 4 per cent of Australia's dairy production.

The dairy industry is divided into two main production areas:

a The primary production of milk for human consumption – involving the keeping of cows and other milking animals such as goats and sheep.

b Processing of milk to produce diverse products and extend the saleable life of milk. This objective is typically achieved by:
   - heat treatment to ensure that milk is safe for human consumption and has an extended shelf life
   - preparation and packaging of a variety of dairy products which are fermented, flavoured, blended with other ingredients or can be stored in a semi-dehydrated or dehydrated form (butter, cheese and milk powders).

Major dairy companies in Western Australia have processing plants in the Perth metropolitan area, Boyanup, Brunswick and Capel. Small processing plants are located in the Perth outer metropolitan area and near Harvey and Margaret River.

About 40 per cent of the state's milk production is sold as fresh milk, the remainder being used for products such as flavoured milk, long-life milk, cream, cheese, butter, dairy desserts, milk powders, ice cream, yoghurt and whey.

The volume of milk produced in Western Australia has remained at an approximate level of 400 million litres of raw milk for some years despite decreasing numbers of dairy farmers. This static situation is largely due to industry restructuring as a result of deregulation.

Potential environmental issues associated with dairy processing activities include the significant consumption of water and energy for processing and cleaning, and the discharge of wastewater with high organic loads and unpleasant odours. Water has many uses in dairy processing including cooling, equipment washing, heating and clean up.

The majority of water is used for cleaning process equipment and work areas to maintain hygiene standards. Some dairy plants are located in regions without abundant potable water sources and can place a significant demand on local freshwater resources.

In addition, wastewater can place a significant burden on small-scale regional municipal wastewater treatment plants.

Wastewater characteristics

Milk is a complex biological fluid consisting of milk fat, protein, lactose and lactic acid, as well as trace elements such as sodium, potassium, calcium and chloride. Dairy products contain all or some of the milk constituents and, depending on the nature and type of product, may also contain sugar, salts, flavours, emulsifiers and stabilisers. Fresh milk and dairy product manufacturing rarely cause release of products toxic to humans or animals.

The characteristics of dairy processing wastewater vary markedly depending on dilution of milk residues with wash water, pre-treatment, type of cleaning compounds and the sophistication of the processing plant. For an overview of potential sources of waterborne waste, see Appendix C. Dairy processing wastewater contains predominantly milk and milk products, such as whey, which have been lost from the process, as well as detergents, sanitisers, acidic or caustic cleansers, nutrients, dissolved solids (including sodium chloride) and small amounts of machinery lubricants. Wastewater derives from tanker wash down, equipment and pipeline cleaning, spillage and cleaning of floors.

Hazardous or contaminated wastes may be occasionally derived from oily residue from gearboxes of processing machinery, laboratory waste, cooling agents, batteries, paints, lubricants and the solids from equipment and the floors.

Biochemical oxygen demand (BOD) is a measure of how much dissolved oxygen is consumed as microbes break down organic matter such as milk. Typical dairy process wastewater has a BOD of about 2000 mg/L and a dissolved solids concentration of around 1800 mg/L. The BOD level in a plant's wastewater can be used to estimate how much product (and income) is lost to waste.

Advice and recommendations

Location

1 Site selection has a significant bearing on the required intensity and cost of wastewater treatment and the management effort required to protect water quality. Where practicable, the site should be located away from sensitive environments (Appendix A). Our nearest regional office can provide further information about the location and protection of sensitive water resources in Western Australia.

2 New dairy processing plants should not be located within a 100 m of a waterway or wetland, within a floodway or in a riparian vegetation zone.

3 In order to provide protection from pollutants such as contaminated water runoff, odour and noise, dairy processing plants should be located outside the minimum recommended buffer distance to designated residential areas and other sensitive environments (reference 7), and be screened by trees or topographical features.

4 Separation buffers to water resources should be determined on the basis of agreed waterway values, vulnerability and biophysical criteria (reference 4c). The buffers should be covered with natural vegetation, sustainable with minimal intervention and protected from any adverse effects from adjoining land use activities.

5 The following factors should be considered during the site selection and the plant design process:

   a land area required for establishing the enterprise and the potential for future expansion

   b neighbouring land uses and their sensitivity

   c the proximity to sensitive surface and groundwater resources

   d accessibility to services and amenities, including water supply and waste disposal

   e the appropriate location of any wastewater treatment and waste disposal areas

   f the suitability of on-site or surrounding land for wastewater irrigation.

Within public drinking water source areas

Appendix A provides explanatory information on the department's public drinking water source area (PDWSA) management strategy.

6 In designated P1 areas, the management objectives are that there should be no degradation of water quality and most risks to water quality are excluded. In P1 areas dairy processing plants are considered an incompatible land use. Incompatible means the activity is likely to conflict with this department's policy for protection of drinking water source quality and will be opposed.

7 In P2 areas, the management objective is to ensure a minimal risk of contamination of the water source beyond its present seasonal quality. In P2 areas dairy processing plants are considered an incompatible land use. P2 areas are managed on the principle of risk minimisation and most intensive rural activities will be opposed.

8 In P3 areas, the risk of contamination to water sources is managed via best environmental practice rather than land use exclusions. In these areas dairy processing plants are compatible activities subject to conformity with development approval and operating conditions, but should where practicable be connected to reticulated sewerage, unless exemptions apply under the current government sewerage policy. Management practices should be conducted without causing a significant risk of contamination to local water resources, in accordance with National Water Quality Management Strategy paper recommendations (reference 1).

Near natural waterways

Waterways managed by the Department of Water include all natural creeks, streams, brooks, rivers, inlets, estuaries and surface drainage systems.

9 Facilities should not be established on land subject to seasonal flooding, within defined floodplains or within waterway foreshore areas.

10 An adequate separation distance should be maintained between milk processing infrastructure, waste management areas and waterways (including foreshore areas) to protect the ecological and social values of the waterways and to prevent degradation of water quality. Foreshore areas are determined on the basis of the waterway values, vulnerability to threats and biophysical criteria as described in our Foreshore policy 1 – *Identifying the foreshore area*. Our Water note 23 and River restoration report 16, both titled *Determining foreshore reserves,* provide supporting information on defining foreshore areas (reference 4).

11 Natural vegetation buffers can improve water quality by filtering contaminated water before it enters a water body subject to appropriate hydrological and contaminant conditions. Vegetation density and landform are important considerations when determining appropriate separation distances between land uses and waterways. For advice on buffer selection, see our Water quality protection note 6 *Vegetated buffers to sensitive water resources* (reference 4b).

12 For dairy processing developments near natural waterways, project details should be provided (see Appendix E) and advice sought from the department's local regional office.

13 Information on the location of sensitive water resources and waterway values is available from the department's local regional office (see <www.water.wa.gov.au> select *Contact us*). For location information online, select *Tools and data > Maps and atlases > Geographic data atlas.* These interactive maps show proclaimed waterways management areas in the south-west of Western Australia by opening the *Environment* layer. For general online information on waterways and guidance on best management practice, select *Managing our water > Managing our rivers and estuaries.*

Planning and development approvals

The following plans and approvals may be required by regulatory agencies based on the location, scale and proposed operation of the dairy processing plant. Statutory approval requirements are summarised in Appendix B.

