ACKNOWLEDGMENTS

The process of preparing the draft guidelines was initiated in early 1998 with the formation of a working group. The task of the group was to update an existing publication “Environmental Code of Practice - Cattle Feedlots” published in 1993 by the Environmental Protection Authority, and incorporate legislative requirements as well as recent developments in feedlotting practices and environmental standards. The group has consulted with a wide range of people from different organisations and the contribution of the following for their participation as members of the working group is gratefully acknowledged:

- Paul O’Meehan, Bruce Moore, Joe Hethrington and John Griffiths (Western Australian Lot Feeders’ Association);
- Glen Smith (AUS-MEAT);
- Peter Ryan, Ray Claudius and Chris Ryan (Water and Rivers Commission);
- Ron Powell, Elizabeth Morgan, Catherine Harrison and Caroline Raphael (Department of Environmental Protection);
- Brian McIntyre (Department of Agriculture, Western Australia);
- Brian Devine (Department of Health, Western Australia).

We also thank those people and organisations who responded with suggestions and comments on the draft document.

**Note:** At the time of publication of these guidelines the Department of Environmental Protection (DEP) and Water and Rivers Commission (WRC) were amalgamating to form the Department of Water, Environment and Catchment Protection (DEWCP). Following amalgamation DEWCP should be the contact point for references to DEP or WRC.
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1.0 Introduction

This document is one of a series of Environmental Guidelines prepared for activities that have the potential to impact on the environment and quality of water resources.

The cattle feedlot industry is recognised as an important and growing part of the Western Australian beef industry and a significant contributor to the State’s economy. The industry was developed to supply beef ‘out of season’ during autumn-winter when high quality beef could not be produced in sufficient quantity from pasture feeding. Over time, the lot-feeding season has been extended to satisfy an increasing demand for better quality and consistency of beef. With lot-feeding there is a much greater ability to control and predict the growth and carcass characteristics of cattle and produce a more uniform high quality product. Demand for lot-fed product in the export markets in Asia has also increased and there is considerable scope for further expansion. The relatively small size of the domestic market and the limited opportunity for it to increase substantially, means that further expansion of the cattle industry in Western Australia is very dependent on growth of lot-feeding to supply export markets.

In 1998 it was estimated that there were about 300 cattle feedlots in Western Australia. The majority of these feed a small number of cattle and many operate ‘opportunistically’ in response to year to year variations in profitability. Only 10 - 20 percent of feedlots feed more than 500 cattle per year. There has been a trend for an increase in the number of larger feedlots and in the number of feedlots that are feeding year round. In 1998 approximately 130,000 cattle were produced from feedlots representing a gross value of production of around $70 million and this was expected to increase by 10 to 20% over the following years.

The disposal of animal wastes from intensive farming activities gives rise to concerns within the community about nutrients and micro-organisms entering the soil, groundwater and water courses through run-off. Inappropriate siting and poor management practices of feedlots may pose a significant threat to water resource quality, the environment and community amenity, particularly from nutrient-rich wastewater, odour, dust, noise and insects.

Since few feedlots in Western Australia have drainage systems that utilise waste stabilisation ponds, most of the liquid wastes (urine and rain on the feedlot area) soak into the ground where the possibility of contamination of groundwater is increased.

The feedlot industry increasingly views its operations as a comprehensive input-output system of food production and waste management. Accordingly the feedlot industry has been proactive in the development of procedures to manage potential environmental impacts of its activities. In particular the Australian Lot Feeders’ Association (ALFA) was closely involved with the Authority for Uniform Specification Meat and Livestock (AUS-MEAT) in initiating the National Feedlot Accreditation Scheme (NFAS) which came into operation in 1994. Under this voluntary scheme, feedlots gained accreditation through preparation and approval of a quality assurance manual. It included a strong component on environmental protection based on a Code of Practice for Protection of the Environment. All NFAS accredited feedlots are required to comply with all State and local government regulations. They are subject to annual audits by AUS-MEAT. In March 2001, a new national environmental Code of Practice was endorsed by Standing Committee on Agriculture and Resource Management (SCARM) and by Agriculture and Resource Management Council of Australia and New Zealand and will replace the earlier Code.
This code was published by Meat and Livestock Australia (MLA) in June 2000 (MLA, 2000). It is intended for use by feedlot management and provides a comprehensive framework that addresses all potential problem areas and is designed to ensure sound environmental performance by the industry.

1.1 Purpose of the document

These guidelines have been developed to provide information on legislative requirements that must be met by the feedlot industry, and guidelines on acceptable environmental management practices for the establishment and ongoing management of feedlots in Western Australia. These guidelines are not legal advice. Important legal details have been omitted to allow a general summary to be presented.

These guidelines replace the Department of Environmental Protection’s (DEP) Environmental Code of Practice for Cattle Feedlots (DEP, 1993). They should be used in conjunction with the National Guidelines for Beef Cattle Feedlots in Australia (SCARM, 1997) and National Beef Cattle Feedlot Environmental Code of Practice (MLA, 2000). The National Guidelines provide additional information on acceptable standards for the establishment, operation and environmental management of feedlots in Australia.

These guidelines also aim to increase public understanding of the feedlot industry and to emphasise that feedlot operators are aware of their obligations to the environment and the community. The recommendations in this document represent the consensus view of participating government agencies and industry representatives.

1.2 Definition of a beef cattle feedlot

‘A beef feedlot is a confined yard area with watering and feeding facilities where cattle are completely hand or mechanically fed for the purpose of production. This definition does not include the feeding or penning of cattle in this way for weaning, dipping or similar husbandry purposes or for drought or other emergency feeding, or at a slaughtering place or in recognised saleyards.’ (SCARM, 1997).

For the purposes of these guidelines a feedlot is one on which cattle are maintained at such densities that pasture foraging has a negligible role in sustaining them. In some cases, the cattle may be held in roofed enclosures.

Facilities where cattle are handled, loaded or unloaded, where feed is stored or mixed, or where animal wastes are accumulated, treated or stored prior to removal or disposal are considered as part of the feedlot.

1.3 Scope

These guidelines apply to all new feedlots and extensions to existing feedlots throughout Western Australia, including the operation of ‘opportunity’ feedlots which are set up to lot feed cattle on an occasional or irregular basis. Existing feedlots may need to be Licensed or Registered according to the criteria detailed in Section 2.3. Others may continue to operate in their present locations but should progressively adopt operational and management practices consistent with these guidelines.

The requirements that should be met by feedlots will vary according to a number of factors depending on the environmental sensitivity of the location. This document sets out acceptable environmental management practices and procedures. Alternative techniques or methods may be used provided they can be demonstrated to be effective in meeting environmental goals.

Assessment of applications to develop a cattle feedlot, and the setting and auditing of License and Registration conditions will be based on this publication.
2.0 How to get approval for a new or expanded feedlot

There are a number of pieces of legislation in the areas of environmental protection, public health and town planning that may impact on the establishment and operation of beef cattle feedlots. Summaries of the relevant legislative requirements are presented in Appendix A. The legislation is administered by local government, the DEP, the Environmental Protection Authority (EPA) and the Water and Rivers Commission (WRC). These bodies are therefore responsible for the approval process.

Tables 1 and 2 and Figure 1 outline the approval processes and the steps involved from submission of a proposal to establish or operate a feedlot to receiving approval. Required approvals can be sought concurrently.

Table 1. Approvals that may be required prior to construction and/or expansion of a feedlot.

<table>
<thead>
<tr>
<th>Approval Required</th>
<th>Comments</th>
<th>Authority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning approval</td>
<td>Required by all feedlots regardless of size or location.</td>
<td>Local Government</td>
</tr>
<tr>
<td>Building approval</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Works approval</td>
<td>Required by feedlots with a capacity of over 500 head and a</td>
<td>Department of Environmental</td>
</tr>
<tr>
<td></td>
<td>stocking rate of over 50 hd/ha (200sq m/ha).</td>
<td>Protection</td>
</tr>
<tr>
<td>Groundwater well License</td>
<td>Required if you need to use underground water for your</td>
<td>Water and Rivers Commission</td>
</tr>
<tr>
<td></td>
<td>feedlot and it is situated in a proclaimed Groundwater</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Area or if drawing from a confined aquifer (ie artesian</td>
<td></td>
</tr>
<tr>
<td></td>
<td>supply). This is the case for the majority of the State.</td>
<td></td>
</tr>
<tr>
<td>Surface water License</td>
<td>Required if surface water is being used in a proclaimed</td>
<td>Water and Rivers Commission</td>
</tr>
<tr>
<td></td>
<td>Surface Water Area.</td>
<td></td>
</tr>
<tr>
<td>Advice regarding suitability of site</td>
<td>Feedlots are not permitted in Public Drinking Water Source</td>
<td>Water and Rivers Commission</td>
</tr>
<tr>
<td></td>
<td>Areas classified for Priority 1 or 2 protection. Advice</td>
<td></td>
</tr>
<tr>
<td></td>
<td>should sought for feedlots in Waterways Management Areas</td>
<td></td>
</tr>
<tr>
<td></td>
<td>or near sensitive water resources.</td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Approvals that may be required for the ongoing operation of new or existing feedlots.

