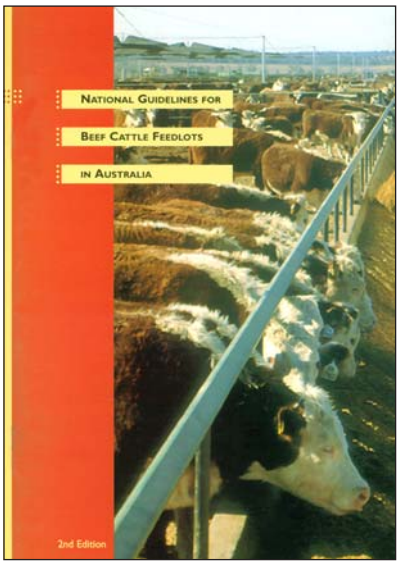
Primary Industries Standing Committee

National Guidelines for Beef Cattle Feedlots in Australia

SCARM Report 47



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Cover: Myola Enterprises Pty Ltd feedlot in northern New South Wales
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Foreword

The Feedlot Sector is an important, value adding component of the Australian Beef Industry. The Sector's expansion over the last ten years has been stimulated by the increasingly stringent requirements in our major export and domestic markets for consistent quality in our beef products.

The gross value of production from cattle in accredited feedlots is currently in excess of one billion dollars. Approximately half this gross value is added by the feedlot industry.

In addition to their importance to the economy generally, feedlots are important influences in regional economies. This importance was demonstrated by a 1994 Meat Research Corporation sponsored study on the *Regional Impact of Feedlot Investment* which looked at the impact of a representative (25 000 head) feedlot on local and regional economies.

In summary, the annual impact of the representative cattle feedlot on the local and regional economies was estimated to be $11.7 million value added ($468 per head capacity), with an increase in employment of 122 jobs.

Australia has exciting opportunities, particularly in the beef markets of the Western Pacific Rim. These markets are sophisticated and extremely competitive for high quality product. Feedlotting provides the means to maximise the opportunities offered by these markets for a consistent supply of high quality beef tailored for the particular needs of the market.

The continuing growth of the feedlot sector is necessary to meet projected increase in demand from both export and domestic markets. However, such growth must progress in a way that is sensitive to community expectations and requirements.

The first edition of these *Guidelines* was published in 1992. The Guidelines arose from concerns that the lack of uniformity of regulations relating to the establishment and operation of feedlots in Australia was hindering the development of the industry.

The development of these Guidelines brought together a diverse group of interests, including the three tiers of government, the industry and animal welfare organisations. These groups worked together to ensure that feedlot development could occur in a way that maximises the benefits for all.

Since then, the National Feedlot Accreditation Scheme (NFAS), a national quality assurance system of industry self regulation, has been introduced. The NFAS is intended to complement these Guidelines and is based on compliance to three *Codes of Practice*: The *National Guidelines for Beef Cattle Feedlots in Australia;* the *Australian Model Code of Practice for the Welfare of Animals — Cattle*; and the Australian Veterinary Association's *Code of Practice for the Safe Use of Veterinary Medicines on Farms*.

In excess of 1300 feedlots, with a nominated capacity of 1 009 633 cattle, have expressed interest in gaining Accreditation. At 1 July 1996 there were 745 accredited feedlots with a nominated capacity of 852 000 cattle. Accredited capacity could exceed one million head by the end of the decade.

The Australian feedlot industry has matured significantly in recent years and is now managerially and technically equivalent to the best American industry practices.

On environmental grounds, the Australian industry has developed into a responsible corporate citizen and a world leader.

Some community groups have expressed concern at the implications of some proposed feedlot developments. While they perceive a threat to the local amenity, the environment and/or the welfare of the animals involved, on many occasions this concern is based on incomplete information.

Community concerns may be alleviated by the feedlot approval process. Its purpose is to ensure the proposed development protects the community amenity, particularly from odour, dust, noise and insects. In addition, a development proposal covers how it will protect the quality of surface and groundwaters, ensure the welfare of the cattle involved and be environmentally sustainable.

The runoff from the controlled drainage area (the effluent) and the manure produced by cattle in feedlots are valuable organic fertiliser resources. Sustainable utilisation of these resources is considered in the approval process and is an important aspect of feedlot operations.

A well managed feedlot industry has beneficial effects from both welfare and landcare aspects. Further, the industry has a strong economic impact on other industry sectors — in particular store cattle, grain and fodder production, transport, processing, merchandising, design and construction and veterinary support.

These *Guidelines* are aimed at promoting the development of a feedlot industry that is both sustainable and responsive to community expectations.

I commend this second edition of the *Guidelines* to people and organisations with an interest in the feedlot industry. In particular, I commend these *Guidelines* to the regulators, legislators and administrators and I urge them to act promptly to make the changes needed to implement the *Guidelines*.

John Anderson, MP

Minister for Primary Industries and Energy

Chairman,
Agriculture and Resource Management Council of Australia and New Zealand

Origin and Purpose of the Guidelines

Before the first edition of the *National Guidelines* was released in December 1992, the Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) established the National Feedlot Guidelines Standing Committee (NFGSC) to monitor the implementation of the *Guidelines* and to make recommendations for their periodic updating, if required.

The NFGSC involves representatives of the Standing Committee on Agriculture and Resource Management (SCARM) and of the Australian and New Zealand Environment and Conservation Council (ANZECC), plus industry — the Australian Lot Feeders Association (ALFA), the Cattle Council of Australia and the Meat Industry Council — local government and the animal welfare organisations (both the RSPCA and the Australian and New Zealand Federation of Animal Societies — ANZFAS). The Committee has been chaired by NSW Agriculture.

In 1992 the Senate Standing Committee on Rural and Regional Affairs published a report — *Beef Cattle Feedlots in Australia* — of its investigations into the lot feeding industry in Australia. One of the recommendations in this Report was that: *"a specific model code for the welfare of cattle in feedlots be developed and incorporated into the National Guidelines for Beef Cattle Feedlots in Australia*". This *Code* has been developed by the NFGSC and is Appendix 2.2A to this edition of the *Guidelines*. It includes the Animal Care Statement proforma (Appendix 2.2A.2), completion of which forms part of the documentation for accreditation through the National Feedlot Accreditation Scheme. The Animal Care Statement records the individual feedlot operator's commitment to the welfare of the cattle in their care.