14 A business plan should be prepared prior to the establishment and management of dairy processing operations. The plan should include a map of the dairy processing operations and a strategic plan for the business enterprise including establishment, operation, best practice management, markets, finance, water and environmental management, and ongoing risks and opportunities.

15 The first point of contact for planning the development of a dairy processing facility and for land-use planning related queries should be the local government authority. The town or shire council is responsible for land zoning and development approval through the *Planning and Development Act 2005*.

16 Any discharges to waste stabilisation, disinfection or effluent reuse systems should be approved by the local government authority in accordance with the *Health Act 1911*.

17 Permission for any discharge of treated wastewater to stormwater drains must be obtained from the operator of the drain (normally your local government authority or for main drains, the Water Corporation).

Water Corporation (or alternative water services provider)

18 For connection to a scheme water supply (where available) see online information at <*www.watercorporation.com.au*> or the alternative water provider's website.

19 An industrial waste discharge permit should be obtained by all waste generators wishing to discharge wastewater, process liquids, groundwater or stormwater into a sewer under the *Water Corporation Act 1995*, *Metropolitan Water Supply, Sewerage and Drainage Act 1909* or the *Country Towns Sewerage Act 1948*. All wastewaters discharged to sewer must comply with the water service provider's acceptance criteria for industrial wastes.

Swan River Trust

20 The Swan River Trust is responsible for the protection and management of the Swan-Canning river system. Activities and development close to the Swan, Canning, Helena or Southern rivers are likely to have an effect on the waters of the river system. Any proposals abutting the Trust's development control area (DCA) should be referred to the Trust for comment.

21 Developments distant from the DCA, but near tributaries or drainage systems or likely to affect groundwater flows, should also be referred to the Trust for comment and advice. For more details see online information at <www.swanrivertrust.wa.gov.au>, phone the Trust on 9278 0900 or email < planning@swanrivertrust.wa.gov.au>.

Department of Environment and Conservation

22 Under the Environmental Protection Regulations 1987 (as amended), milk processors that produce more than 100 tonnes of product per year and discharge to land or waters, may require works approval prior to their construction and a licence prior to their operation. These regulations apply to premises on which milk is separated or evaporated (other than a dairy farm); or evaporated or condensed milk, butter, ice cream, cheese or any other dairy product is manufactured, and from which liquid waste is or is to be discharged onto land or into waters.

The licensee should take all reasonable and practicable measures to prevent or minimise the discharge of waste and the emission of noise, odours or electromagnetic radiation from the premises.

Licences and works approvals are issued with legally binding conditions that apply to specific premises and are intended to prevent or minimise the potential for pollution. For detailed information, see *A guide to the licensing system – licenses and registration* available online at <www.dec.wa.gov.au> or phone the Department of Environment and Conservation on 6467 5000.

23 The transport of wastes that may cause environmental harm or health risks is regulated by the Department of Environment and Conservation using the Environmental Protection (Controlled Waste) Regulations 2001. These regulations require all carriers, drivers and vehicles used to transport controlled bulk waste on public roads to be licensed.

24 Controlled wastes include all liquid wastes and solids that may not be disposed of at Class I (inert), II or III (putrescible waste) landfill facilities.

25 The discharge of certain prohibited materials is regulated through the Environmental Protection (Unauthorised Discharge) Regulations 2004 (Appendix B). For further information contact the Department of Environment and Conservation.

26 Some wastes that may not be discharged to a sewerage system are regulated by the Environmental Protection (Controlled Waste) Regulations 2004. Any discharge to the environment should be effectively treated to ensure that it meets water quality guidelines for the protection of aquatic ecosystems. The discharge of treated wastewater to land or soakage should be meet the acceptance criteria of both the Department of Environment and Conservation and Department of Health.

27 Any proposed development within 200 m of a natural wetland should be referred to the Department of Environment and Conservation for assessment. Wetland types include lakes, damp land, sump land and palusplain. On the Swan Coastal Plain any proposed dairy processing development within 200 m of any conservation category, resource enhancement category or wetland gazetted under the Environmental Protection (Swan Coastal Plain Lakes) policy 1992 should be referred to Department of Environment and Conservation office for assessment. For more information refer to the Department of Environment and Conservation's *Position statement, wetlands 2001* (reference 3b) and our water note 4 *Wetland buffers 2000* (reference 4c).

28 The *National pollutant inventory* is an online database designed to provide the community, industry and government with information on the types and amounts of certain substances being emitted into the environment. Currently 93 substances are reported to the inventory. There are legal obligations for companies to report estimates of emissions of these substances from their facilities, as set out in the Environmental protection (NEPM – NPI) regulations 1998. The onus is on each facility operator to report emissions of each substance which exceeds inventory thresholds.

For further information on industry reporting to the inventory, see online information at <www.npi.gov.au> or phone the Department of Environment and Conservation's National Pollutant Inventory Unit on 6467 5287.

Department of Water

29 If the dairy processing plant requires a water supply drawn from surface or groundwater, a water allocation licence may be required under the *Rights in Water and Irrigation Act 1914* (if situated in a declared water allocation management area or drawing from a confined aquifer). To apply for a water allocation licence, contact the Department of Water's regional office. Further information is available online at <www.water.wa.gov.au> select *managing our water*.

30 A permit from the department under the *Rights in Water and Irrigation Act 1914* may also be required to undertake any works that will alter the bed or banks of a waterway within a proclaimed river, surface water management area or irrigation district. Permits, if granted, may contain conditions such as a requirement to stabilise waterway banks or restore vegetation fringing the waterway.

31 Development approval from the Department of Water is required in proclaimed waterway management areas. Proponents should contact our local regional office and provide projects details for assessment (Appendix E). A water quality improvement plan addressing nutrient management for the Leschenault Inlet is expected to be available soon. To discuss any technical aspects, contact our Waterways section in Perth by phone on 6364 6700.

Other development constraints

32 The construction of facilities should be consistent with Food Standards Australia New Zealand <www.foodstandards.gov.au> and Australia New Zealand Food Authority standards and codes of practice (reference 8).

Establishment and operation

Cleaner production

The state ‘cleaner production’ strategy aims to improve the environmental performance of operations by focusing on the causes of environmental problems rather than the symptoms. It is most commonly applied to production processes through the conservation of resources, the elimination of toxic raw materials and the reduction of wastes and emissions. Cleaner production can benefit an operation through reduced costs in operating, waste treatment and disposal as well as a reduced liability risk.

A process commonly used to maintain hygiene, known as ‘cleaning in place’, uses alkaline solutions and acidic cleansers. See the ‘chemical reduction’ section in this note for information on reducing the environmental hazards of this method.

33 Cleaner production options should be investigated for all aspects of the operation and may include:

- a process area ‘housekeeping’
- b life cycle planning (design phase through to use and disposal phase)
- c state of the art in-plant production processes including partial cleaning with ‘in place’ material recovery
- d incorporation of modern technologies and processes for water conservation, waste minimisation, wastewater treatment and recycling or reuse
- e steam condensate recovery and use of a ‘closed’ water cycle
- f selection of appropriate recovery processes which provide potential for adding value through by-products.