<table>
<thead>
<tr>
<th>Approval Required</th>
<th>Comments</th>
<th>Authority</th>
</tr>
</thead>
<tbody>
<tr>
<td>License</td>
<td>Applies to feedlots with a capacity of over 500 head and a</td>
<td>Department of Environmental</td>
</tr>
<tr>
<td></td>
<td>stocking rate of over 50 hd/ha (200sq m/ha) and located</td>
<td>Protection</td>
</tr>
<tr>
<td></td>
<td>less than 100m from a water body.</td>
<td></td>
</tr>
<tr>
<td>Registration</td>
<td>Applies to feedlots with a capacity of over 500 head and a</td>
<td>Department of Environmental</td>
</tr>
<tr>
<td></td>
<td>stocking rate of over 50 hd/ha (200sq m/ha) and located</td>
<td>Protection</td>
</tr>
<tr>
<td></td>
<td>more than 100m from a water body.</td>
<td></td>
</tr>
<tr>
<td>Groundwater well</td>
<td>Comments as for Table 1</td>
<td>Water and Rivers Commission</td>
</tr>
<tr>
<td>License</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surface water</td>
<td>Comments as for Table 1</td>
<td>Water and Rivers Commission</td>
</tr>
<tr>
<td>License</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disposal of manure</td>
<td>Off-site disposal of solids</td>
<td>Local Government</td>
</tr>
<tr>
<td>Ponds and Irrigation</td>
<td>Aerobic and anaerobic ponds used to treat liquid waste and</td>
<td>Department of Health</td>
</tr>
<tr>
<td></td>
<td>irrigation from ponds.</td>
<td></td>
</tr>
</tbody>
</table>
2.1 Local Government approval

All proposals should initially be submitted to the local government, where they will be assessed for consistency with town planning schemes, local planning policies and local health regulations. Some local governments levy planning fees and charges. Local government may seek advice from the DEP and the WRC as part of their approval process. Local government will refer proposals to the WRC for advice where feedlots are located in Public Drinking Water Source Areas (PDWSA)\(^1\), Waterways Management Areas or near sensitive water resources (such as rivers, estuaries and wetlands). See Section 2.3 and Appendix A for further information.

If there is the likelihood of significant environmental impact, the proponent and local government have an obligation to refer the proposal to the EPA for formal environmental impact assessment. For example, a cattle feedlot to be located on land with remnant native vegetation, or in a sensitive water catchment, may require formal environmental impact assessment. Such proposals will require additional information to ensure that all aspects of nutrient and waste management are considered. In these cases the EPA may recommend that the feedlot can be operated only under certain specified conditions. There is a time frame associated with this process and an appeals period.

Where feedlots have a capacity of under 500 head and local government is satisfied that there are no significant environmental issues, they may grant approval for construction and operation of the feedlot. However the feedlot should be managed in accordance with these guidelines and in such a way that it does not have any adverse environmental effects. Where feedlots cause significant adverse impacts, the DEP may require action to rectify the problem.

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2.2 Environmental Protection Authority assessment

Feedlots with the potential to have significant environmental impacts require formal environmental impact assessment by the EPA. This process is designed to consider and resolve environmental issues associated with development proposals. The proponent has the ultimate responsibility to refer such a proposal to the EPA. It is also possible for the local government, or any person, to refer a proposal to the EPA.

2.3 Department of Environmental Protection approval

Feedlots with a capacity of more than 500 head of cattle require a Works Approval and either License or Registration. In this case proposals should be submitted to the DEP as well as to the local government. Works Approvals, Licenses and Registrations are intended to minimise the potential for pollution.

Works Approvals are issued prior to construction of premises, and specify construction conditions. Licenses and Registrations are issued to allow premises to operate. Licenses may contain conditions specific to the property such as limits on waste disposal. Registrations are issued by the DEP to premises that are then managed through industry guidelines.

The circumstances where a Works Approval and License or Registration are required are as follows:

Works Approval and License are required when the feedlot:
- has a capacity of over 500 head; AND
- has a stocking rate over 50 head per hectare (200 square metres per animal); AND
- is less than 100 metres from a water body.

---

\(^1\) PDWSA - Public Drinking Water Source Areas include Underground Water Pollution Control Areas, Water Reserves and Catchment Areas declared under the Metropolitan Water Supply, Sewerage and Drainage Act 1909 or the Country Areas Water Supply Act 1947. These areas are used as a source of public drinking water supplies.
Works Approval and Registration are required when the feedlot:
- has a capacity of over 500 head; AND
- has a stocking rate over 50 head per hectare (200 square metres per animal); AND
- is more than 100 metres from a water body.

Works Approval, License or Registration are not required when the feedlot:
- has a capacity of under 500 head; OR
- has a stocking rate under 50 head per hectare (200 square metres per animal).

The first stage of this process is the application by the feedlot operator for a Works Approval to the DEP. The information required in the initial application is listed in Section 2.5. Application forms are available from the DEP.

Proponents are encouraged to discuss their proposal with officers of the DEP’s Licensing Branch prior to submission, particularly if it may be contentious within the local community. Additional information is often required by the DEP before it can issue a Works Approval. If this is the case the proponent will be advised accordingly. It usually takes up to 6 weeks to process an application for a Works Approval, once all the relevant information has been submitted.

2.4 Water and Rivers Commission approval

Proponents intending to source water from watercourses or groundwater must contact the WRC regarding the need for a License to abstract water.

Feedlots cannot be established in PDWSA that are classified for Priority 1 or 2 source protection, nor in well-head protection zones or reservoir protection zones. Conditions apply to establishing and operating cattle feedlots in PDWSA that are classified for Priority 3 source protection. The locations of PDWSA in the south-west of WA are shown in Appendix B.

Development proposals in declared Waterways Management Areas and near conservation lakes and wetlands must not constitute a threat to the ecology or aesthetic values of sensitive waters, or the stability of their bed and banks. The Avon River, Albany Waterways, Leschenault Inlet, and Wilson Inlet (and their respective catchment areas), and the Peel Inlet’s environs are declared Waterways Management Areas (see Appendix B).

The WRC employs a risk-based approach to assessing development proposals. Proposals are assessed against both industry best practice and acceptable precedents to ensure practicality and consistency. Conditions may be recommended based on local conditions to ensure development proposals are compatible with values present in the surrounding environment. These guidelines draw on information from previously approved feedlots in WA. WRC / DEP recommendations or conditions will normally be imposed via local government development approval processes and/or Environmental Protection Act regulatory measures.

2.5 Information required

In submitting an initial proposal to the local government (and the state agencies if required) the following information should be provided:

- A brief description of the project, including land area and the maximum number of cattle to be lot fed at any time;
- A plan of the property on which the feedlot is to be located, showing boundaries, the location of existing facilities and proposed improvements including treatment and disposal facilities;
- A map showing any neighbouring dwellings within 1000 metres of the feedlot site, any patches of remnant vegetation, any bores, wells, wetlands, surface water, drains or water courses within 500 metres of the feedlot, and any areas of land to be used for waste disposal;
• A description of land form, soil types and contours (or details of land slope) and (if applicable) groundwater depth, quality and flow direction;

• Details of on-site drainage and waste and stormwater handling facilities (see section 4.4.1). This should include details of rainfall, evaporation and infiltration and runoff factors;

• Identification of 1 in 100 year flood level (generally available from WRC), or areas of flood prone land (feedlot work areas need to be above this level);

• Details of waste quantities produced (see section 4.2), the method of treatment, recycling, and disposal;

• Details of the land area to be used for waste disposal and a description of the land form, including areas used for cropping and the cropping regime (see sections 4.3 and 4.4); and

• Identification of any aboriginal archaeological sites or other significant areas.

The information provided does not have to be professionally drafted, but must be clear, unambiguous and provide an understanding of the proposed treatment and control methods.

Proposals to establish or expand a feedlot in sensitive environments, including those listed below, will require additional information. This information ensures that all aspects of nutrient and waste management are considered. Additional details are given in Appendix C. Some recognised sensitive environments are shown in Appendix B and include:

• Managed estuaries, e.g. the Peel-Harvey and Swan-Canning catchments;
• Protected lakes e.g. the Yalgorup Lakes catchment, incorporating Lakes Clifton and Preston;
• Public Drinking Water Source Areas; and
• Wetlands with recognised conservation values.

Other generic environments regarded as sensitive include:
• Land subject to seasonal flooding;
• Locations with buffer distances less that those shown in Table 3; and
• Locations with areas having land slopes greater than 10%.
Figure 1. Approval process for cattle feedlots.
(Note: If the feedlot may have significant environmental impacts, the proposal should be referred to the EPA).

A. Small feedlots

Local government consults with DEP/WRC

Proposal is submitted to local government

Proposal is consistent with planning provisions and these guidelines

Local government approves feedlot

Proposal is inconsistent with planning provisions, these guidelines or environmental concerns of DEP/WRC

Proposal refused

B. Large feedlots

Proposed or expanded feedlot is over 500 head and over 50 head/ha

Proposal is submitted to DEP/WRC

Proposal is submitted to local government

Local government and DEP/WRC may refer proposal to EPA

Proposal is not environmentally acceptable

Proposal approved

Proposal is not consistent with local planning provisions

Proposal refused

Proposal is consistent with local planning provisions

Under 100 m from water body - EP Act Works Approval and License

Over 100 m from water body - EP Act Works Approval and Registration
3.0 Local planning issues and site selection

Feedlots must be located and operated so that they are compatible with expectations of the area’s land uses. In particular, feedlots must not produce undesirable emissions such as noise, dust and odours that exceed appropriate levels for the area.