In 1994, when the *National Guidelines* had been in place for nearly eighteen months, the NFGSC sought comments in regard to the need for changes to the *Guidelines*.

The Committee established two working parties to address the areas of feedlot hydrology and animal welfare and the Second Edition of the *National Guidelines* incorporates recommended changes in these areas.

Before making these changes, the recommendations were circulated widely for comment from all involved organisations, plus conservation groups.

Changes in the drainage requirements also incorporate the results of the Meat Research Corporation funded research into feedlot hydrology and management of effluent and manure. Outcomes of this research, conducted by Queensland's Department of Primary Industries from 1990–1995, were released at a national conference in June 1995 (MRC Project No DAQ079 — *Feedlot Waste Management Final Report*, unpublished) .

The intent of these *Guidelines* is to provide a framework of acceptable principles for the establishment and operation of feedlots in Australia. The requirements in the *Guidelines* are acceptable standards for good management practice across Australia.

Individual State, Territory, regional and local government guidelines, laws and regulations may be more detailed and/or stringent than these *Guidelines*, to take account of the specific circumstances in different geographic areas.

Queensland and New South Wales already had guidelines and legislation in place in 1992. Since the first edition of the *National Guidelines*, South Australia and Victoria have published their own state guidelines and there have been legislative changes applicable to cattle feedlots in most states.

1 Definition of a Beef 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.

1.1 Considerations

1.1.1 In consideration of what the definition of a feedlot covers, a number of common features were identified. These include:

— confinement of cattle;

— cattle fed wholly or substantially on prepared or manufactured feed;

— exclusion of cattle confined for normal management practices, drought or emergency feeding; and

— no crops or pastures grown on the confinement area.

1.1.2 The following issues should be considered by regulatory authorities:

— the period of use in any 12 months; and

— feedlots with capacities of 50 head or more may require variable levels of documentation, depending on their potential impact.

Exclusions for accepted management feeding and emergency feeding, plus specification of number of animals, length of feeding period and frequency of use will provide the specificity needed to accurately define the particular type and size of the lotfeeding operation which would be covered by a particular regulatory process.

1.1.3 The National Feedlot Guidelines Standing Committee has specified minimum yard areas and trough space per head in the *Australian Code of Practice for the Welfare of Cattle in Beef Feedlots*.

With regard to the maximum yard area per head, the Committee determined that 25 m^2 should be considered a maximum area per head guideline. While the Committee believes that, in certain circumstances, feedlots may operate at greater areas per head, it was agreed that it would be the responsibility of the proponent to justify the greater area and to obtain approval from the appropriate authority.

1.1.4 *Exclusions*, as noted above, do not automatically include facilities for holding cattle being prepared for transport — for example, preconditioning of stock to be exported. Such facilities, where capacity is fifty (50) head or more, may be subject to the requirements for feedlots, depending on the appropriate State or local authorities.

2 Guidelines

2.1 Environment Protection

2.1.1 Introduction

Compliance with the following guidelines will facilitate the establishment of feedlots which are agriculturally and environmentally sustainable and acceptable to the community. Siting and management are key elements in achieving sustained environmental performance.

These guidelines are appropriate for the majority of feedlots constructed in Australia. There are, however, other design and construction options which could be acceptable in appropriate circumstances.

2.1.2 Environmental Performance Objectives

Feedlots throughout Australia, irrespective of their size, should seek to attain the following environmental performance objectives:

2.1.2.1 Effluent & Manure Utilisation

Feedlots should be managed so that the nutrient, salt, organic matter and water values of feedlot effluent and manure are effectively utilised.

2.1.2.2 Land Protection

Feedlots should be managed so that the cropping capacity of effluent and manure utilisation areas is maintained or improved; and so that lands are not degraded by soil structure decline, salinisation, acidification, waterlogging, chemical contamination and/or soil erosion.

2.1.2.3 Groundwaters

Feedlots should be sited, designed, constructed and operated such that underground water resources do not become polluted by the feedlot development. Special consideration should be given to feedlot and manure stockpile runoff and effluent irrigation water.

2.1.2.4 Surface Waters

Feedlots should be sited, designed, constructed and operated such that surface waters beyond the property boundaries do not become contaminated by the feedlot development. Special considerations should be given to feedlot and manure stockpile runoff, effluent irrigation tailwaters and contaminated stormwater runoff from effluent irrigation areas, contaminated sub-surface flow, or discharge of contaminated groundwater.

2.1.2.5 Community Amenity

Feedlots should be sited, designed, constructed and operated so as not to cause unreasonable interference with the comfortable enjoyment of life and property off site or with off-site commercial activity. In this regard, special consideration should be given to odour, dust, flies and noise above appropriate background levels and to off-site transport effects.

Attainment of these environmental objectives will be facilitated by giving due consideration to the site selection, design and construction,

operation and management, and monitoring and reporting factors discussed below.

2.1.3 Considerations for Site Selection

Intelligent siting greatly facilitates the environmental management of cattle feedlots. The site selected, where possible, should be one which avoids the need for costly environment protection measures and which ensures the preservation of community amenity.

Each state has its own specific requirements, but site selection should always take the following considerations into account.

2.1.3.1 Areas for Utilisation of Effluent and Manure

Adequate land needs to be available, to enable the effluent generated to be utilised on site, unless an acceptable off-site utilisation method is available and is approved. The soil types need to be suitable for, and able to sustain, the agronomic regimes proposed. The area available needs to be able to accommodate the hydraulic, nutrient, salt and organic loads involved. That is, there should be no deleterious build up of these constituents in the soil.

Manure may be utilised on and/or off site. Again, the soil types need to be suitable for and able to sustain the agronomic regimes proposed. As with effluent, the area available needs to be able to accommodate the nutrient, salt and organic loads involved, and to protect any underlying groundwaters, whether the manure is utilised on or off site.