34 Cleaner production in the dairy farming industry is gaining increased acceptance. Through programs such as DairyCatch, best environmental management practice is promoted within the industry. Dairy processors can play an important role in supporting these programs and encouraging dairy farmers who follow best practice. For further information on DairyCatch, see the Department of Agriculture and Food’s Bulletin 4689 (reference 2b).

35 The Curtin University’s centre of excellence in cleaner production has developed information notes for the food processing industry and they also offer training in applying the cleaner production approach to your business operations. Further information is available by contacting the centre on 9266 4520 or online at <www.cleanerproduction.curtin.edu.au>. Additional online information on cleaner production is available from reference 10, the Australian Department of the Sustainability, Environment, Water, Population and Communities <www.environment.gov.au> (reference 1) and the cleaner production group at the University of Queensland (reference 11).

Environmental management

36 Steps to improving environmental management in a dairy processing operation should include:

- a ensuring management is committed to water conservation and waste load reduction

b creating a positive culture among employees and obtaining their ideas on water conservation and waste load reduction

c training operators in ‘total quality management’ procedures and risk management techniques

d the appointment of an environmental supervisor who is responsible for setting specific goals for water conservation and waste load reduction at the plant, and for doing what is needed to meet these goals

e allocating an appropriate share of management effort and expenditure

f good communication within the organisation to increase overall efficiency, including risk identification and continuous improvement

g control over the product and processes through a program of quality assurance.

37 Sustainable management of dairy processing wastewater should be achieved by the development of an environmental management plan. The basis of this plan is to report on the plant’s activities, and may include:

a assessment and a planned response to possible contaminant emissions that could have an impact on the surrounding environment

b annual reports on environmental performance at the dairy works

c exception reporting to alert management to unusual variations in plant performance and significant deviation from licence requirements.

38 The environmental management plan should be integrated with an environmental management system which incorporates a process of review and improvement. Through this process all opportunities for water conservation, pollutant reduction and recycling should be investigated.
This management system would provide the management, administration and monitoring framework for an operation’s environmental aspects. It should include risk management and auditing. The management system may be certified (ISO 14001). Further information is available online from <www.iso.org>.

Water conservation

39 In modern dairy processing plants, a water consumption rate of 1.3 to 2.5 litres water per kilogram of milk intake is typical. However, less than one litre of water per kilogram is possible (reference 2a). Operators should begin to implement water-use efficiency procedures in all aspects of their business. For general information on water saving options refer to the Water Corporation’s *Waterwise program* described online at <www.watercorporation.com.au>.

40 The processing plant design should ensure that stormwater runoff and contamination is minimised. Any contaminated stormwater should discharge to an adequately designed wastewater treatment system. Clean stormwater should be diverted away from the processing plant and its wastewater treatment system.

41 For detailed information on stormwater management in Western Australia see the *Stormwater management manual for Western* Australia (reference 4a) available online at <www.water.wa.gov.au> select *managing our water > stormwater and drainage*.

42 Other options for conserving water include:

a regularly inspecting facilities, in particular pumps and waste storage ponds, and fixing leaks promptly

b using continuous rather than batch processes to reduce the frequency of cleaning

c using automated cleaning-in-place systems or installing fixtures that control the flow of water for manual cleaning processes (such as automatic shut-off nozzles on water hoses)

d manually sweeping up spills after application of absorbent materials, rather than washing down with water hoses

e using high pressure, low volume water cleaning systems

f reusing relatively clean wastewater (such as that from final rinses) for other cleaning steps or in non-critical applications

g installation of water meters at strategic locations within the plant, reading them regularly and recording the results in an operations log.

Chemical reduction

43 Process equipment, pipes and tanks should be kept clean and free of harmful micro-organisms to maintain hygiene standards. This is generally achieved with a periodic chemical flushing process, called cleaning in place, and involves the use of alkaline and/or acidic cleansers. The acidic cleanser normally used is a mixture of nitric and phosphoric acids. These chemicals ultimately discharge to the wastewater treatment facility and increase the load on the system.

44 Chemical use should be minimised and other less environmentally hazardous chemicals substituted for sodium-based reagents (such as potassium in place of sodium compounds) and nitric and phosphoric acids where practicable.

45 Cleaning chemicals should be recovered and reused on site. These include alkalis, acids, surfactants, sequestrants, peptizing agents, enzymes and oxidizers. The use of modern membrane filtration systems (such as reverse osmosis) should be investigated as they can recover up to 80 per cent of acids and alkalis used for cleaning, as well as dissolved solids.

Waste minimisation

Milk loss to the wastewater stream can amount to 2 to 3 per cent of the incoming milk, but can be as low as 0.5 per cent in efficient plants (reference 2a). Preventing pollution at its source is normally less expensive and more practical than ‘end-of-pipe’ waste treatment.

Small solid particles enter the wastewater drainage system during normal production, daily wash down and the cleaning-in-place process. These particles represent a loss of product and add an unnecessary load to the wastewater treatment facility. Recovered wastewater treatment sludge and discarded product packaging are other potential sources of solid waste.

46 Systems in which equipment malfunctions or accidental spillage of wastewater or products could occur should have effective alarms or interlock systems. Potential spill areas should be located over concrete pads or hard stand with an adequate perimeter barrier or graded slope controls. Containment area fluids should drain into the wastewater treatment system.

47 Fat, milk solids and minerals should be recovered from processing and recycled or reused for animal feed or fertiliser either at the dairy plant or off-site. By-products such as whey, buttermilk and skim milk should be collected for reprocessing into higher value products (such as skim milk powder, buttermilk powder, whey powder, whey protein concentrate or casein) or recovery processes should be used to remove valuable constituents (such as soluble proteins and lactose). Production and recovery processes should be selected so that chemical contamination does not occur.

48 Captured solids and waste pond sludge should be dewatered using centrifuges, drying beds, filter presses or chemical coagulation. Unstable organic solids should be composted or digested so that the material can be used on land in a dry stable state as a form of fertiliser. The sludge quality should be analysed for salt and nutrient content and spread onto land in quantities consistent with vegetation needs and water quality objectives.

49 Alternatively it may be possible to sell the organic waste material to reprocessing companies. For further information on composting, contact the Department of Agriculture and Food on 1300 136 016 and for information on waste reprocessing, see online information at < www.zerowastewa.com.au >.

50 Fuel and chemical storage should be consistent with our Water quality protection note 56 *Tanks for above ground chemical storage* (reference 4b).

51 Options for minimising waste include:

a draining vats, vessels and pipes completely of product before cleaning

b using starch plugs or cleaning ‘pigs’ to recover product from pipes before cleaning

c separating waste stream components such as solids from liquids, high from low salinity wastewater, and wastewater from any ion exchange processes to improve wastewater quality

d reducing residues, where viscous or fatty products stick to equipment, by minimising equipment surface areas, maintaining equipment and correct preparation of ingredients before filling vessels

e using level controls and automatic shut-off systems to avoid spills from storage vessels and tankers

f cleaning up spills manually before washing down

g installing suitably sized and well maintained screens or effectively trapped and covered floor drains with removable covers at points where large solid losses can occur and enter the wastewater stream

h installation of grease traps for processes in which fat and protein losses are high

i settling tanks to capture solids in the process rinse water, settled sludge decant to the solids management system for stabilisation, dewatering and disposal.