3.1 Local planning

New feedlots should not impact on areas zoned residential. Similarly, rural land should not be rezoned to residential close to established feedlots.

This recommendation is based on the principle of compatible land use.

Compatible land use means that feedlot activities do not conflict with, or disadvantage, the occupiers of neighbouring land. Conversely, the neighbouring land uses do not restrict the practices necessary for the feedlotter to maintain a viable commercial operation employing good land use practice.

The local government’s town planning scheme will determine locations where a cattle feedlot may be considered.

The issues of noise, dust and odour can cause conflict between feedlot operators and residents living too close to feedlots. A rural land use strategy will identify potential long-term conflicts, and ensure that they are avoided or managed satisfactorily. Appropriate planning and management practices can avoid or resolve conflict and impacts.

There are also potential adverse environmental impacts of wastes from cattle feedlots on water resources. These include:

- excessive release of nutrients, often causing algal blooms in surface water;
- introduction of harmful micro-organisms eg. bacteria and protozoa to water bodies;
- suspended solids in waterways;
- depletion of oxygen and production of noxious odours following the death of aquatic biota and the decomposition of organic matter;
- loss of beneficial use of the water resource (eg. increased nitrate concentration in groundwater used as a public drinking water supply source).

In Western Australia, groundwater resources are a major source of water supply for human drinking water, stock, irrigation, industry and domestic gardens. Nearly 70% of all water used and 40% of Perth’s public drinking water comes from groundwater. The rest is from surface water catchments. Shallow unconfined groundwater and surface water sources are particularly vulnerable to contamination.

The WRC can provide further information about protecting water resources.

Levels of undesirable emissions or pollutants decrease or are diluted, with increasing distance from a source. The distance where emission levels are considered acceptable is called a buffer distance or separation distance (EPA, 1997). The recommended minimum separation distances between feedlots and a number of sensitive environmental or community features are summarised in Table 3. These are minimum distances, and larger separation distances may be desirable in some circumstances.

In assessing a feedlot, the local government will consider the size or capacity of the feedlot, animal stocking density, soil types, annual rainfall, topographical features, vegetated buffers and the presence of adequate and sustainable separation distances to sensitive environments.

Other planning issues that should be considered include:

- the amount of traffic a feedlot business will place onto local roads;
- the proximity of dwellings on adjoining properties;
- the potential for dwellings to be developed on adjoining properties;
Table 3. Minimum separation distances between feedlots and sensitive landmarks

<table>
<thead>
<tr>
<th>Description</th>
<th>Separation distances</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groundwater table (wet season level)</td>
<td>1.5 m</td>
</tr>
<tr>
<td>Banks of water courses that flow intermittently</td>
<td>50 m</td>
</tr>
<tr>
<td>Property boundary</td>
<td>50 m</td>
</tr>
<tr>
<td>Private water supply bores and dams</td>
<td>100 m</td>
</tr>
<tr>
<td>Banks of permanent streams and rivers</td>
<td>100 m</td>
</tr>
<tr>
<td>Conservation wetlands (as identified by the Water and Rivers Commission)</td>
<td>200 m</td>
</tr>
<tr>
<td>Boundary of wetland vegetation around estuaries and lakes</td>
<td>200 m</td>
</tr>
<tr>
<td>Neighbouring isolated residences or public amenities</td>
<td>1000 m</td>
</tr>
<tr>
<td>Populated town site (residential areas)</td>
<td>5000 m</td>
</tr>
</tbody>
</table>

- appropriate planning controls to ensure compatible land uses are maintained; and
- any other considerations that the local government feels may be relevant to achieve the objectives of it’s town planning scheme.

3.2 Feedlot site selection

The site selected should be one that avoids adverse environmental impacts, and should minimise the need for expensive environmental protection measures.

The feedlot should be set out so that the appropriate separation distance or buffer is maintained. Table 3 provides guidance on the minimum separation distances. Separation distances may be varied where it can be demonstrated that there is no increased risk of adverse impact on the environment.

The feedlot should have access to sufficient land area to allow for environmentally acceptable solid and liquid waste disposal unless an off-site use acceptable to the local government and the DEP is available. Sections 4.3 and 4.4 contain further detail about waste management.

The feedlot should be located above the 100 year flood level (if identified), and above flood prone land in any case. The land should be gently sloping (between 2% and 5%) so that stormwater drainage and liquid wastes can be easily managed. Rocky and steep (greater than 10%) slopes are erosion prone and should be avoided.

Ideally, the feedlot site will be buffered by natural physical features, such as a hill, natural woodland, scrub or areas used for agriculture or forestry, which are generally not used by the public.

Pens and associated infrastructure, manure stockpiles, settling ponds and stabilisation ponds should not be sited within the minimum separation distances listed in Table 3. However, in some cases, a physical barrier between the feedlot and water body may make it possible for separation distances to be reduced.
4.0 Feedlot design and operational requirements

Feedlots should be designed and constructed to make optimal use of the conditions of the site to facilitate management of the day to day operations while minimising the impact on the environment and local residents or land users. Factors to be considered in designing the layout include topography, location of nearby waterways, surrounding vegetation and soil type, access to services, roadways, external visual access, rainfall and prevailing wind.

Feedlots must operate with the appropriate License, Registration and approvals and in accordance with any conditions imposed upon them by regulatory authorities. Operation as described in these guidelines will minimise the risk of conflict with neighbours and the surrounding community.

The Health Act 1911, gives local government responsibility to control a nuisance that may arise from the operation of a feedlot. In particular, there are regulations regarding pesticide use and fly eradication (see sections 4.8 and 4.11 respectively). Local health laws may impose further requirements on the operation of a feedlot. Complaints that may arise about smell, dust, noise or chemical spray drift from a rural property can also be referred to the Agricultural Practices Board, established under the Agricultural Practices (Disputes) Act 1995 (See Appendix A). The Board uses a process of communication between parties to resolve conflicts.

4.1 Feedlot layout and design

Feedlots should be designed so that they allow efficient management and feeding of the animals and efficient collection and treatment of all waste products, and minimise adverse impact on the community. Various important aspects of design and construction are briefly described in the following section. Excellent sources of more detailed information are the National guidelines (SCARM, 1997) and publications from other States (Department of Primary Industries, Queensland, 2000, New South Wales Agriculture, 1997, and Department of Agriculture Energy and Minerals Victoria, 1995).

Figure 2 is reproduced from the National Feedlot Guidelines and shows a desirable layout of a feedlot. A convenient layout is to have feedlot pens located on either side of a central laneway that can be used for distribution of feed and movement of animals to and from feedlot pens. The central laneway may be located at the highest point with the pens on a suitable down-slope.

Drainage design criteria are discussed in Section 4.4.

4.1.1 Pens

Pens should have a uniform slope of 2-5% away from the feed troughs to promote drainage of liquid waste and drying of solid waste. The pen surface should be erosion resistant and well drained. Some preparation such as grading and compaction and the addition of suitable clay, crushed limestone or gravel may be necessary to achieve the required result. The development and maintenance of a feedlot “pad” will greatly assist in management of feedlot pens. The pad is formed by the action of the animal’s hooves constantly compacting the manure deposited on the ground. The pad or interface layer builds up to form an impermeable layer, which limits contaminants from seeping into the ground below. The pad greatly assists in cleaning of pens but may be difficult to maintain in the wet conditions experienced in the south-west of Western Australia during winter.

Pens should be designed where possible to minimise pen to pen drainage. The choice of appropriate surface materials combined with good drainage, such as the use of graded drainage channels should reduce bogging during winter feedlotting.
In dry conditions, dust can be a problem where stocking density is too low. Urine and manure help prevent excessive dust, so higher stocking density may be required.

### 4.1.3 Mounds

Mounds may be used in feedlot pens to provide cattle with a dry place to stand or lie down. They should not be necessary in well drained pens in dry conditions. However in wet conditions such as those prevailing during late autumn and winter in the south-west of Western Australia they provide a means of avoiding excessive bogg conditions in feedlot pens. Mounds should be constructed of compacted soil, and located well away from the feed and water troughs. Pen cleaning and pen drainage should also be considered when locating mounds. Several small mounds or long mounds are preferred to large mounds to aid drainage.
4.1.4 Feed troughs

Feed troughs should be designed and located to allow easy access of animals and minimise spillage of feed material and accumulation of spilt feed and manure around the base of the trough. The feed troughs should be located on the high side of the feedlot and run parallel to the contour. They should not be constructed down a slope. Troughs are best constructed directly onto the ground with fencing incorporated into the trough. Vertical sides are preferred. These features minimise build up of waste material and facilitate cleaning. Roofing over the feed trough area should be considered to prevent food spoilage and provide shelter for the animals.