2.1.3.2 Groundwater

A feedlot should not be sited above groundwater resources that are deemed to be vulnerable to contamination, unless those resources will be demonstrably protected. For example, protected by one or more impervious geological strata and/or considerable depth.

2.1.3.3 Surface Waters

The locations of pens and associated infrastructure, manure stockpiles, sedimentation basins and holding ponds, should not be in flood prone areas, unless adequate safeguards are incorporated. Special provisions may be required where effluent and manure utilisation areas and terminal ponds are located within flood prone areas.

A reasonable buffer should be provided between the feedlot complex (including effluent and manure utilisation areas) and streams, rivers and other watercourses. The separation distance chosen should be a function of the intervening topography, other site specific factors and the management practices employed by the feedlot operation.

2.1.3.4 Community Amenity

Even with the best design and operational practices presently available, it is not possible to prevent entirely the generation of odour, dust and noise by feedlots. Therefore, to protect community amenity, a buffer zone should be created between the feedlot and sensitive community receptors and, once established, this buffer zone should desirably be maintained for the life of the feedlot. That is, it should be protected from incompatible uses. Local authority land use planning should reflect this principle.

It is accepted that control by the feedlot owner/operator of land use within the entire buffer zone will be impractical in many situations. Sites should not be selected in locations where there is a reasonable expectation that higher order development, incompatible with feedlot use, is likely to occur in the buffer zone, within the life of that feedlot.

The desirable separation distance between the point of generation of the odour, dust or noise, and each sensitive receptor will be a function of the source and strength of the odour, dust or noise, the prevailing meteorological conditions at the site, and the nature of the intervening terrain and vegetation. Source strength will itself be a function of feedlot size and design, management practices and stocking densities among other factors.

The separation distance should be sufficient to protect sensitive receptors from odour impacts. If it does this, it will usually protect them from dust and noise as well. Experience with existing feedlots would indicate that large feedlots may need to be separated from sensitive receptors by substantial distance.

Siting should also take into account the potential impacts on community amenity and road conditions caused by road transport of stock and materials, travelling to and from the feedlot. Consideration may need to be given to time and route restrictions.

2.1.3.5 Environmentally Unfavourable Sites

While the selection of a site with one or more unfavourable environmental parameters is not encouraged, some site disadvantages can be overcome or reduced by appropriate engineering works or superior management practices.

Where such a site is chosen, performance should be closely monitored by the operators and also by state and/or local regulatory authorities, who should be empowered to ensure performance.

2.1.4 Considerations for Design and Construction

The features described below should be included in the design and construction of all feedlots. Typical feedlot features are illustrated schematically in Figures 1 and 2.

2.1.4.1 Pens

Pens should be constructed on gently sloping ground to facilitate drainage without promoting erosion. A slope of 2% to 4% is preferred. It can be a naturally occurring slope or it can be created artificially from level land or a steeper slope. However created, it should be properly land-formed. Slopes outside these ranges may be acceptable, but require a higher standard of construction and operational management.

Pens should be oriented with the feed trough at the high side of the pen and running parallel to the contour to minimise pen to pen drainage. Running feed troughs down a slope is not encouraged.

Pens should be sized to provide adequate pen area and feed trough length per animal to minimise build up of manure and spilt feed, which can increase odour generation. As a guide, a 600 kg animal may be provided

with 15 m^2 of pen area and, if fed once per day, 0.3 m of feed trough length (further information in Appendix 2.2.A). These are estimates only and may vary depending on several factors, including rainfall, management or different rations.

Water troughs should be well separated from feed troughs, with provision for any spillage to drain directly to the drainage system.

Pen surfaces should be evenly graded and compacted to form a smooth surface without hollows.

In general, the surface around feed troughs and water troughs in any permanent feedlot should be protected by a reinforced concrete apron at least 2.5 m wide. In low rainfall zones or where the facility is used infrequently, alternative apron surfaces, evenly graded and compacted to form a durable surface, could be acceptable.

If shade or shelter is provided it should be designed and constructed so that it does not impede the drying of the pen surface, or pen cleaning.

2.1.4.2 Manure Stockpiles

An area needs to be set aside within the controlled drainage area (see 2.1.4.3) where manure can be stockpiled and composted if necessary.

2.1.4.3 Drainage System[1]

A drainage system is essential to minimise the risk of surface and groundwater contamination and to promote rapid drying of the feedlot following rainfall. Normally the drainage system should provide for:

- **Diversion Banks and/or Drains** to exclude external runoff from the feedlot complex, to create a controlled drainage area;
- **Catch Drains** within the controlled drainage area to convey stormwater runoff and other effluent from pens, stockpiles and other contaminated areas to sedimentation and storage systems;
- **Sedimentation Systems** to remove entrained settleable solids from the effluent. Types of sedimentation systems can include:
  - — Settling Ponds
  - — Settling Basins
  - — Settling Terraces
- **Holding Ponds** to hold the effluent in order to minimise the potential for it to contaminate soil and/or water resources pending application to crops/pastures.
- **Evaporation Systems** to reduce the volume of effluent by evaporation.

The use of an evaporation system is not a preferred alternative to the appropriate siting, construction, operation and management of a cattle feedlot as set out in these guidelines.

Evaporation may be used to reduce the volume of effluent in selective sites, where it can provide the best environmental outcome in the situation.

Where evaporation systems are used, they should follow sedimentation systems.