Effluent treatment

A number of dairy processing plants in Western Australia are connected to the reticulated sewerage system, but the majority of country-based plants treat and dispose of their effluent on-site. Wastewater treatment is required for most plants to reduce the organic loading to concentrations that cause minimal environmental impact ,do not generate a health risk or attract disease vectors. The selection of a treatment process will depend

mainly on the site characteristics, the wastewater components and concentrations, available practical and affordable technologies, the solid waste and sludge production, the treated wastewater quality to match environmental criteria, the discharge point relative points of impact and cost.

52 Effluent should be sufficiently pre-treated to minimise the risk of excessive contaminant discharge to the environment. It should not limit the use of local water resources or harm aquatic ecosystems consistent advice given in the *Australian and New Zealand guidelines for fresh and marine water quality 2000* (reference 1a).

53 The treatment system should capture discharge from all tanker wash and processing plant wash-down. It should also permit safe, effective and sustainable reuse or disposal of liquids and separated solids. The treatment system design should take account of the quantity, quality and any intermittent generation of wastewater.

54 The treatment system should be designed to reduce degradable organic matter (as biochemical oxygen demand), suspended solids and water temperature. It should be resilient to fluctuations in pH, salt and surfactants. Balance tanks may be employed to assist in evening out variations in flow, pH, organic strength and temperature.

55 Treatment systems may incorporate physical, biological, or chemical treatment processes (for typical process diagram, see Appendix D). Organic load can be reduced by physical methods such as filtration, reverse osmosis, centrifuges and air flotation techniques; biological treatment such as activated sludge systems, trickling filters and anaerobic digesters; and/or chemical treatment to aid in clarification, coagulation, and settling of biological solids.

56 Where adequate land is available, waste stabilisation in ponds should be considered via a treatment train involving anaerobic, facultative, aerobic, and/or polishing ponds. Ponds should be designed to waste stabilisation pond criteria, catering for maximum hydraulic and waste load with capacity for effective water containment during the statistical wettest year in ten. Low permeability clay, concrete and/or synthetic pond liners should be used for controlling wastewater pond seepage in porous soils.

57 Ponds are most easily installed where the land slope is less than 1 in 10, the water table is at least 1 m below the pond base and the soils are deep and sufficiently impermeable (less than 10 mm/day permeability) to retain the wastewater. Our water quality protection notes 39 *Ponds for stabilising organic matter* and 27 *Liners for containing pollutants, using engineered soils* provide detailed advice (reference 4b).

58 Ponds should not be constructed where prone to flooding or unplanned overflows can enter surface waters or natural wetlands. In addition, treatment systems should have an effective scum trapping system to prevent release of floating matter.

59 Periods when land application of treated effluent may not be practicable (such as during the wet season) should be handled by wastewater storage ponds. Allowance should also be made for treatment ponds to be taken out of service, solar dried and solids periodically removed. Ponds should be de-sludged once the settled solids layer takes up one third of the pond volume.

60 Planning for any increase in dairy processing production needs to consider the capacity of the wastewater treatment system. Treatment capacity can be augmented in several ways including:

a load reduction due to improved housekeeping and/or wastewater stream segregation

b physical pre-treatment processes (such as screening)

c anaerobic pre-treatment processes with appropriate controls on gases generated

d chemical dosing (such as improved settling of solids by pH adjustment) or microbiological supplements

e artificial aeration of ponds (such as use of floating aerators)

f duplication of existing treatment modules

g expansion of storage pond capacity.

Disposal of treated effluent and solids

61 If effluent is unsuited to on-site disposal, stabilised wastes should be removed by tanker or pumped to an area where they can be disposed of safely, while minimising risk to the environment. In areas where reticulated sewerage is available, connection controls should be discussed with the Water Corporation or local water service provider. Disposal methods should meet local government authority health and planning criteria. Contact your local government (council) office or an office of the Department of Environment and Conservation for further information.

62 If effluent requires on-site disposal, but is not suitable for irrigation to land, the use of solar evaporation in effective containment ponds may be considered. For instance it may be appropriate to manage highly saline wastewater in evaporation ponds so that salts and other recyclable products can be recovered. Pond design should be guided by information in our Water quality protection note 39 *Ponds for stabilising organic matter* (reference 4b).

63 Captured solids and pond sludge should be dewatered within lined storage or handling areas that are fully contained and drain back to the wastewater treatment system.

64 Solid wastes should be stabilised, dewatered and then digested, composted and/or stored appropriately for reuse or recycling. Captured solids and sludge may have value for animal feed or for use in a controlled manner as a compost or fertiliser. Solid wastes and sludge that cannot be recycled or reused should be disposed of at an approved putrescible material landfill site. Your local government authority (council) can provide further information.

Wastewater irrigation of land

65 Generally, land application for the benefit of trees, crops or pasture provides an efficient means of using treated wastewater, along with the wastewater's nutrient and organic components. The nutrients in wastewater that are most likely to be utilised by plants are carbon, nitrogen, phosphorus and potassium. Sustainable use of water and nutrients matched to vegetation needs should be a goal of wastewater irrigation schemes.

66 Prior to applying treated wastewater to land a *Nutrient and irrigation management plan* should be prepared for the property. For information on preparing the plan, see our Water quality protection note 33 *Nutrient and irrigation management plans* (reference 4b). Information on waste load models for estimating sustainable loading

rates of effluent to soil is available from the Department of Agriculture and Food (reference 2).

67 When preparing a nutrient and irrigation management plan, a soil survey should be conducted to determine the suitability of the soils for different types of irrigated agriculture. Soils should have the following characteristics:

- a a structure that permits air movement and water penetration
- b sufficient depth to the watertable to permit optimum root development by the irrigated vegetation
- c adequate natural drainage or suitable artificial drainage
- d sufficient capacity to hold water for plant use between successive irrigation cycles
- e nutrients and trace elements in sufficient quantities for adequate plant development
- f low sodium concentration and a high phosphorus retention index
- g moderate pH (neutral to slightly acidic soils are best for most irrigated crops)
- h suitability for cultivation (such as irrigated pasture or crop production)
- i able to withstand cultivation without incurring significant erosion, dust problems or major structural declines.

68 The most satisfactory soils for efficient irrigation range in texture from sandy loam to clay loam (these accept irrigation rates of 5 to 10 mm/hour). They are generally preferred to more highly permeable sandy soils and less permeable heavy clay soils. Problems of soil permeability will also increase when the sodium adsorption ratio approaches ten.

69 Additional factors to consider in determining the suitability of land for irrigation include the climatic conditions, topography of the land, ground cover, vicinity to groundwater and surface water resources, the hydrology of the site (considering direction and speed of groundwater flow, dilution rates and watertable levels) and susceptibility to flooding, waterlogging, and surface water runoff.