4.1.5 Feed trough aprons

The area near the feed trough is one of high cattle density and a potential problem area for development of holes that can lead to the accumulation of moisture and manure. An apron capable of withstanding heavy traffic should extend 2.5 - 3.0 metres from the feed trough. It is best constructed of reinforced concrete or compacted gravel or rock to ensure a permanently durable surface. The apron should slope (at least 2%) away from the feed trough. The area adjacent to this apron may need special attention and filling to prevent the formation of holes.

In some feedlots, particularly opportunity feedlots which operate on an occasional basis, temporary feeding facilities such as self feeders may be used without the construction of a concrete or compacted apron. In this case formation of holes may be prevented by frequent relocation of the feeder.

4.1.6 Water troughs

Water troughs should be placed well away from the feed troughs in an area that allows drainage directly from the pen during cleaning or spillage. They should have adequate capacity and size to meet the demands of the number of animals kept in the pen. A minimum of 30 mm length trough space per head is required. The water supply should be clean and fresh for maximum animal performance. Water requirements vary according to size and environmental conditions from as much as 70 litres per head per day in hot weather to as little as 30 litres per day in cold weather.

Water troughs should be designed in a similar way to feed troughs to allow easy cleaning and to minimise the opportunity for accumulation of manure. Water troughs also require an apron similar to feed troughs and electric or conventional fencing may be necessary to prevent stock climbing into the trough.

4.1.7 Laneways

Access ways and laneways are constructed to facilitate distribution of feed to feeding pens and minimise wastage of feed. They may also be used for movement of stock. They should be constructed to allow all-weather access and minimise the generation of dust. Drainage from laneways should be directed away from feeding pens.

4.1.8 Fencing

Fencing should be capable of controlling the stock and should be designed to allow for cleaning of pens. A clearance of approximately 350 mm from ground level will allow easy cleaning of material accumulated along the fenceline.

4.1.9 Shade

Shade from trees or artificial shade cloth structures should be provided where cattle need protection from extreme weather conditions likely to cause heat or cold stress. If feed troughs are covered, extra shade is essential to prevent stock monopolising the area around the feed trough and preventing access of other cattle. Shade areas need to be carefully designed so they do not create a problem due to overcrowding in the shaded area. Shading may also prevent drying and lead to boggy conditions that produce odours especially in higher rainfall areas during winter in the south-west of Western Australia.
Where high temperatures persist alternative cooling means, such as water misters or sprays, should be considered.

### 4.2 Feedlot waste characteristics

Cattle in feedlots produce large quantities of liquid and solid wastes. Wastes include fresh manure (faeces and urine), decomposed manure (on the pen floor and in stockpiles) and fresh or stored feedlot run-off.

Beef cattle wastes consist of approximately 70% faeces (20 - 30% as dry solids) and 30% urine (3 - 4% as dry solids) and are produced at the rate of 5 - 6% of body weight per day. On average each 450 kg lot-fed animal produces up to 30 kg of solid and liquid waste each day. The waste contains high concentrations of putrescible organic matter, nitrogen, phosphorus, microorganisms and total solids. Table 4 shows the typical pH and nutrient content.

The waste also contains salts. The level of salts present depends on whether additional salts are included in the feed ration.

A major problem in feedlotting is disposing of the large quantities of solid waste and, in periods of heavy rainfall, liquid waste. Stormwater run-off from uncovered feedlots and seepage of contaminants from these sites has great potential to pollute surface water and groundwater.

Waste products must be disposed of so that they do not cause any significant contamination of surface or underground water resources and do not cause offence to residents in the vicinity. A waste management system should form part of the overall feedlot management plan. Ideally all waste products will be incorporated into a crop or pasture production system without any long-term adverse effects on soil fertility or structure. The use of feedlot wastes to supplement the nutrient requirements of pasture and crops is an environmentally acceptable practice, if managed effectively to minimise potential impact to water quality and public amenity.

#### Table 4. Characteristics of feedlot wastes - organic and nutrient concentrations

<table>
<thead>
<tr>
<th>Analyte</th>
<th>Fresh Manure</th>
<th>Pen Manure</th>
<th>Stockpile Manure</th>
<th>Pond Effluents</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>7.0</td>
<td>6.4</td>
<td>6.9</td>
<td>7.4</td>
</tr>
<tr>
<td>Total Nitrogen</td>
<td>5.9 g/kg</td>
<td>21.5 g/kg</td>
<td>20.4 g/kg</td>
<td>700 g/L</td>
</tr>
<tr>
<td>Ammonium-Nitrogen</td>
<td>1.5 g/kg</td>
<td>0.75 g/kg</td>
<td>1.0 g/kg</td>
<td>No data</td>
</tr>
<tr>
<td>Total Phosphorus</td>
<td>1.6 g/kg</td>
<td>7.3 g/kg</td>
<td>8.1 g/kg</td>
<td>100 g/L</td>
</tr>
<tr>
<td>Biochemical Oxygen Demand (BOD)</td>
<td>27 g/kg</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


1 Pen manure is fresh manure that has accumulated on the feedlot floor.
2 Stockpile manure is manure that has been scraped from the pen floor and placed in a stockpile or compost heap.
3 Pond effluent is water that has been stored in a retention pond or stabilisation pond for some time, so that the settling of solids has occurred.
4.3 Solid waste management

**Principles:**
- Prevent contamination of surface or groundwater resources; and
- Prevent dust, breeding of flies and offensive odours.

4.3.1 Removal and storage of solid waste

Most of the manure from cattle lot-fed in paddocks for relatively short periods is incorporated into the soil and the cattle should be periodically rotated between paddocks to ensure the manure loading is not excessive.

Manure from intensive feedlots, where the cattle are confined in high densities or on hard stand for extended periods, should be scraped up and removed as necessary. The frequency with which pens are cleaned will depend on factors such as the stocking density and the size of the animals.

Manure should be stored in a stockpile on an impervious surface where water from rain, sprinklers or surface drainage cannot access the manure (or where any run-off drains back to holding ponds). Manure can be stored for an extended period until it is used on the farm (see Section 4.3.2) or is removed off-site for use or disposal in a manner approved by the local government and DEP. A low moisture content in the manure will minimise odour and generation of leachate.

Aerobic composting of the manure (in turned piles or rows) may be used to stabilise the waste and reduce the incidence of disease-causing organisms. Feedlots that produce more than 1000 tonnes per year of compost require a license from the DEP.

Off-site disposal of solids requires local government approval, after advice from the DEP and the WRC.

4.3.2 Disposal of solid waste over land

The soil where solid feedlot waste is to be spread needs to be suitable for, and able to sustain, the agronomic regimes proposed. The disposal area also needs to be able to accommodate the water, nutrient, salt and organic loads involved.

Table 5. Maximum phosphorus and nitrogen application rate criteria to protect water quality

<table>
<thead>
<tr>
<th>Vulnerability Category</th>
<th>Soil Description</th>
<th>Max available Phosphorus (as P) loading (kg/ha /yr)</th>
<th>Max available Nitrogen (as N) loading (kg/ha /yr)</th>
<th>Maximum manure application rate (t/ha/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Coarse sandy soils / gravels (PRI&lt;10) draining to surface waters with mod/high risk of eutrophication.</td>
<td>10</td>
<td>140</td>
<td>1.2</td>
</tr>
<tr>
<td>B</td>
<td>Coarse sandy soils / gravels (PRI&lt;10) draining to waters with a low risk of eutrophication.</td>
<td>20</td>
<td>180</td>
<td>2.6</td>
</tr>
<tr>
<td>C</td>
<td>Loams / clay soils (PRI&gt;10) draining to waters with mod/high risk of eutrophication.</td>
<td>50</td>
<td>300</td>
<td>6.1</td>
</tr>
<tr>
<td>D</td>
<td>Loams / clay soils (PRI&gt;10) draining to waters with a low risk of eutrophication.</td>
<td>120</td>
<td>480</td>
<td>14.7</td>
</tr>
</tbody>
</table>


1. Phosphorus is the rate-limiting nutrient. Maximum manure application assumes no additional nutrient sources (eg. fertilisers)
2. PRI means phosphorus retention index.
Land application should be timed to promote most benefit to site vegetation and minimise leaching of nutrients to surface water and groundwater.

- Putrescible organic waste loading to land should be controlled to limit problems with odours, flies and vermin.
- Solid waste should not be spread on land within the minimum buffer distances (from water resources) listed in Table 3.
- Where approval has been granted to deposit solid waste on land with reduced buffer distances, monitoring may be required to ensure that unacceptable leaching of nutrients or odour emissions do not occur.
- Manure should be incorporated into the soil where possible. Otherwise, manure should be spread evenly over the land surface using a manure spreader of suitable design. Conditions conducive to fly breeding must be avoided.
- The application of nutrient-rich wastes and fertilisers should not exceed the total nutrient load outlined in Table 5. The nutrient loading to land is a cumulative loading from all sources, i.e. solid manures, liquids and any artificial fertiliser added.
- Vegetation cover should be maintained on the disposal area to prevent soil erosion and to enhance nutrient uptake.

Producers wishing to have soil or waste material analysed for nitrogen and phosphorus can contact the Department of Agriculture for advice.

4.4 Liquid waste management

Principle:

- Nutrient-rich wastewaterv should not contaminate any surface water body or groundwater resource.