1. Additional information and design specifications are provided in Appendix 2.1.A.

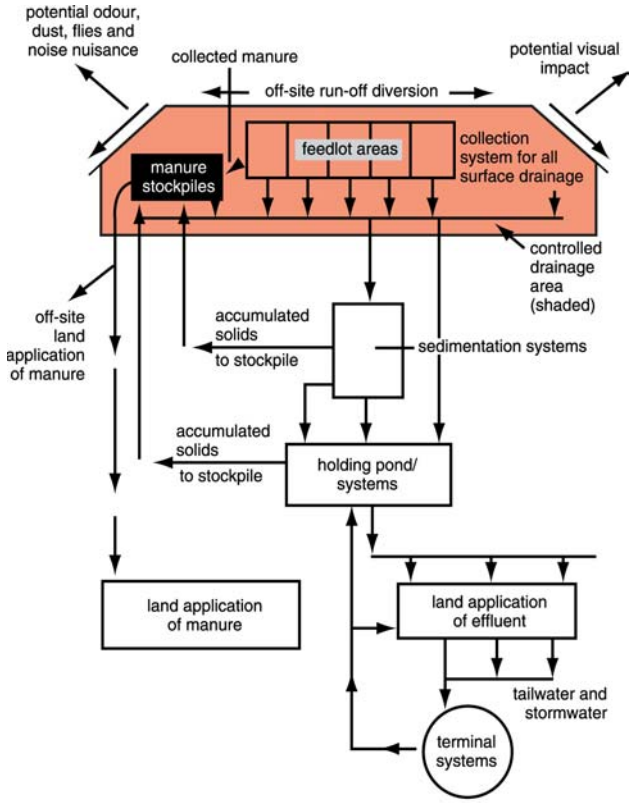


Figure 1 Schematic layout of a Feedlot Effluent and Manure Management System

- **Effluent and manure utilisation areas** to which effluent and manure can be applied for crop and/or pasture production to effectively utilise or sustainably assimilate the nutrients, salts, organic matter and water contained in feedlot effluent and manure.
- **Terminal systems** to collect irrigation tailwater and manage contaminated stormwater runoff from the effluent irrigation area.
- **Impermeability.** Where unsuitable soil types are present (for example sands), the bases and sides of catch drains, sedimentation systems, holding ponds, evaporation systems and terminal systems should be sealed with a low-permeability clay and/or an artificial membrane to minimise infiltration of effluent into the soil profile.

2.1.4.4 Carcass Disposal

Carcass disposal areas, appropriately sited to ensure protection of surface water, groundwater, and community amenity, should be included in the feedlot design to provide for mortalities.

2.1.5 Considerations for Operation and Management

Each feedlot should establish an environmental management plan which includes quality control provisions. The plan should provide for:

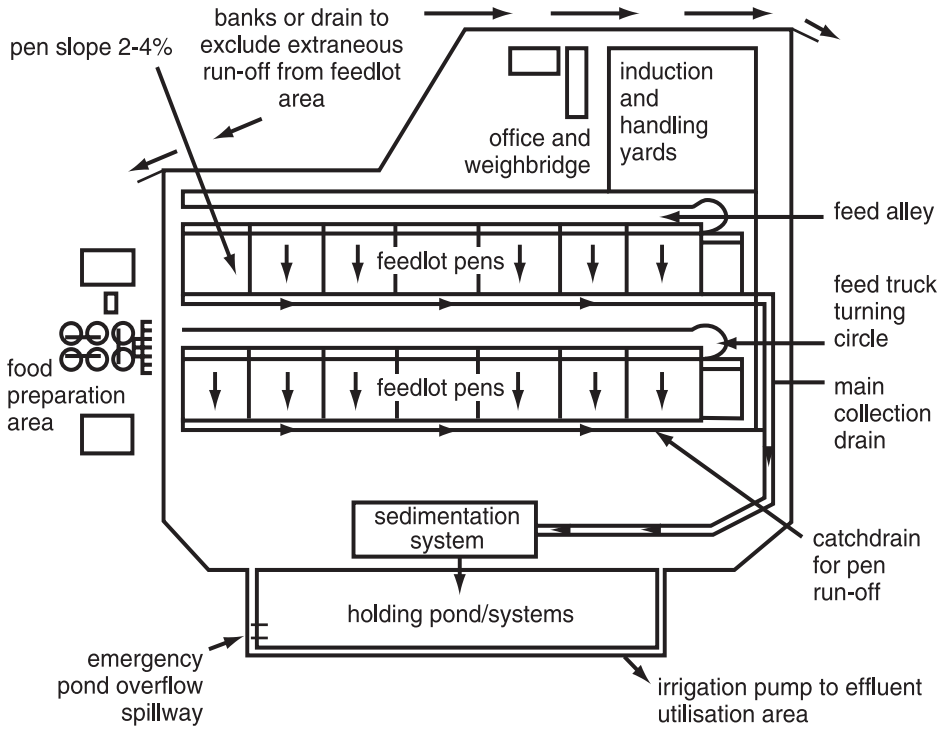


Figure 2 Schematic layout of a feedlot pen drainage system.

- regular cleaning of spilt feed along feed alleys;
- regular cleaning of manure/feed from under fences sufficient to prevent build up;
- suppression of dust, and fly and insect pest populations as required;
- periodic removal of manure from pens (at a minimum following each draft of cattle) and repair of the pen surface as required, taking care to preserve the manure pad/soil interface layer;
- cleaning and repair of drains and sedimentation systems as necessary, especially following storms;
- utilisation of effluent and emptying of holding ponds as quickly as practicable following storms, but in accordance with crop/pasture moisture requirements;
- ensuring that the irrigation of effluent does not cause undue odour;
- maintaining any wet stockpiled manure in an aerobic condition by turning at regular intervals until dry or fully composted;
- incorporation of manure into soil immediately following any land application wherever practicable, subject to agronomic considerations;
- periodic monitoring of effluent and manure, plus the appropriate utilisation areas and environmental conditions, as necessary (see Section 2.1.6); and
- destocking provisions, including site remediation arrangements designed to avoid environmental damage following destocking.

2.1.6 Considerations for Monitoring and Reporting

2.1.6.1 The monitoring and reporting procedures should be developed in consultation with the relevant authorities on a site specific basis. The procedures should be reviewed periodically.

2.1.6.2 All feedlot managers should carefully observe the environmental performance of their feedlots and should institute remedial action should problems arise.

2.1.6.3 Key climatic parameters may require monitoring, for example, rainfall and evaporation.

2.1.6.4 Periodic measurement of the constituents of effluent in holding ponds and of manure in stockpiles, at the time of application, may be necessary to determine sustainable application rates to crops and pastures.