70 To ensure that an irrigation system is designed correctly, an irrigation specialist should be consulted. The specialist should provide an irrigation plan complete with design parameters and operating characteristics detailing the irrigation methods, application rates and water scheduling.

71 Treated and stabilised wastewater used for irrigation should be routinely tested and applied at appropriate rates to avoid environmental problems including waterlogging, salt build-up, soil toxicity, and excessive leaching of nutrients. Wastewater with a high biochemical oxygen demand should be applied at rates that will not cause the development of anaerobic conditions or attract insects. For detailed information see our Water quality protection note 22 *Irrigation with nutrient-rich wastewater from rural industries* (reference 4b).

72 The intensity (mm/hour) and irrigation application (mm/cycle) should be adapted to the soil and vegetation to prevent excessive leaching of wastewater beneath the root zone. Using small quantities of treated wastewater frequently (avoiding high evaporation periods) and application during periods without rainfall is recommended. Resting periods between applications may be required to permit re-aeration of the soil and minimise leaching of salts from the soil profile. When the soil is saturated, irrigation waters should be stored until the soil dries sufficiently for irrigation.

73 Waterways and wetlands within irrigated land should, where practicable, not be altered from their natural flow path and form. Any artificial drainage channels should be located and designed to reduce the risk of erosion and minimise nutrient transport. Local native vegetation should be maintained or reintroduced, along waterway banks, around wetlands, to erosive slopes and on degraded land.

74 Treated wastewater release points should be placed with maximum practical separation distances from sensitive environments and residential areas. Treated wastewater spraying should be avoided near residential areas or fully contained on-site surrounded by a non-irrigated vegetation screen or buffer zone.

75 Surface ponds of irrigated water should be avoided. This occurs where land is flat (slope of less than 1 in 200).

76 Wastewater irrigation may yield a tail-water discharge which should be disposed of in an environmentally sensitive way. Runoff capture ponds with recycle pumps should be considered. Wastewater discharge into surface or groundwater areas is not recommended.

Monitoring and reporting

77 Monitoring the plant's performance in conserving water, minimising chemical use and effluent output, achieving effective wastewater treatment and recycling or reuse of waste products is important. Monitoring data should be routinely assessed and where necessary remedial action taken.

78 The wastewater output should be recorded and the quality analysed to benefit management of the enterprise and assist in assessment of any land application program. Concentrations of nutrients (nitrogen, phosphorus and potassium), total dissolved solids, salinity, organic matter, biochemical oxygen demand, suspended solids and pH should be recorded.

79 Samples should be analysed using accredited procedures (such as AS/NZS 5667 – 1998) and laboratories (NATA accredited and use *Standard methods for examination of water and wastewater APHA AWWA WEF*' – reference 11) or other approved standard.

80 Monitoring frequency should be based on the scale of the operation, the waste load disposed on-site, the reliability of waste management system and the vulnerability of the receiving environment. Monitoring data should include:

a the plant's water and chemical cleaning agent usage, monitored daily

b waste stream indicators, monitored on a weekly basis

c the volume and characteristics of wastewater before and after treatment (i.e. treatment plant performance), monitored daily to weekly

d the volume of treated wastewater discharged to irrigated areas, monitored weekly

e the health of crop or pasture plants, soil chemistry, structure and water balance, monitored at the end of the irrigation season

f key quality parameters in any run-off from the property, standing groundwater level and its quality below the irrigation area, monitored at three-monthly intervals

g the environmental values of relevant local surface and groundwater bodies, monitored monthly to quarterly.

81 Acceptable effluent volume monitoring methods include hours-run meters linked to pump performance graphs, magnetic, ultrasonic (Doppler), orifice plate or mechanical flow meters.

82 Monitoring bores should be used to assist in monitoring groundwater depth and quality and should be operated in accordance with our Water quality protection note 30 *Groundwater monitoring bores* (reference 4b). Tensiometers or neutron probes (which monitor water penetration of the soil) may be used as tools to plan appropriate water application rates or initiate irrigation cycles. All equipment should be regularly maintained and calibrated for accuracy.

Accidents and emergency response

83 A contingency plan for the dairy processing plant should be developed, outlining management responses to various abnormal operating situations. The contingency plan should be regularly reviewed. Employees or service contractors should be trained and assigned roles in emergency management procedures and techniques.

84 Plants should be prepared for disruption to power supplies, operator error, disruption by storms, flooding, breakdowns including drain blockages and pump failures, variable loading of the effluent treatment and disposal system, and spillage of chemicals.

85 The Department of Water regional office should be notified, as soon as possible, of any significant chemical spill or leakage to the environment where there is the potential to contaminate surface water or groundwater.

Appendix A: Information on sensitive water resources, note limitations and updates

Sensitive water resources

Our water resources sustain ecosystems, aquatic recreation and aesthetic values as well as providing drinking, industry and irrigation supplies. Along with breathable air, uncontaminated water is essential for viable communities. Natural water resources have to remain within defined quality limits to retain their ecological, social and economic values. Hence they require appropriate protection measures to minimise contamination.

Information on water quality parameters and processes to maintain water values are published in the Australian Government's national water quality management strategy papers. These papers are available online at <www.environment.gov.au> select *water > water policy and programs > water quality >.*

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 in significant quantities are washed or leached into water resources.

Sensitive waters include estuaries, natural waterways, wetlands and groundwater. These waters support one or more of the environmental values described below.

Public drinking water sources

Overview

A public drinking water source area (PDWSA) is the collective name given to any area proclaimed to manage and protect a community drinking water source. PDWSA include underground water pollution control areas, water reserves and catchment areas administered by the Department of Water under the provisions of the *Metropolitan Water Supply, Sewerage and Drainage Act 1909* or the *Country Areas Water Supply Act 1947*.

For online information on the location of a 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.*

Within PDWSA, priority areas (P1, P2 and P3) are defined via publicly consulted drinking water source protection plans or land use and water management strategies. Priority areas are used to guide land planning, rezoning and development approval processes. Priority areas are assigned considering the current local planning scheme zoning, land tenure, the water source's strategic value and its vulnerability to harm. Each priority area is managed using a specific risk-based strategy to provide for effective water resource protection. This department develops these documents in consultation with other government agencies, landowners, industry and the community.

P1 areas are defined to ensure human activity does not degrade the water source. These areas are declared over land where the provision of high-quality drinking water for public use is the primary beneficial land value. P1 areas typically cover land controlled by the state government or one of its agencies. These areas are managed under the principle of *risk avoidance* and so most land development and human activity is normally opposed.

P2 areas are defined to ensure 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 exists (such as low intensity rural use). Protection of public water supply sources is a high priority in P2 areas. These areas are managed in accordance with the principle of *risk minimisation*, and so the intensity of development is restricted (with management conditions) and activities with a low water contamination risk are acceptable.

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 co-exist with other land uses such as residential, commercial and/or light industrial development. Protection of P3 areas is achieved through land use management measures provided via environmental guidance (e.g. these protection notes) or via site-specific development approval conditions to limit the water resources contamination risk from the land use or activity. If, however, the water source becomes contaminated, then water supplied from P3 sources may need to be treated more intensively or an alternative water source commissioned.