4.4.1 Removal of liquid waste

Clean stormwater should be channelled away from the feedlot area, using bunds, culverts or drains, to ensure it does not become contaminated with manure or urine.

Any contaminated water from areas outside the feedlot, including stormwater run-off, should (wherever possible) be directed via drains to a settling pond lined with very low permeability clay or plastic. This water should then be suitable for discharge to an irrigation area.

Run-off from the feedlot should be collected in a drainage channel, with sufficient cross-section to handle the 10-year peak flow resulting from a one-hour storm. Refer to The Institution of Engineers, Australia (1987). To prevent effluent being washed into a watercourse, all contaminated flows should be directed to stabilisation ponds for treatment before being spread over land by tanker or irrigation.

Where liquid and solid waste combine and drain to a pond, effluent treatment is recommended using a multi-pond stabilisation system, incorporating anaerobic and aerobic treatment. Such systems are described in Appendix D.

4.4.2 Storage of liquid waste

Settling ponds

- Where possible, solids and larger suspended matter should be removed from the effluent stream by the use of coarse screening equipment prior to entering a settling pond.
- The capacity of any settling pond should provide adequate retention time for entrained solids to settle out (one and a half to two hours are normally satisfactory).
- For feedlots without roof or cover, the capacity of the settling pond should not be less than 15 litres per square metre of feedlot area (in the south-west of WA).
• At least 600 millimetres of free board should be provided to prevent stormwater overflowing from the pond.

The outflow from the settling pond should be conveyed either to a holding pond before irrigation over land or to wastewater stabilisation ponds. Wastewater with Biochemical Oxygen Demand (BOD)\(^2\) concentration exceeding 150 mg/litre normally requires further biological stabilisation in an anaerobic or facultative pond (see Appendix D).

Captured solids should be applied to land in a sustainable manner using crop nutrient needs and status of soil as outlined in Section 4.3.2. The nutrient loading to land is a cumulative loading from all sources, ie. solid manures, liquids and any artificial fertiliser added.

**Volume of storage/treatment ponds**

Ponds should have sufficient capacity to retain a 10-year return frequency 72-hour storm event using a run-off coefficient of 0.8 for the feedlot pens and associated works (see The Institution of Engineers, Australia, 1987). Ponds should also be capable of retaining all the captured stormwater from the feedlot in a 90 percentile wet year.

**4.4.3 Disposal of liquid waste over land**

**Principle:**

• Wastewater irrigation should not contaminate any surface water body or groundwater resource.

In some instances, it may be possible to retain all liquid waste for evaporation in shallow ponds. Liquid waste can be disposed of raw or after treatment (eg. by ponding). Treatment will reduce the BOD of the effluent and will allow the waste to be applied over a much smaller area due to reduced odours.

The waste disposal area should be located so that it is consistent with the buffer distances defined in Table 3 (Section 3.1). Where wastewater is irrigated over aquifers, monitoring may be required to allow early detection and management of adverse environmental impacts.

The area required for irrigation should be determined by whichever of the following becomes the limiting factor (usually nutrient loads):

• organic loads should not exceed 30 kg BOD / ha / day (may cause offensive odours);

• the maximum water infiltration rates established under wet season conditions with high soil moisture conditions and low rates of evaporation (varies between 5 and 15 mm/hour depending upon soil permeability characteristics);

• the maximum soil holding and vegetative nutrient uptake ability (Table 5 & Appendix C). This precludes irrigation on almost all coarse sandy soils; and

• nutrient load from irrigated wastewater and solids (Tables 4 & 5).

Nutrient-rich wastewater should not be applied unless the soil nutrient status has been determined and the application of wastewater is consistent with the site irrigation management plan. High risk areas include those where:

• there is a recent history of heavy fertiliser application;

• animals have been held at high stocking densities; or

• other sources of nutrients have been discharged on-site over an extended period of time.

Sufficient land disposal area should be available for a 10 to 14-day rest period between applications on any given part of the area, the

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\(^2\) BOD - Biochemical Oxygen Demand. A measure of the amount of oxygen taken up by biochemical processes during breakdown of organic matter in the environment.
objective being to alternate between anaerobic and aerobic conditions in the top layer of soil. Shorter periods may be acceptable under dry summer conditions. Crops or pasture should be maintained to take up as much as possible of the nitrogen and phosphorus from the wastewater to prevent pollution of any ground or surface waters and minimise erosion.

4.5 Irrigation application methods

Irrigation systems may include:

*Flood irrigation* - suited to heavy soils with infiltration rates less than 10 mm/hour.

The effluent is distributed from pipe outlets or channel syphons and allowed to run evenly over a vegetated surface. Suitable land for flood irrigation should have a gentle slope of 0.5 to 1% with a tail-water collection drain for collecting the run-off and pumped return to the holding pond. Sufficient vegetated area should be provided to avoid surface erosion and ensure that residues in any discharged tail waters do not contaminate local surface waterways.

*Sprinkler irrigation* - suited to permeable soils with an infiltration rate of at least 10 mm/hour.

Usually untreated effluent is unsuitable for sprinkler irrigation, but treated effluent from an anaerobic/aerobic pond system is sufficiently free of solids for pumping through sprinklers. Methods commonly used include fixed sprinkler systems, moveable sprinkler systems or self propelled irrigation systems.

*Trickle irrigation* - generally not suitable for effluent, due to clogging problems, but may be used with filtered effluent from anaerobic/aerobic pond systems. Experience with sand filters suggests that trickle irrigation will block up.

4.6 Odour control

Odour can be a major problem with cattle feedlots if appropriate control measures are not undertaken. Odours are produced by feedlots through decomposition of manure and spilt feedstuffs. They are particularly noticeable where waste is stored before treatment or where treatment systems become overloaded. The proximity of cattle feedlots to urban areas (especially upwind), the number of cattle, climatic conditions and the management of waste products are factors that influence the production of unpleasant odours and the likelihood of complaints.

The following techniques should be considered to reduce odour problems:

- maintain low stocking densities especially in high rainfall areas;
- clean pens regularly to avoid excessive accumulation of manure in feedlot pens;
- maintain cleanliness in feeding facilities and avoid accumulation of spilt feed and manure around feed and water troughs and under fencelines;
- spread manure as often as practicable after collection;
- spread manure evenly in a pre-planned manner avoiding patchy distribution on pasture or cropland;
- incorporate manure into soil on cropping areas as soon as practicable after application;
- apply manure early in the day (i.e. late morning) when air is warming and rising and diluting odours, rather than late in the day when air is settling, cooling and concentrating odours;
- spread manure on a cool day when odour production is lower; and
- spread all the manure in as short a time as possible.

Whenever possible, avoid spreading manure on the weekends or holidays particularly on sites with holiday-makers nearby. Spread manure on still days when wind will not carry odours or manure particles into public places, roads or neighbouring land.

4.7 Dust control

Feedlots with cattle at low stocking densities can become very dusty during summer and cause a
nuisance to neighbouring properties. In addition, stock trucks entering and leaving the feedlot, especially early in the morning or late at night, can annoy nearby residents and cause dust problems on unsealed roads.

The following techniques should be considered to reduce dust problems:

- maintain pen surfaces to remove loose manure build up;
- encourage development of a hard surfaced feedlot pad;
- water internal roads and other trafficked areas within the confines of the feedlot as required;
- use soil amendment, water sprays or water cannons for dust control in pens;
- maintain grass cover where possible around the feedlot site; and
- plant trees as windbreaks in appropriate positions to reduce impact of prevailing winds.

4.8 Pesticide and other chemical use

Pesticides and other agricultural chemicals may contaminate water resources including drinking water if not properly managed.

Some of these chemicals are very slow to degrade and can remain in the environment for long periods. They also have the potential to be transported in the environment in the same way as nutrients. Application near rivers and wetlands should be carried out in accordance with directions provided by the manufacturers, Department of Health and Department of Agriculture.

The use of biological and other biodegradable pesticides should be investigated as alternatives to long-life synthetic chemicals.

Application of pesticide and / or other chemicals near rivers and wetlands should be carried out in a manner that avoids contamination and prevents environmental damage. Target specific chemicals should be used where possible. Taking account of weather and environmental conditions and using appropriate buffer zones near water bodies will minimise the risk of contamination.

A Code of Practice for the use of agricultural chemicals in Western Australia (Rutherford, 2001) provides guidelines for the safe and environmentally responsible use of pesticides and other farm chemicals. In addition a one day training course (ChemCert) is available in the use of agricultural and veterinary chemicals. Information about this course is available from agricultural chemical suppliers or from the ChemCert Coordinator (see Appendix F).

The following procedures will assist in the environmentally safe use of pesticides and chemicals.

- A contingency plan should be developed to manage accidental spills in PDWSA. The plan should include notification of Fire and Rescue WA if the spill is serious.
- Pesticide containers should be stored in a weather-proof and fire resistant building that is maintained in good condition. Pesticide containers should be stored on an impermeable base, such as sealed concrete. The storage and handling areas should have either a perimeter bund, or slope inwards to a central grated sump to fully contain spills and facilitate clean-up. Ideally, the handling area should be roofed to exclude rainfall.
- When preparing sprays, empty pesticide containers should be triple rinsed to remove pesticide concentrate. Add rinse water to the sprayer mixing tank.
- The AVCARE brochure ‘Preparing Farm Chemical Containers for Safe Disposal’ should be followed.
- Unused pesticide and contaminated disposable equipment should be disposed of outside any PDWSA and in accordance with the Health (Pesticides) Regulations 1956. If they are left lying around with chemical residues, contamination or even poisoning of people, stock or crops may occur.
• Do not burn or bury pesticide containers on
  the farm.