2.1.6.5 Periodic monitoring of effluent and manure utilisation areas will also usually be necessary to measure changes in relevant soil chemical and physical characteristics and to detect the onset of soil degradation.

2.1.6.6 Where there is a danger that sensitive resources may be affected (for example, surface water and/or groundwater), periodic monitoring of these resources will be necessary.

2.1.6.7 Records should be maintained of incidents leading to any loss of community amenity. These should include the causes, the prevailing environmental conditions at the time, remedial action taken and provisions made to prevent a recurrence.

2.1.6.8 Immediate reports should be made to the relevant authority where an incident threatens environmental or community amenity. For instance, pond overflows must be immediately reported.

2.1.6.9 Feedlots which have caused significant environmental impact or which require consistently superior management practices as a consequence of siting or design/ construction limitations, should be required to submit a report on their environmental performance to the appropriate State/Territory and/or local authority at least annually.

2.1.7 Conclusion

2.1.7.1 While the intent of these environmental guidelines is to establish the baseline conditions, where a proponent proposes to deviate below these the onus is on the proponent to provide supporting documentation to demonstrate that land and water resources and community amenity are protected.

2.1.7.2 State/Territory and/or local authorities may need to make provisions on a regional or site-specific basis, according to the prevailing circumstances

Appendix 2.1.A
Design Specifications — Feedlot Drainage Systems and Areas for Effluent and Manure Utilisation

Design Specifications

The design specifications that follow are acceptable standards for good management practice across Australia.

The "Design Storm" mentioned in the following text is defined as a rainfall event, with a nominated average recurrence interval (A.R.I.), that has a duration equal to a catchment's time of concentration according to *Australian Rainfall and Runoff* (Pilgrim, 1987).

Diversion Banks and/or Drains

Objective: To exclude external runoff from the feedlot complex to create a controlled drainage area.

Design Concept: Uncontaminated up slope runoff should be diverted away from the feedlot in order to minimise the quantity of contaminated runoff requiring treatment.

Design calculation: Diversion banks or drains should be designed to carry peak flow rates resulting from a design storm event with an average recurrence interval of 20 years. Diversion banks and drains should carry flow at a non-scouring velocity.

Catch Drains

Objective: To convey stormwater runoff from the controlled drainage area to sedimentation and storage systems.

Design Concept: Runoff from the controlled drainage area should drain into a collecting drain system and then to the sedimentation system, to holding ponds and/or evaporation systems. Drains should be designed to produce velocities sufficient to transport manure, but not sufficient to cause scouring and erosion.

Design calculation: Catch drains should be designed to carry, at a non-scouring velocity, peak flow rates resulting from a design storm with an average recurrence interval of 20 years, using a runoff coefficient of 0.8.

Sedimentation Systems

Objective: To remove entrained settleable solids from the effluent.

Design Concept: Sedimentation systems should aim to achieve flow velocities sufficient to enable effective settlement of at least 50% of settleable solids from feedlot runoff. Systems should be designed to enable efficient cleaning.

Design calculation: Sedimentation systems should be designed to cater for the peak flow rate runoff from a design storm having an average recurrence interval of 20 years and using runoff co-efficients of 0.8 for the feedlot pens,

roadways and other hard stand areas and 0.4 for grassed areas within the controlled drainage area. The sedimentation systems should be designed to deposit solids settling at a maximum flow velocity of 0.005 m/s.

The volume required to achieve settling at the required velocity is determined by using the following formula:

$$V = Qp\ (l/w).\ \lambda/\ v$$

Where:
- V = sedimentation system volume (m^3)
- Qp= peak inflow rate for a design storm with an average recurrance interval of 20 years (m^3/s) . Reference *Australian Rainfall and Runoff* (Pilgrim 1987).
- l/w= length to width ratio, where l is the length along the direction of flow
- λ (Lambda) is a scaling factor
- v= flow velocity (m/s): maximum = 0.005m/s

Lambda is a scaling factor, which accounts for silt accumulation and removal frequency. Values for lambda are set out in Table 1 for each of the three sedimentation systems.

Table 1: Scaling Factors

Sedimentation system	l / w	λ (lambda)
Basins	2-3	2.5
Terraces	8-10	1
Ponds	2-3	6

Worked example for a fictitious 5000 head capacity feedlot located near Dubbo

Total catchment area	= 12.0 ha or 0.12 km^2
Total pen area	= 7.5 ha
Roads, drains and other hard stand areas	= 4.5 ha
Grassed or cultivated area	= 0 ha
Catchment length	= 0.8 km
Catchment slope	= 9 m/km
Time of concentration	= 46.5 minutes
1 in 20 year ARI design storm intensity	= 54 mm/hour
1 in 20 year ARI design storm rainfall total	= 42 mm
Peak flow rate (rounded up)	= 1.44 m^3/s
Length to width ratio (Maximum depth for a pond will apply for each State)	= 3
λ (lambda)	= 6
Maximum permissable flow velocity	= 0.005 m/s

The design of the sedimentation system requires a sedimentation pond.

Therefore the minimum sedimentation pond volume required is:
Sedimentation pond volume = (1.44 x 3 x 6)/ 0.005 = 5184 m^3

Alternatively the volume may be determined using the inflow hydrograph for the design storm with an ARI of 20 years, a head discharge curve for the outlet and the flow routing methods described in *Australian Rainfall and Runoff* (Pilgrim 1987). Reference: Lott and Skerman (1995)

Minimum freeboard is 0.9m.

Holding Ponds

Objective: To hold the effluent pending application to crops/pastures and to minimise the flow of contaminated runoff to pastures.

Design Concept: Holding ponds should be large enough to temporarily store effluent from major storms and/or when extended wet periods prevent the irrigation of effluent. The holding ponds should have sufficient capacity so that pond overflows are limited to an acceptable frequency.

Design Calculation: The volume needed for major storm events and for extended storage periods should both be calculated and the pond sized to accommodate whichever is the greater.

Major storm event: Holding ponds should be capable of retaining at least a 1 in 20 year, 24 hour storm event, using volumetric runoff coefficients of 0.8 for the feedlot pens, roadways and other hard stand areas and 0.4 for grassed areas within the controlled drainage area.