Additional protection zones are defined close to the point where drinking water is extracted or stored. These zones are called *wellhead protection zones* (WHPZs) and *reservoir protection zones* (RPZs). Statutory land use constraints apply to activities within these zones surrounding sources to safeguard waters most vulnerable to contamination.

WHPZs are assigned within the perimeter of water production wells based on hydrological factors. Statutory land use restrictions apply in these zones as groundwater moves rapidly

towards wells due to aquifer depressurisation by pumping. Any contaminants leaching from the ground surface in WHPZs could rapidly migrate into scheme water supplies (before effective remedial action can occur). In sedimentary basins, WHPZs 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.

RPZs are defined over and around public water supply dams or pipe-head reservoirs. Statutory access and land use restrictions apply in RPZs. The aim is to restrict the likelihood of contaminants being deposited or washing into water sources in any runoff. RPZs within state-controlled land cover an area up to two kilometres measured outward from the reservoir top water-level and include the inundated area when the reservoir is full.

For additional explanatory information on PDWSAs, see our Water quality protection note 25 *Land use compatibility in public drinking water source areas,* note 36 *Protecting public drinking water source areas,* note 75 *Proclaimed public drinking water source areas,* note 76 *Land use planning in PDWSA* and note 77 *Risk assessment in PDWSA. These notes are* available online at <www.water.wa.gov.au> select *publications > find a publication > series browse >*.

Established activities within PDWSAs

Many land use activities were approved and established before publication of a source protection plan or land use strategy. The operators of these activities should ensure that modern environmental facilities and practices are progressively implemented so the water resource's contamination risk is minimised (within practical and economic constraints).

New or expanded activities in PDWSAs

Any development proposals that could affect a drinking water source should be referred to this department's regional office with detailed supporting information for assessment and a written response.

The development proposal may be approved (with or without conditions); additional information may be sought before a decision is made; or the proposal opposed due to a statutory or policy conflict or inadequate protective measures provided to safeguard the water source. To assist the assessment, operators should demonstrate that under all operating conditions the materials and processes used on-site do not pose a significant water contamination risk.

Buffers to water supply sources

Native vegetation buffers should be used to separate compatible land use areas from the full supply level of reservoirs their primary feeder streams and/or production bores used as a source of drinking water. Advice on suitable buffer forms and dimensions is provided in our Water quality protection note 6 *Vegetated buffers to sensitive water resources*.

Within clearing control catchments

Controls on vegetation clearing for salinity management are provided under part IIA of the *Country Areas Water Supply Act 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 of clearing controls may be obtained from our regional offices, see online information at <www.water.wa.gov.au> , select *Contact us*.

Private water supply sources

Those sources vulnerable to contamination include:

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

Underground ecosystems

Important underground ecological functions that may be at risk of contamination include groundwater- and cave-dwelling animals and microorganisms (generally located within soils that have open pore spaces such as sand, gravel and limestone).

Waterway ecological and social values

Waterways that have high social and conservation significance are described in Environmental Protection Authority (EPA) 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 *policies and guidelines > environmental assessment guidelines > guidance statements.*

This department also manages waterways throughout Western Australia under Section 9 of the *Water Agencies (Powers) Act 1984* and the *Rights in Water and Irrigation Act 1914*. For online information, see <www.water.wa.gov.au> and select *managing water*. Apart from aquatic ecosystems and water sources, waterways provide social values including aesthetic appeal, drainage pathways and recreational opportunities for watercraft use, fishing, tourism, swimming and related aquatic activities. Engineered drains and constructed water features are normally not assigned ecological values because their function and operational factors outweigh their ecological value.

We also administer the the *Waterways Conservation Act 1976* which defines Western Australian waterways subject to specific regulatory controls. Currently proclaimed waterways are the Avon River, Peel-Harvey Inlet, Leschenault Inlet, Wilson Inlet and Albany waterways management areas.

Swan River Trust management area

The Swan River Trust is responsible for the protection and management of the Swan-Canning River system to safeguard its ecological and social values under the *Swan and Canning Rivers Management Act 2006.* Approval from the Trust is needed for any land- or water-based development within the Swan, Canning, Helena or Southern Rivers and their associated foreshore areas - the *Swan River Trust development control area (DCA*). Activities and development close to these areas are likely to have an effect on the waters of the river system. Development proposals within or abutting the DCA should be referred to the Trust for comment.

Developments distant from the DCA, but near river tributaries or drainage systems, that could affect waters within the area, e.g. by leachate in groundwater flow, should also be referred to the Trust for assessment and advice. For detailed information, see online advice at <www.swanrivertrust.wa.gov.au>, phone +61(8) 9278 0900 or email: planning@swanrivertrust.wa.gov.au .

Wetland ecology

Many important wetlands have been given conservation status under the Ramsar convention (described online at <www.ramsar.org>), Japan and Australia migratory bird agreement (JAMBA), China and Australia migratory bird agreement (CAMBA), and Republic of Korea and Australia migratory bird agreement (ROKAMBA).

Wetlands are also protected under various Australian and Western Australian government policies. Conservation wetland data to guide land planning and development activities is provided via the following publications:

- Scheduled wetlands are defined by the Australian Government in the *Directory of important wetlands in Australia,* available online at <www.environment.gov.au> select *water > water topics > wetlands.*
- Wetlands with defined high conservation significance are described in the EPA (WA) guidance statement 33 *Environmental guidance for planning and development* (section B4.2.2). This statement is available online at <www.epa.wa.gov.au> select *policies and guidelines > environmental assessment guidelines > guidance statements.*

The Department of Environment and Conservation (DEC) is the custodian of the state wetland datasets, and is responsible for maintaining and updating relevant information. These datasets are available 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 online at *water > wetlands > data* or by phoning DEC's nature conservation division on 9334 0333.

Wetlands datasets identified for conservation value or for resource enhancement include:

- *Geomorphic wetlands of the Swan Coastal Plain*
- *South coast significant wetlands*
- *Geomorphic wetlands Augusta to Walpole* (this dataset awaits detailed evaluation).

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

Note limitations

Many Western Australian aquifers, waterways and wetlands await detailed scientific evaluation, present data on their quality is sparse and their values remain unclassified. Unless demonstrated otherwise, any natural waters that are slightly disturbed by human activity are considered to have sensitive environmental values. Community support for these water values, the setting of practical management objectives, provision of sustainable protection services and effective implementation are vital to protecting or restoring water resources for both current needs and those of future generations.

This note provides a general guide on environmental issues, and offers solutions based on data searches, professional judgement and precedents. 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's recommendations shall not be used as this department's policy position on a specific matter, unless confirmed in writing. In addition, regulatory agencies should not use this note's recommendations in place of site-specific development conditions based on a project's assessed environmental risks. Any regulatory conditions should consider the values of the local environment, the safeguards in place and take a precautionary approach.

Where a conflict arises between this note'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 water quality contamination risk than would apply if the recommended protection measures were used.