• Operators should contact their local
government for details of the ‘DrumMuster’
program. DrumMuster is the collection
scheme for non-returnable rigid metal and
plastic containers used in the packaging of
crop production products and animal health
products.

The Health (Pesticides) Regulations 1956 may
be applicable where pesticides are used in
association with feedlots.

4.9 Noise control

The premises should be operated so that noise,
excluding vehicle movements, does not exceed
levels recommended by the DEP for those
premises. Vehicle movements should be timed
and routed to minimise noise.

The operation of the cattle feedlot should be in
accordance with the noise levels specified in the
Environmental Protection (Noise) Regulations
1997. In the first instance further advice
regarding appropriate noise levels should be
sought from the relevant local government.

4.10 Visual impact

Careful siting of feedlots and the use of trees
and shrubs or land forms will minimise
problems. Dense shelter belts should be planted
to screen the areas from public view and may
also be useful as a windbreak or to help control
dust. Careful selection of tree species and
planting location is necessary to ensure that they
do not provide unwanted shade over the feedlot
pen area.

4.11 Fly and vermin management

Flies can be a major nuisance associated with
the keeping of livestock. Fly breeding,
particularly the stable fly, has become a
significant problem associated with manure and
organic waste. The first step in controlling flies
is to eliminate the breeding sites: manure, organic
waste, wet or damp areas, poorly managed
compost heaps and drainage areas. Further
details on managing the fly problem are available
in Agriculture Western Australia and Health
Department of Western Australia, (1999)

The cattle feedlot industry is generally not
sufficiently intense to create stable fly breeding
situations. However, there have been a number
of outbreaks of stable fly that have been
associated with vegetables being fed to livestock.
Where vegetable waste is fed to cattle, it should
be confined in feed troughs and prevented from
being scattered and mixed with cattle manure
and other waste feed.

Rodents such as rats and mice are one of the most
widespread and destructive pests in the world.
They eat and contaminate vast amounts of food,
damage buildings, and spread numerous
diseases. To effectively ward off rodent
infestations, constant vigilance is necessary. Rats
and mice can be destroyed or controlled by a
vigorous campaign consisting of good sanitation,
spillage management and feed storage
management.

4.12 Dead stock management

Delivery of dead animals to a rendering plant is
the preferred disposal method. However, in many
areas of the country, a rendering service is not
available. Cattle owners should then use burial
pits for disposal of dead animals in accordance
with local government requirements. They
should be sited and constructed as follows:

• locate the pit at least 100 metres from wells,
domestic water bores, streams and surface
water bodies;
• use areas with clay soil if possible;
• construct the pit so that the bottom is at least
1.5 metres above seasonal high water table;
• pits should be covered with a minimum of
one metre of earth after use; and
• distribute pits throughout the property, if more
than one pit is required.

On-site burning of carcases should only be
conducted in accordance with authorised disease
control measures.
4.13 Impact of vehicles

Consideration should be given to access to the premises by stock trucks or road trains, ensuring that they have sufficient room to manoeuvre without endangering or obstructing other traffic.

Where a truck washdown facility is provided, all drainage should be directed to a settling pit or contained within the feedlot area.

Note also section 4.9 which considers noise control.

4.14 Fuel Storage

Fuel containers exceeding 200 litres capacity should be stored in a manner that will prevent escape of contents to the environment in the case of accidents. Where sites have permeable soils or are located close to sensitive water resources (eg PDWSA, streams or wetlands) fuel containers should be stored in a secure weatherproof building or within a secondary containment compound. The containment compound should be able to contain 110% of the maximum volume of fuel stored, and capture any fuel jetting from fittings or delivery hoses. The containment may be constructed of rigid water-proof material eg rendered masonry on a graded reinforced concrete slab or tested flexible membrane such as high density polyethylene.

Proposals for above ground fuel storage systems in PDWSA need to be assessed by the WRC prior to Department of Minerals and Petroleum Resources approval. The proposal should include:

• a site plan showing the location of the facility;
• construction details of tanks and their associated containment compounds; and
• an inspection and maintenance schedule for the facility to ensure effective containment of fuels.

4.15 Animal Welfare

It is the responsibility of feedlot owners and managers to care for the welfare of animals under their control. This applies not only while animals are in the feedlot but also while they are in transit to and from the feedlot. There are two animal welfare codes that are relevant and should be followed by feedlot operators.

The first is the *Australian Model Code of Practice for the Welfare of Animals - Cattle* (Standing Committee on Agriculture, 1992). This includes a section on intensive cattle systems and deals with housing, space and accommodation of animals. It also includes (as Appendix 2) the Australian Lot Feeders’ Association Code of Practice: Cattle Welfare in Feedlots, which deals with livestock management, feeding management and yard management as well as animal health issues.

The other welfare code is the *Australian Model Code of Practice for the Welfare of Animals - Land Transport of Cattle* (SCARM, 1999) which should be followed in the transport of cattle to and from the feedlot.
Appendix A - Legislative requirements

The following Acts are applicable to the establishment and operation of feedlots in Western Australia.

Environmental Protection Act 1986

The *Environmental Protection Act 1986* is the primary legislation for the protection of the environment and control of pollution.

It is specifically ‘...an Act to provide for an Environmental Protection Authority, for the prevention, control and abatement of environmental pollution, for the conservation, preservation, protection, enhancement and management of the environment and for matters incidental to or connected with the foregoing.’

The Act provides a number of mechanisms for preventing and controlling pollution. Particularly relevant to the cattle feedlot industry are:

- Part IV of the Act requires the environmental assessment of proposals ‘likely, if implemented, to have a significant effect on the environment’; and
- Part V of the Act provides pollution control mechanisms for prescribed industrial or other premises with significant potential for pollution of air, land or water. These include Works Approvals, Licensing and Registration.

An application for a Works Approval will be examined initially under Part V of the Act. If it appears that there may be an adverse impact on the environment the proposal will be forwarded to the EPA for consideration under Part IV of the Act. Alternatively, the proponent, local authority or others, may refer any new proposal directly to the EPA for consideration. Following completion of Part IV assessment and approval, the proposal will be sent to the DEP’s Licensing Branch for processing of the Works Approval. Once the conditions of the Works Approval have been met, the applicant can apply for a License or Registration.

A License may not require any further information than was provided for the Works Approval. The License may contain conditions intended to minimise discharges to the environment and prevent pollution. The Registration process involves only the provision of information about the occupier and the location of the premises.

Once proposals are submitted the DEP must observe certain timeframes. The DEP should be contacted for further details on fees associated with Works Approvals, Licenses and Registrations.

Water and Rivers Commission Act 1995

The *Water and Rivers Commission Act 1995* has a number of subsidiary Acts and by-laws (detailed below) to protect water resources that may influence the location and operation of feedlots. The Act is administered by the WRC.

Public Drinking Water Source Areas

The quality of the domestic water supply sources is protected within PDWSAs. The by-laws under the *Metropolitan Water Supply, Sewerage and Drainage Act 1909* and *Country Area Water Supply Act 1947* enable the WRC to control potentially polluting activities, to regulate land use, inspect premises and to take steps to prevent or clean up pollution.
The WRC uses a three-tiered priority classification system to manage land within PDWSA.

Priority 1 (P1) and 2 (P2) source protection areas are defined over land where the provision of public drinking water is the prime beneficial land use (P1) or a high priority (P2). Feedlots are incompatible with the water management objectives of P1 and P2 source protection areas. An example of a P1 area is Crown land on the Gnangara groundwater mound. An example of a P2 area is rural land in the Moora Water Reserve.

Priority 3 (P3) source protection areas are defined to minimise the risk of pollution to the water source. P3 areas are declared over land where public water supply needs to co-exist with other land uses such as residential, commercial and light industrial developments. Protection of P3 areas is achieved through permit conditions and guided management.

Feedlots are a restricted land use in P3 areas, and may be subject to conditions to protect water resources. Approval is required from the WRC. The WRC may oppose the establishment of cattle feedlots in P3 areas, if it considers that the activity poses a significant risk to water resources.

In addition to the priority classification system, well-head protection zones and reservoir protection zones are defined to protect the water source from contamination in the immediate vicinity of production wells and reservoirs. Feedlots are incompatible land uses in these areas, so the establishment of feedlots is not permitted.

Proponents should contact the WRC for more information.

**Declared Waterways Management Areas**

Under the provisions of the *Waterways Conservation Act 1976*, the WRC has a conservation function and associated planning and pollution control powers in declared management areas. Development proposals in declared management areas must not constitute a threat to waterways, or the stability of their bed and banks.

The Avon River, Albany Waterways, Leschenault Inlet, and Wilson Inlet (and their respective catchment areas), and the Peel Inlet’s environs are declared Waterways Management Areas.

Proponents should contact the WRC for more information.