Annual water balance: Holding ponds should be capable of retaining the balance of runoff from the controlled drainage area in a 90 percentile wet year. The water balance should be calculated using no longer than average monthly evaporation losses from the pond and monthly withdrawals for irrigation. Daily or weekly data may be used. A volumetric runoff co-efficient of 0.3 to 0.5 should be used, based on site specific assessment.

Spillways should be designed for a 1 in 50 year design storm event and outlet at a non-scouring velocity.

Minimum freeboard is 0.9m.

Evaporation Systems

Objective: To reduce the volume of effluent by evaporation.

Design Concept: Evaporation systems should have the capacity to hold contaminated runoff pending evaporation. Systems should only be considered at sites where average annual evaporation exceeds average annual rainfall, subject to site specific assessment. The evaporation system should have sufficient capacity so that the system overflows are limited to an acceptable frequency.

The use of a multiple-bay system may facilitate regular cleaning and maintenance, and should be assessed on a site specific basis.

Design Calculation:

Annual Water Balance: Evaporation systems should be capable of retaining

the balance of runoff from the controlled drainage area in a 96 percentile wet year. A volumetric runoff co-efficient of 0.3 to 0.5 should be used, determined on a site specific basis.

Spillways should be designed for 1 in 50 year design storm event and outlet at a non-scouring velocity.

Minimum freeboard is 0.9 m.

Disposal of sludge from evaporation systems

The options for the disposal of sludge from evaporation systems are:

- secure landfill — site would need to be approved by the appropriate state authority;
- spread on agricultural land at acceptable levels;
- mix with manure and spread on land at acceptable levels.

Where sludge is applied to land, nutrient and salt balances need to be calculated, monitored and managed. Refer to *Effluent and Manure Utilisation Areas* in the following Section.

Effluent and Manure Utilisation Areas

Objective: To employ crops/pastures and soils to effectively utilise or sustainably assimilate the nutrients, salts, organic matter and water contained in feedlot effluent and manure.

Design Concept: The area of land required to enable utilisation of the effluent and/or manure applied under a given crop/pasture regime should be calculated using water, nutrient and salt balances and a critical organic loading rate. Crops/pastures need to be harvested and removed from the utilisation areas to prevent nutrient build-up. Where nutrients and salts are not taken up in plant growth and removed, their sustainable assimilation by the soil must be demonstrated.

Site selection, design and management practices should incorporate erosion control to ensure that stormwater, transported sediment and nutrients do not cause pollution or nuisance.

Design Calculation: The annual loading rate for each of the constituents of the effluent and manure (eg nitrogen, phosphorus, salts and hydraulic load) should be calculated. The minimum area required for effluent utilisation will be the largest calculated for any individual constituent.

Irrigation of effluent: Irrigation should be on a moisture deficit basis.

The design criteria should be based on a 90 percentile wet year (the wettest year in 10 based on historical or simulated data for the local area). Loading parameters are hydraulic load, organic (biochemical oxygen demand) load, nutrient (nitrogen and phosphorus) load and salt load. The hydraulic loading rate should take into account all irrigation loads: including for example, supplementary irrigation, or the use of fresh water to dilute effluent to reduce salinity.

Application of Manures: The volume, nutrient composition and salinity of the manure, and the yield, nutrient and salt composition of the harvested crop should be estimated and balanced to determine the area required for manure utilisation.

Any manure storage should be within a controlled drainage area with any leachate and/or rainfall runoff from the stockpile directed to the sedimentation and holding pond systems.

Managed off-site utilisation of manure is an acceptable alternative to on-site utilisation.

Terminal Systems

Objective: To collect and recycle all irrigated effluent tailwater and to manage contaminated stormwater runoff from the effluent irrigation area, so as not to pollute waters.

1 Tailwater

Design Concept: All effluent irrigation tailwater should be collected and recycled. Tailwater collection systems will vary according to the irrigation system and the site.

Effluent irrigation systems should be designed, on a site specific basis, to manage and recycle the tailwaters generated by that system. All surface irrigation systems require tailwater collection and recycling systems. In contrast, a well managed effluent irrigation system (excluding surface), which rarely generates tailwater and is in a non-sensitive location, might rely on a stormwater management system described below to handle any tailwaters generated.

2 Stormwater runoff from the effluent irrigation area

Design Concept: To manage, as determined on a site specific basis, the stormwater runoff from the effluent irrigation area, that may carry nutrients, salt and sediment, so that it does not contaminate waters.

Design Calculation: The terminal systems shall be designed for a capacity that is the summation of the volume of the effluent irrigation tailwater and the storm water runoff from the effluent irrigation area. The system capacity is defined by the equation below:

$$V = a + b$$

where:

- V= volume of terminal system (m^3)
- a= effluent irrigation tailwater (m^3) and is required for all effluent irrigation tailwaters.
- b= storm water runoff from the effluent irrigation area (m^3). In sensitive locations 'b' shall be a volume equivalent to 12 mm of rainfall runoff from effluent irrigation areas. In non-sensitive locations, alternative measures such as vegetative buffers or artificial wetlands may be used to manage the 12 mm of storm water runoff.

Spillways should be designed for a 1:20 to 1:50 year design storm event, subject to a site specific assessment and outlet at a non-scouring velocity.

Minimum freeboard is 0.9m.

2.2 Animal Welfare

2.2.1 Objective

To ensure that the health and welfare of cattle kept in feedlots are protected at all times.

2.2.2 Considerations

It is the responsibility of lotfeeders to ensure that the animals in their care are properly and responsibly managed according to the *Australian Code of Practice for the Welfare of Cattle in Beef Feedlots* (from here on referred to as the *Feedlot Code*) or as it may be modified by individual States/Territories.

The Australian Model Code of Practice for the Welfare of Animals — Cattle (hereafter referred to as the *Model Code*) was developed by the Sub-committee on Animal Welfare (SCAW) for the Animal Health Committee (AHC) and was published in 1992. The *Model Code* is currently under review. Appendices 2 and 3 of the *Model Code* have been revised and updated by the National Feedlot Guidelines Standing Committee and this *Feedlot Code* is presented as Appendix 2.2A in these *Guidelines*, to apply to cattle in beef feedlots. This includes Appendix 2.2A.2 — an Animal Care Statement Proforma for cattle in beef feedlots.