Note updates

This note will be updated as new information is received, industry/activity standards change and resources permit. 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: WA statutory approvals relevant to this note

What's regulated?	Western Australian statutes	Regulatory office
Regulation of prescribed premises that could pollute	*Environmental Protection Act 1986,* Part V Environmental regulation	Department of Environment and Conservation www.dec.wa.gov.au
Land and waters that have been contaminated by human activity	*Contaminated Sites Act 2003* and associated regulations 2006	
Prohibited discharge of specified contaminants	Environmental Protection (unauthorised discharges) Regulations 2004	
Management of human wastes Community health issues	*Health Act 1911*	Department of Health www.health.wa.gov.au Local government
Transport, storage and handling of fuels, solvents, explosive and other dangerous goods	*Dangerous Goods Safety Act 2004* Dangerous goods safety regulations 2007	Department of Mines and Petroleum –Resources Safety Division www.dmp.wa.gov.au
Licence to take surface water, groundwater or disturb waterways	*Rights in Water and Irrigation Act 1914*	Department of Water - regional office www.water.wa.gov.au
Discharge of waters to managed waterways	*Waterways Conservation Act 1976*	

What's regulated?	Western Australian statutes	Regulatory office
Industrial sites in existing public drinking water source areas Clearing of native vegetation in the Mundaring, Wellington, Harris, Denmark, Warren or Kent catchments	*Metropolitan Water Supply, Sewerage and Drainage Act 1909* *Country Areas Water Supply Act 1947*	
Emergency response planning	*Fire and Emergency Services Authority of WA Act 1998*	Fire and Emergency Services Authority www.fesa.wa.gov.au
Statutory policies covering wetlands, drinking water catchments and estuaries	*Environmental Protection Act 1986,* 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 natural waters	*Environmental Protection Act 1986,* Part IV Environmental impact assessment	
Discharges into the Swan-Canning Estuary	*Swan and Canning Rivers Management Act 2006*	Swan River Trust www.swanrivertrust.wa.gov.au
Discharge to sewer (industrial waste permit) or to main drain	*Metropolitan Water Supply, Sewerage and Drainage Act 1909* *Country Towns Sewerage Act 1948*	Water Corporation www.watercorporation.com.au Designated water services provider
Subdivision of land Land zoning and development approval	*Planning and Development Act 2005*	Western Australian Planning Commission Department of Planning www.planning.wa.gov.au Local government (council)

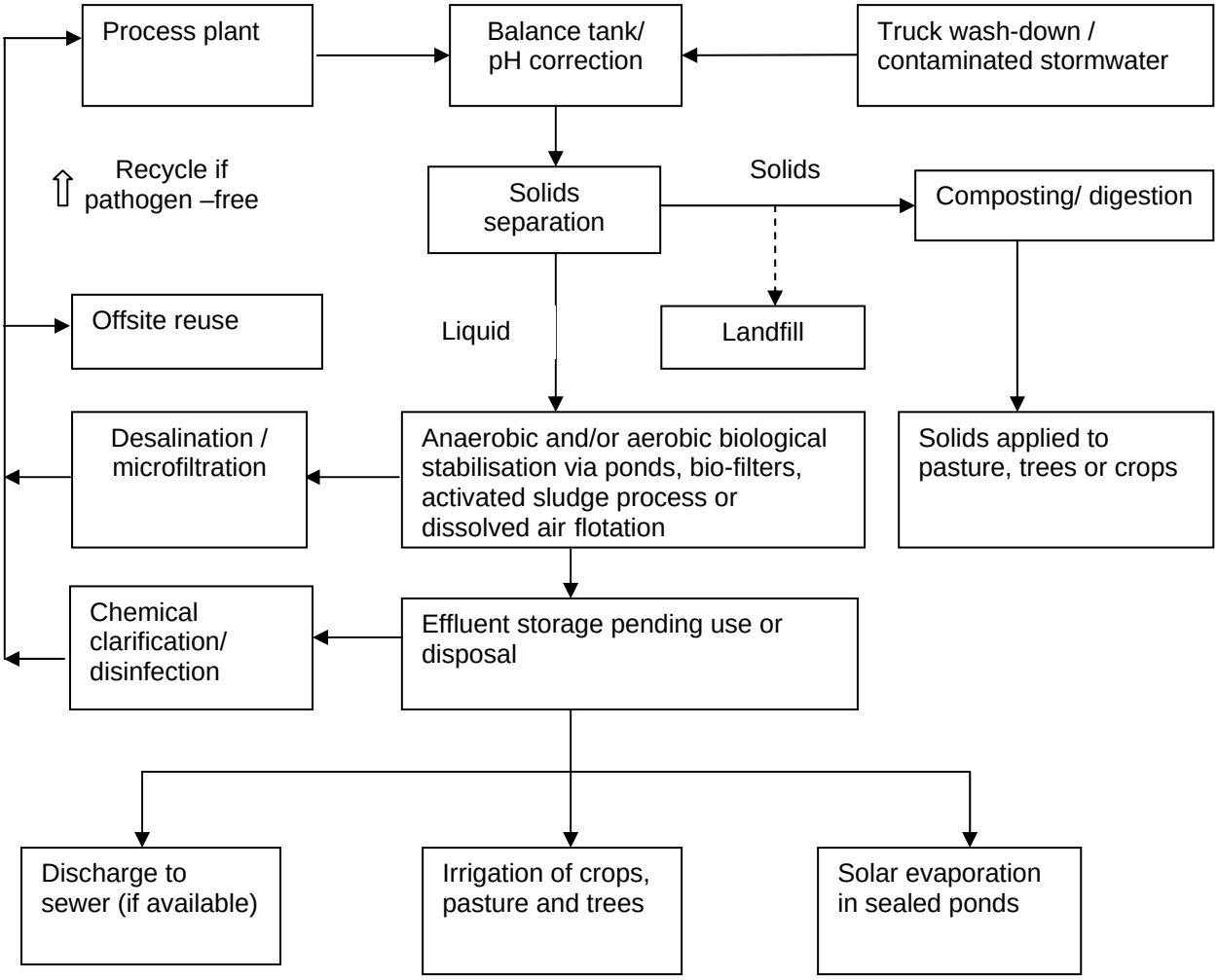
Relevant statutes are available from the *State Law Publisher* at <www.slp.wa.gov.au>.

Appendix C: Sources of waterborne waste

Dairy processes	Sources of waste	
Preparation stages		
Milk receiving/ storage	Poor drainage of tankers Spills and leaks from hoses and pipes Spills from storage silos/ tanks	Foaming Cleaning operations
Pasteurisation/ ultra heat treatment	Liquid losses/ leaks Recovery of downgraded product Cleaning operations	Foaming Deposits on surfaces of pasteurisation and heating equipment
Homogenisation	Liquid losses/ leaks	Cleaning operations

Dairy processes	Sources of waste	
Preparation stages		
Separation/ clarification (centrifuge, reverse osmosis)	Foaming Cleaning operations	Pipe leaks
Product processing stages		
Market milk	Foaming Product washing Cleaning operations Overfilling Poor drainage	Sludge removal from clarifiers/ separators Leaks Damaged milk packages Cleaning of filling machinery
Cheese making	Overfilling vats Incomplete separation of whey from curd Using salt in cheese making	Spills and leaks Cleaning operations
Butter making	Cleaning operations Produce washing	Vacreation (reduced pressure pasteurisation using steam) and salt use
Powder manufacture	Spills of powder handling Start-up and shut-down losses Plant malfunction	Stack losses Cleaning of evaporators and driers Bagging losses

Appendix D: Wastewater treatment flow diagram for a small dairy plant



Appendix E: Data needed to support project assessments

Where facilities near sensitive waters are to be constructed or upgraded, the following data should be supplied with the development proposal:

1 Site owner/ operating tenant's name and contact details.

2 A site plan showing the location of the project facilities relative to tenements, leases, lots and roads. The plan should show the topography, remnant vegetation cover, existing and proposed development areas and on-site water features and sources.