**Water allocation**

Under the *Rights in Water and Irrigation Act 1914*, proponents must obtain a License from the WRC if they intend to source water from a proclaimed Groundwater Area or Surface Water Area or from artesian sources.

Proponents should contact the WRC for more information if they are sourcing groundwater or diverting or pumping water from waterways.

**Swan River Trust Act 1988**

The Swan River Trust is the statutory approval authority for all development and activities occurring within the Trust’s management area. Any new development proposals occurring within the Trust’s management area (generally the waters of the Swan and Canning River systems and their banks) must be submitted to the Trust, who will assess the proposal and make recommendations to the Minister for the Environment and Heritage who then makes a determination.
Town Planning and Development Act 1928
The Town Planning and Development Act 1928 gives local government the responsibility to prepare statutory planning schemes (which may include town planning schemes and rural strategies), for areas within its municipal boundaries. Town planning scheme requirements vary between local governments and therefore it is possible for local governments to have different conditions for establishing and operating feedlots.

A land use map may be viewed at the Council offices and the zoning of the proposed area determined.

Health Act 1911
The Health Act 1911 gives local government responsibility to control a nuisance that may arise from the operation of a feedlot.

The Fly Eradication Regulations will enable control in regards to flies, especially stable flies. The Health (Pesticides) Regulations 1956 may be applicable where pesticides are used in association with feedlots.

Aerobic and anaerobic ponds used to treat liquid wastes and the irrigation of liquid wastes from such ponds requires the approval of the Department of Health.

Soil and Land Conservation Act 1945
The Soil and Land Conservation Act 1945 provides for the conservation of soil and land from the effects of erosion, salinity, flooding and eutrophication.

Land degradation is a significant cause of loss of rural production capacity. Land degradation includes the deterioration of natural or introduced vegetation, soil erosion, eutrophication of water bodies and flooding. These impacts may be detrimental to the present or future land use.

The legislation requires that appropriate land management practices are used to maintain the stability of the land in perpetuity.

Where a land holder causes land degradation and this is brought to the attention of the Commissioner of Soil Conservation, the Commissioner may, after consultation with the land holder, issue a Notice directing the land holder to rectify the situation.

Agricultural Practices (Disputes) Act 1995
Complaints about smell, dust, noise or chemical spray drift from a rural property should be referred to the Agricultural Practices Board, established under the Agricultural Practices (Disputes) Act 1995.

The Board has a wide range of expertise in local government, environment, agriculture and law.

The legislation is based on the principle that farmers must have the right to farm, while other rural people have the right to be protected from nuisance caused by unacceptable farming practices. Under the Act, an agricultural practice is considered to be normal if it is carried out and managed:

- Consistent with proper and accepted customs and standards, as established and followed in similar agricultural operations under similar circumstances.
- It complies with the requirements of a code of practice made or approved by the DEP or under any written law.
• Normal farm practice may include the use of innovative technology and management practices.
• The board may declare that an existing agricultural practice is a normal farm practice, even if it does not comply with existing environmental laws, however, such laws can only be waived for a maximum of two years.
• If a person carrying on an agricultural operation fails to comply with an order of the board, that practice may not be considered a normal farm practice.

When a dispute is referred to the Board, the Board will appoint a suitably qualified mediator to ensure both parties become fully informed of all the issues and sort out any misunderstandings, and resolve the conflict.

If mediation is unsuccessful, the Board may convene a formal hearing to determine if the “nuisance” constitutes normal farm practice.

If the Board considers the practice is normal, there is no further involvement from the Board.

If the practice is considered not to be normal, the Board may ask the farmer to alter the practice or cease it completely.

The Board’s decisions are not binding in a legal sense, however, they are admissible as evidence in civil proceedings.
Appendix B - Maps depicting environmental features in the South-West of Western Australia

These maps are presented to alert feedlotters as to the location of the various environmental features. The precise position of these features in relation to the feedlot and the potential impact should be checked with the relevant authorities.

Map1. Public Drinking Water Source Areas
Map 2. Declared Waterways Management Areas, conservation lakes and wetlands
Appendix C - Additional information required for proposals in sensitive environments

Additional information is needed for assessment of feedlot proposals in the following settings:

- Estuaries, the Peel-Harvey and Ellen Brook catchments;
- The Yalgorup Lakes catchment;
- Any Public Drinking Water Source Area;
- Wetlands with recognised conservation values;
- Within buffer distances less that those shown in Table 2; and
- Areas with land slopes greater than 10%.

Information needs are listed as follows:

**Water resources description**
- A brief description of any confined and unconfined groundwater aquifers beneath the site (define direction and magnitude of groundwater flow, seasonal variation, minimum depth to groundwater).
- A map depicting any conservation wetlands related to feedlot facilities.
- Details of any licensed use of water resources at the site.
- Data on local water resources quality, eg. pH, salinity, nutrients and metals.

**Nutrient management (nutrient use by vegetation)**
Sufficient nutrients should be applied to meet the on-site cultivated vegetation needs only. They should also be applied in a manner that is timely and minimises runoff or leaching losses.

- Identify vegetation species to be grown. Select vegetation species appropriate to the seasonal waste loads anticipated from the proposed activity.
- Determine fertiliser requirements during the establishment and operational phases of the project and assess technical advice on crop needs (eg. soil testing, plant tissue testing). Define nutrient needs for:
  - any planned short-term crops at various points in growth cycle,
  - any planned long-term vegetation, eg. trees based on seasonal needs.
- Outline the types and constituents of fertiliser proposed for application. Consider the use of any slow-release fertilisers or “fertigation” to match vegetation nutrient needs. Take into account the input of nutrients already present in irrigation water.
- Identify which areas of the site will be fertilised. Include information on quantity, frequency and method of application.
- Provide details of any off season water retention or runoff collection basins designed to hold water for recycling. Details of leaching, odour and algal controls should be included.

**Irrigation**
Efficient methods of irrigation not only lower water, power and maintenance costs but also minimise fertiliser leaching. Use of modern technology can permit well controlled and efficient irrigation systems.

- Outline quantity, quality and availability of the water source(s) to be used.
- Determine a water balance, i.e. seasonally how much water enters and leaves the site.
- Describe the irrigation methods, and how application will be managed to ensure water and nutrients will not be applied excessively.
• Define how irrigation will be scheduled to avoid runoff, excessive groundwater mounding and leaching. The schedule should incorporate regular monitoring of crop water usage and soil moisture status to match irrigation with crop requirements. The aim should be for a minimum of irrigation water passing beyond the plant root zone. Soil type, root depth and plant species uptake rate should be considered. The schedule should include the frequency, rates and timing (time of year and day) of applications.

• Outline how soil structure will be maintained. Intensive cultivation or use of salty irrigation water may harm vegetation and lead to dispersive or poorly drained soils, increasing the risk of runoff soil erosion and crop failure.

• Consider potential to recapture runoff from irrigated areas and recycle the water. The concentration of salts and toxins by evaporative processes may place limits on recycle systems.

**Drainage controls**
Drainage systems should be included in the design criteria where there is a risk of contaminated runoff.

• Outline the design and function of any artificial water bodies, which are proposed (eg. Waste stabilisation ponds, multiple use and purpose built wetlands, compensating basins).

• Incorporate perimeter bunds, contouring and / or filtration systems into design where potential exists for export of water off site via water bodies.

• Outline projected storm and surface water runoff rates and the volume and destination of surface runoff. Describe how site drainage will be affected by the development proposal. Will any storm water be diverted to storage? How are the effects of extreme storm events managed?

• Drainage design should incorporate the principles of water sensitive urban / rural design (Water and Rivers Commission (1998a)).

**Water resources protection**
Solid and liquid waste disposal can reduce surface and groundwater quality. Management options to prevent water resource contamination should be considered. Some options are:

• Amend sandy soils with iron rich loams to increase moisture retention and minimise leaching of nutrients. Describe any soil amendment program (eg. nature of amendment, application rate, incorporation method and depth). Provide design details of expected performance and effective life of the soil amendment program.

• Avoid areas where the seasonal depth to the water table is less than 2 metres.

• Construct leachate barriers that drain to collection basins.

**Vegetation management**
Careful management of vegetation can minimise nutrient loss.

• Provide a brief description of how vegetation will be maintained.

• What is planned to protect soil and water resources when any crop is harvested?

• Describe any remnant or other vegetation buffers along watercourses, property boundaries and on unused land.

• Specify windbreaks to reduce the amount of water used, stabilise sands and reduce wind erosion, particularly in horticultural activities.

• Explain management of the site to avoid soil compaction and salinity problems.
Pesticide use and storage
Some pesticides remain mobile and toxic in the environment. Such pesticides and sometimes their carrier solvents don’t degrade, and have the potential to be transported in the same way as nutrients. Application near rivers and wetlands should be carried out in accordance with manufacturers’, Department of Health and Department of Agriculture guidelines and be target specific where possible. Provide details of pesticides used:

- Outline form and type of pesticides, frequency, and rate of application.
- Discuss potential for site export and impact on non-target species.
- Provide details of secure chemical storage facilities.