This *Feedlot Code* will become part of the revised *Model Code* and should be read in conjunction with the *Model Code*. The *Feedlot Code* is endorsed by the Standing Committee on Agriculture and Resource Management (SCARM) and the Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) as the relevant animal welfare code for the Australian lotfeeding industry.

Modifications to existing *Welfare Codes of Practice* are made from time to time in the light of experience or as new information on animal welfare becomes available. Such modifications should only be made after consultation with industry, Government and appropriate community bodies. At the same time as an application for approval to develop a feedlot is lodged with the consent authority, a partially completed Animal Care Statement (see Glossary and Appendix 2.2A.2) should be lodged with the appropriate State agency. Further, the completed Animal Care Statement should be lodged with that agency within six months of feeding operations commencing, or as part of the application for accreditation, if that occurs first.

The Animal Care Statement is a document which provides details of the manner in which a feedlot operator will comply with the provisions of the *Australian Model Code of Practice for the Welfare of Animals — Cattle*, particularly the *Feedlot Code*.

At the same time as an application to expand or transfer ownership of a feedlot is lodged with the consent authority, a completed Animal Care Statement should be lodged with the appropriate State agency.

2.2.3 Considerations for Monitoring

Animal welfare aspects of feedlot management should be recorded to support implementation of the Animal Care Statement and must be available to the relevant authorities.

Appendix 2.2A
Australian Code of Practice for the Welfare of Cattle in Beef Feedlots

While the Feedlot Code *will be part of the revised* Model Code, *it replaces Appendices 2 and 3 in the first edition of the* Model Code. *It should be read in conjunction with the remainder of the first edition of the* Model Code, *although overriding part of section 1.5.1 and most of section 2.*

1. Definition and Environmental Issues

1.1 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.

1.2 The location, design and construction of a feedlot and/or a feed pad should take account of topography, climate, age and size of animals to be fed, space and feed requirements, and labour and management skills available. Adequate provision should be made for cleaning, drainage and waste disposal. Areas should be of a soil type which does not bog in wet weather, and be adequately graded and drained to provide proper water runoff and a firm and dry footing under normal feeding conditions. Effluent disposal should be arranged and monitored to ensure environmental safety. These issues are covered further in the National Feedlot Guidelines.

1.3 The first and most important consideration for any feedlot manager is the well-being of all cattle under his control, whether on the feedlot or in transit. A feeding exercise should not be attempted unless the operator has the resources to comply with the National Feedlot Guidelines and with this national feedlot code and the relevant State welfare code. Initial design, facility maintenance, cattle acquisition, health management and feeding control must all be co-ordinated and organised around cattle welfare requirements.

2 General Livestock Management Issues

2.1 This code should be read in conjunction with the National Feedlot Guidelines, requirements of the appropriate State legislation and the Animal Care Statement in place at the individual feedlot.

2.2 Responsibility for the various main areas covered in this code will be assigned in the Animal Care Statement for the individual feedlot.

2.3 Each feedlot should, in consultation with an experienced veterinarian with specialist skills in feedlot medicine and in accordance with State laws, develop and operate its own specific health management programme which will provide for the particular needs of the feeding programmes proposed for the site. The programme will include policy on arrival procedures, drug use, feeding, general handling and record keeping. These issues will also be covered in the Animal Care Statement.

2.4 Livestock personnel should be thoroughly familiar with the management programme and trained accordingly. Feedlots are to maintain sufficient numbers of trained and experienced staff to cater adequately for all provisions of the established health management programme on a 7 day a week basis.

2.5 The transportation of cattle to and from the feedlot should be carried out in accordance with established State codes or the *National Code of Practice for the Land Transport of Cattle*. Special attention should be paid to recommendations relating to the standard of transport equipment, loading densities and rest stops for long distances.

2.6 Cattle should always be handled quietly and, to the extent possible, in the cool of the day, especially during shipment. However, in cooler climates procedures for shipment should address the effect of cold stress. With new arrivals, it is often better to rest cattle overnight with access to palatable hay and water before processing the next day. The rate at which cattle are delivered to the feedlot should never exceed the capability of handling facilities or staff. When handling cattle, avoid the use of excessive noise, whips, canes etc. Laneways, races, entrances and exits should be designed to take advantage of the social behaviour and movement patterns of cattle.

2.7 Newly arrived cattle should be closely inspected for signs of illness or injury and treated as required. Access to quality hay and clean water should be provided on entry and, to the extent possible, arrival groups should be kept separate until processing is complete.

2.8 Dehorning, particularly with mature cattle, is not recommended. Tipping, the removal of the sharp point of the horn (4 to 5 cm) where minimal bleeding may occur, is acceptable. Provision should be made for horned cattle in the allowance for feed trough space and transportation density.

2.9 When cattle are being loaded onto trucks, great care must be taken to handle them as quietly as possible. They should be left on feed until loading commences.

3. Health Inspection

3.1 Responsibilities for health inspection activities will be covered in the individual feedlot's Animal Care Statement.

3.2 All cattle should be closely inspected on arrival to assess health status and treated as required.

3.3 Entry processing treatments should be designed as far as possible to treat and/or prevent disease and parasite conditions which are known to occur in the area or particular cattle group. If the background of a group of feeder cattle is not known, cattle should be treated on arrival, assuming the worst about transport stress and disease exposure.

3.4 Once cattle are penned out, all animals should be checked daily and, in the case of new arrivals, freshly weaned calves in particular, twice daily inspections are advised for the first few weeks of environmental adjustment and feed adaptation.

3.5 Trained and experienced stock handlers must ride or walk all pens looking for any signs of poor health or injury using an established surveillance method. All cattle should be seen standing and moving.

3.6 Surveillance should include water trough inspections and general features of the fencing and pen surface which may predispose cattle to injury.