3 Details of site investigation of soil strata, depth to water table (if applicable) and data on the location, extent, hydrology, quality and dependencies on local water resources (including any seasonal variations) that could be affected by site operations or facilities.

4 The present local government land use zoning (where applicable). Current land use description, any site contamination history and its remediation.

5 Full description and scale of the activities planned for the project site, (site amenities, crops, animals, earthworks and chemical applications), construction and operating workforce and planned project operational life.

6 Describe intended commissioning date, operating hours and any expansion options.

7 Details of any proposed vegetation clearing, environmental buffers, site earthworks and services, including water supply, sewerage and drainage provisions.

8 Description of all materials/ chemicals to be stored or handled on site in commercial quantities, including a water use budget.

9 Description of the types, quantities and quality of solid and liquid waste (if applicable) that will be generated or disposed from the facility.

10 Description of planned material containment, waste management (treatment and disposal); with an environmental management plan and nutrient and irrigation management plan (where applicable).

11 Details of any environmental modelling conducted to demonstrate the effects of the project on local water resources.

12 Planned operational and equipment maintenance procedures.

13 Details of any contingency measures proposed to minimise the impacts of chemical spills and safely dispose of contaminated waters that may result from storms, fire, flood or equipment malfunction or vandalism. Information should include workforce training, site monitoring and emergency response facilities.

14 Any project contractual agreements or regulatory approvals received.

For significant projects, development proponents should engage the services of a qualified and experienced consultant to professionally prepare their development proposal. This should ensure that government agencies can efficiently assess and respond to the proposal without delays caused by inadequate or poorly defined information.

References and further reading

1 Australian government – national water quality management strategy publications available online at <www.environment.gov.au> search *national water quality management strategy,* select *national guidelines*

   a Paper 4 *Australian and New Zealand guidelines for fresh and marine water quality, 2000*

   b Paper 6 *Australian drinking water guidelines, 2004*

   c Paper 9 *Rural land uses and water quality – a community resource document, 2000*

   d Paper 16b *Effluent management guidelines for dairy processing plants, 1995;* also available via <www.awa.asn.au>, request by email <bookshop@awa.asn.au> or from a library service.

2 Department of Agriculture and Food publications, available online at <www.agric.wa.gov.au>

   a Farm notes

      - 39/98 Managing nutrients on irrigated pastures
      - 44/97 Sub-catchment management plans

- 41/99 Water quality for dairying (reviewed Sept 2000)
- 42/99 Cleaning and sanitising a milking plant (reviewed Sept 2000)
- 53/98 Disposing of milk (reviewed Sept 2000)
- 65/96 Soil management options to control land degradation
- 103/00 Environmental management systems for agriculture.

b Other agriculture publications

- Agricultural composting handbook
- Bulletin 4689 *Dairycatch - Environmental best management practice guidelines*, 2006
- Preparing farm chemicals.

3 Department of Environment and Conservation

a Controlled waste publications available online at <www.dec.wa.gov.au> select *pollution prevention > controlled waste*

- *Guideline for controlled waste carriers 2004*
- *Guideline for controlled waste generators 2004*
- *Guideline for controlled waste treatment or disposal sites 2004.*

b Wetlands papers available online at <www.dec.wa.gov.au> select *management and protection > wetlands*

Position statement – *Wetlands 2001.*

4 Department of Water

a Policy and position statements available online at <www.water.wa.gov.au> select *policies*

- *A Guide to the licensing systems – Licenses and registration 2002*
- *Environmental management for animal based industries – Dairy farm wastewater 1998*
- Foreshore policy 1: *Determining the foreshore area*
- *Guidelines for direct land application of biosolids and biosolid products 2002*
- River restoration manual – *A guide to the nature, protection, rehabilitation and long-term management of waterways in Western Australia*
- *Stormwater management manual for WA 2004*.

b Water quality protection notes (WQPN) 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 22 *Irrigation with nutrient-rich wastewater from rural industries*
- WQPN 25 *Land use compatibility in public drinking water source areas*
- WQPN 27 *Liners for containing pollutants using engineered soils*
- WQPN 30 *Groundwater monitoring bores*
- WQPN 33 *Nutrient and irrigation management plans*
- WQPN 36 *Protection of public drinking water source areas – an overview*

- WQPN 39 *Ponds for stabilising organic matter*
- WQPN 41 *Private water supplies*
- WQPN 56 *Tanks for above ground chemical storage*
- WQPN 68 *Wash down of mechanical equipment.*

c Water notes (WN) available online at <www.water.wa.gov.au> select *publications > find a publication > series browse*

- WN 04 *Wetland buffers*
- WN 08 *Habitat of rivers and creeks*
- WN 10 *Protecting riparian vegetation*
- WN 11 *Identifying the riparian zone*
- WN 12 *The values of the riparian zone*
- WN 20 *Rushes and sedges*
- WN 23 *Determining foreshore reserves.*

5 Environment Protection Authority, NSW <www.environment.nsw.gov.au>
The utilisation of treated wastewater by irrigation 1995.

6 Environmental Protection Authority, Victoria <www.epa.vic.gov.au>
Environmental guidelines for the dairy processing industry 1997.

7 Environmental Protection Authority publications available online at<www.epa.wa.gov.au> select *guidance statements*

- Guidance statement 3 *Industrial-residential buffer guidelines*
- Guidance statement 33 *Environmental guidance for planning and development.*

8 New Zealand Code of Practice available online at <http://www.nzfsa.govt.nz/dairy/publications/cop/design-farm-dairies/amendments/amendment-0/page-01.htm>
Farm dairy code of practice.

9 Standards Australia and Standards New Zealand publications available for purchase at <www.saiglobal.com> select *publications*

a AS 3901/ ISO 9001 *Quality systems for design, development, production, installation and servicing*

b AS/NZS 5667.10:1998 *Water quality sampling part 10: Guidance on the sampling of waste waters.*

10 Swan River Trust publication available online at <www.swanrivertrust.wa.gov.au> *Environmental management and cleaner production director for small and medium businesses*, 2005.

11 United Nations environment programme (UNEP), Cleaner production working group for the food Industry, 1997- *Cleaner production checklists for the food industry*. For online information see <www.gpem.uq.edu.au> search *UNEP.*

12 United States publication – American Public Health Association, American Water Works Association, Water Environment Federation. For online information see <www.standardmethods.org>
Standard methods for the examination of water and wastewater (current edition).

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Feedback

We welcome your views on this note. Feedback will help us prepare future versions. To comment on the note or seek clarification, please contact our water source protection branch (details below), citing the note topic and version.

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