Monitoring and reporting
Describe the monitoring system to be implemented. The monitoring program should:

- Determine the soil Phosphorus Retention Index (PRI) at annual intervals.
- Determine phosphorus and nitrogen concentrations in the soil and nearby water resources.
- Describe planned monitoring of water bodies that may be affected by irrigation seepage or runoff.
- Outline procedures for recording the use and rates of application of various artificial fertilisers.
- Determine whether application rates need altering on the basis of results from monitoring bores.

Records of data acquired in managing an irrigation area should be retained for a minimum of 5 years, for review or reporting where requested by government agencies.

Contingency plans
- Indicate steps that will be taken to minimise loss of chemicals to water resources in the event of
  - fire or storm damage;
  - accidental spillage and leakages of chemicals;
  - overflow or seepage from ponds used to store/treat contaminated water.
Appendix D - Multi-pond treatment and storage system

Waste stabilisation pond systems in series represent best management practice in rural areas from an environmental aspect. This is due to their reliability of operation, simplicity of maintenance and resilience to loading fluctuations. In catchments where environmental issues (eg. eutrophication of waterways) are a major factor, progression to best management practice should be the objective. This will minimise the risk from large storage ponds rupturing in a major storm event and discharging raw effluent into nearby streams and waterways.

Raw wastewater can be biologically treated effectively by a multi-pond system (Figure 3). In these systems, effluent enters the first (anaerobic or facultative) pond where solids settle and are broken down by microbiological organisms that thrive in the absence of dissolved oxygen. These ponds should be at least 2 metres deep and preferably 3-6 metres deep to minimise the surface area and provide capacity for solids accumulation as bottom sludge. A second anaerobic pond in parallel is sometimes provided to allow for periodic solar drying and sludge removal. This pond both stabilises manures and reduces suspended solids and nutrients in effluent flowing into the following (aerobic) pond.

The aerobic or facultative pond is shallow (normally 1.2 - 2.0 m deep), encouraging the penetration of sunlight and aeration of water by wind to maintain higher oxygen levels. These ponds depend on a large surface area to allow air from the atmosphere to be used by pond micro-organisms to continue the waste stabilisation process.

These systems operate best where there is a continuous flow-through of wastewater. They reduce the solids content of the effluent and make the resulting wastewater suitable for a wider range of uses, including reuse for wash-down of yards or application to pasture.

The level of treatment achieved is not sufficient to make the water suitable for discharge into any surface or ground water body and it must be contained or utilised on the farm.

If continuous, controlled application to growing pasture is not possible, some storage will be required. Either the aerobic second pond can be made big enough to provide sufficient storage and improve the level of treatment, or a third ‘polishing’/ holding pond can be constructed. The improved water quality from these systems allows application to pasture during dry periods. The downstream ponds are likely to contain algae in the warmer months, hence care needs to be taken to avoid blockages in any effluent irrigation systems.

The ponds should be managed to minimise salinity build up (periodically check electrical conductivity of effluent) which could affect the ability to use the water to irrigate pasture.

Aerobic and anaerobic ponds used to treat liquid wastes require the approval of the Department of Health, as does the use of treated effluent form these ponds for irrigation.
Figure 3. Multi-pond system

Notes:
1. **Anaerobic** ponds are deep ponds where micro-organisms that feed on wastes entering the pond rely on oxygen derived from chemical compounds present in wastewater to thrive. They operate best with high organic loads and warm water temperatures (greater than 25°C) and release methane and low quantities of carbon dioxide as by-products. They will generally have a surface crust that helps as an insulating blanket to maintain water temperature and limits the diffusion of oxygen from the air into the pond. Stabilised waste matter drops to the pond base as an organic sludge (that periodically needs to be removed).

2. **Aerobic** ponds are shallow (less than 1.2m deep) with a large surface area. They contain micro-organisms that stabilise wastes using dissolved oxygen produced by algae in the pond or oxygen drawn from the atmosphere. They mainly produce carbon dioxide and sludge as by-products.

3. **Facultative** ponds are a combination of the above types of pond, with aerobic processes occurring within the surface layer and anaerobic stabilisation processes occurring at depth.
Appendix E - References and further reading

Agriculture Western Australia and Health Department of Western Australia (1999). *Fly Breeding Associated with Horticulture and Livestock.*


Health Department of Western Australia (1994). *Code of Practice - Disposal of Pesticide Residues from Pesticide Spray Applications.*


Rutherford, P. (2001). *Code of Practice for the use of Agricultural and Veterinary Chemicals in Western Australia.* Department of Agriculture Western Australia, Bulletin 4527.


Appendix F - Useful contacts

Department of Environmental Protection and Water and Rivers Commission

Perth Office

(DEP) 141 St Georges Terrace,
Perth WA 6000
Telephone (08) 9222 7000
Fax: (08) 9322 1598

(WRC) Hyatt Centre, 3 Plain Street,
East Perth WA 6004
Telephone: (08) 9278 0300
Fax: (08) 9278 0587

Kwinana Peel Region

165 Gilmore Avenue, Kwinana WA 6167
Telephone: (08) 9419 5500
Fax: (08) 9419 5897

Cockburn Sound Management Council, Shop 1,
15 Railway Parade
Rockingham WA 6168
Telephone: (08) 9591 3837
Fax: (08) 9528 5387

Sholl House, Suite 8,
21 Sholl Street, Mandurah WA 6210
Telephone: (08) 9535 3411
Fax: (08) 9581 4560

North West Region

Lot 980 Cherratta Road,
Karratha Industrial Estate,
Karratha WA 6714
Telephone: (08) 9144 2000
Fax: (08) 9144 2610

Lot 225 Bandicoot Drive,
Kununurra WA 6743
Telephone: (08) 9168 1082
Fax: (08) 9168 3174

Mid-West Gascoyne Region

25 Forrest St, Geraldton WA 6530
Telephone: (08) 9964 5978
Fax: (08) 9964 5983

82 Olivia Terrace, Carnarvon WA 6701
Telephone: (08) 9941 4921
Fax: (08) 9941 4931

South Coast Region

5 Bevan Street, Albany WA 6330
Telephone: (08) 9842 5760
Fax: (08) 9842 1204

Suite 1, 55 Strickland Street,
Denmark WA 6333
Telephone: (08) 9848 1866
Fax: (08) 9848 1733

South West Region

Unit 2, Leschenault Quays,
Austral Parade, Bunbury WA 6230
Telephone: (08) 9721 0666
Fax: (08) 9721 0600

52 Bath Street,
Manjimup WA 6258
Telephone: (08) 9771 1878
Fax: (08) 9771 8108

Geocatch Network Centre,
Unit 2, Palm Court Arcade,
62 Kent Street, Busselton WA 6280
Telephone: (08) 9754 4331
Fax: (08) 9754 4335
ENVIRONMENTAL MANAGEMENT OF BEEF CATTLE FEEDLOTS IN WESTERN AUSTRALIA

Swan Goldfields Agricultural Region
7 Ellam Street, Victoria Park WA 6100
Telephone: (08) 6250 8000
Fax: (08) 9250 8050

254 Fitzgerald Street, Northam WA 6401
Telephone: (08) 9622 7055
Fax: (08) 9622 7155

Swan Catchment Centre,
80 Great Northern Hwy,
Midland WA 6056
Telephone: (08) 9374 3333
Fax: (08) 9374 0685

Department of Agriculture, Western Australia

Perth
3 Baron-Hay Court,
South Perth WA 6151
Telephone: (08) 9368 3333
Fax: (08) 9368 1205

Albany
444 Albany Highway, Albany WA 6330
Telephone: (08) 9892 8444
Fax: (08) 9841 2707

Broome
Cnr Weld & Fredericks Streets,
Broome WA 6725
Telephone: (08) 9192 1579
Fax: (08) 9193 5236

Bunbury
North Boyanup Road, Bunbury WA 6230
Telephone: (08) 9780 6100
Fax: (08) 9780 6136

Busselton
1 Queen Street, Busselton WA 6278
Telephone: (08) 9752 1688
Fax: (08) 9752 3877

Carnarvon
South River Road, Carnarvon WA 6701
Telephone: (08) 9956 3333
Fax: (08) 9941 8334

Dermby
16 Loch Street, Derby WA 6728
Telephone: (08) 9191 0333
Fax: (08) 9191 0334

Esperance
Melijinup Road, Esperance WA 6450
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Fax: (08) 9083 1100

Geraldton
283 Marine Terrace, Geraldton WA 6530
Telephone: (08) 9956 8555
Fax: (08) 9921 8016

Jerramungup
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<td>Narrogin</td>
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<td>(08) 9881 1950</td>
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<td>Northam</td>
<td>Lot 12, Old York Road, Northam WA 6401</td>
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Department of Health, Western Australia

Perth Office

Environmental Health Service
Perth Business Centre
Perth WA 6849
Telephone: (08) 9388 4999

Local Government

In your local area contact the Environmental Health Officer at the Local Government Offices

Western Australian Lot Feeders’ Association

Secretary
PO Box 135
Claremont WA 6010
Telephone: (08) 9384 1933
Fax: (08) 9385 2396

ChemCert

WA Co-ordinator, Terry O’Beirne

88 Westview St
Scarborough WA 6019
Telephone: (08) 9341 5325
Fax: (08) 9341 5325

AUS-MEAT

9 Buchanan St
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