3.7 Sick cattle are to be removed promptly to the hospital area for closer attention by health staff or the consulting veterinarian, who should have specialist skills in feedlot medicine.

3.8 Signs of feeding disorders should be reported immediately to the feeding supervisor and the feedlot manager.

4. Health Management

4.1 The emphasis of the health management programme from the time cattle first arrive will be constant surveillance, particularly in the first 3 or 4 weeks after introduction, early detection of health problems and prompt appropriate treatment.

4.2 Sick or injured cattle are to be removed immediately from the feeding group and placed in appropriate sick bay facilities for treatment in accordance with the established protocol prepared by the consulting veterinarian. The treatment area should be away from, but adjacent to the main feedlot facility. Stressed cattle must be allowed to recover on a high fibre diet, either hay or natural pasture, or be sold or destroyed. When prognosis for recovery is poor, immediate salvage should be undertaken or, where this is not possible, humane destruction must be effected immediately. Where doubt exists, a veterinarian's advice should be sought and followed.

4.3 Adequate records should be kept to monitor the incidence of disease and response to treatment. The Animal Care Statement for the individual feedlot will also refer to this issue. A record of mortality should also be maintained including necropsy reports to be used as a basis for refinement of health management programmes, feed management and

the system of cattle purchasing and processing. Wherever practical, records should also detail the origin of feeder cattle.

4.4 If an illness or death is encountered without the cause being known or reasonably anticipated, it is the responsibility of management to carry out an appropriate investigation and, in the case of notifiable diseases, act in accordance with State regulations.

4.5 Should cows calve in a feedlot, special facilities must be provided for their handling and proper care. Facilities should be appropriate for both cows and calves, while either are held in confinement.

5. Feed Management

5.1 Responsibilities for nutrition will be covered in the Animal Care Statement for the feedlot.

5.2 All diets formulated for use in cattle feedlots are to be nutritionally balanced and designed to provide sufficient nutrients and palatability for the production, maintenance and health of cattle and to ensure that digestive upsets are minimised.

5.3 All cattle, excluding those fed by self feeders, must be fed with the feed being added to the troughs at least once daily and preferably twice to maintain feed freshness. Stale or spoiled feed must be removed from troughs. In wet weather more frequent feeding may have to be carried out to prevent spoilage. Feed troughs should not be allowed to be empty for more than 2-3 hours, if at all.

5.4 The use of any ingredient must be limited to acknowledged nutritionally safe levels in the ration. When grain is used in the diet it should be gradually introduced to avoid digestive problems. The first feeding should always be done early in the morning as this is when cattle start looking for food.

5.5 Ration changes must be made in gradual, safe steps to guard against digestive disorders. All cattle should be closely observed during a ration change and changes should not be made concurrently with other environmental changes such as weather or cattle movement.

5.6 Water must be clean, fresh and readily available with troughs cleaned regularly.

5.7 The feed consumption of all pens of cattle should be monitored each day as any variation in consumption is an indication of their wellbeing.

5.8 When using feed ingredients which carry a risk of disease outbreak due to infections, toxins or nutritional profile, safeguards must be put in place to ensure that processing is carried out correctly and consistently. Poultry litter must be treated and stored properly and should not contain any parts of dead birds.

5.9 Note that the use of poultry litter is prohibited in some states by legislation.

6. General Yard Management Including Space Requirements

6.1 Feedlot measurements will vary widely according to the type, age, sex and weight of cattle, ration composition, soil type, climate and season prevailing at each feedlot and for each cattle group.

6.2 The handling yards are to provide for efficient, quiet handling of cattle with non-slippery surfaces, and no projections into the yard or races which may bruise or injure cattle. There must be adequate holding yards with water available within the handling area. Handling is best done in the cool of the day.

6.3 Cattle pens should be maintained such that they are well drained, provide a firm footing and have sufficient area for the cattle to move around freely. Concrete is recommended only for aprons to feed and water troughs. Pen management should ensure that the pen surface dries as quickly as possible after rainfall.

6.4 The stocking density of pens or yards must take into account age, size, behavioural needs, movement and feeding patterns of cattle. In any event, an absolute minimum space requirement of 9 m^2/head must be provided. In the case of shedded animals, concrete flooring may be used, with a suitable bedding material, for example sawdust, of sufficient depth to minimise feet and leg problems and to provide for acceptable absorption of moisture. An absolute minimum area of 2.5 m^2 must be provided for each animal.

6.5 Fences and troughs must be maintained in good order.

6.6 The fences should be made from materials which cannot injure animals, and allow plenty of fresh air circulation.

6.7 Water troughs should be large enough and designed in such a way that the cattle have easy access. Feed troughs should be designed with the same basic parameters in mind allowing sufficient space for all cattle to eat without competition. Actual space needed will vary with rations, cattle size, feeding frequency. A minimum space of 150 mm/head is recommended for young cattle and 180 mm/head for steers and bullocks.

6.8 A very important consideration is removal of manure from cattle pens and handling areas and maintenance of the pen surface. The National Feedlot Guidelines cover these issues. The frequency of cleaning must be such that cattle have sufficient area free of wet manure build-up for resting. Manure should not be allowed to accumulate to the point where reasonable surface drying is delayed after rainfall.

6.9 Pressure areas close to feed and water troughs, fence lines and drainage lines are to be maintained so that excessive manure accumulation is avoided.

6.10 In some feedlots mounds can be used effectively to provide dry resting areas. If a section of the pen area is used for the stockpiling of manure, stocking density should be adjusted accordingly.

6.11 Dry surface manure should be removed in accordance with the environmental guidelines to minimise dust in periods of still atmospheric conditions. Dust can be controlled by increased frequency of removal, and moisture application by way of increased stocking pressure or water sprays.

7. Protection from Climatic Extremes

7.1 Cattle should be protected from extreme adverse weather conditions causing cold stress or heat stress, as far as practicable. This is also important where cattle are moved from one climatic zone to a feedlot situation in a significantly different zone.

7.2

- Feedlot management and staff must be aware of the climatic conditions and the clinical signs in cattle that are associated with heat stress. At the first instance of such climatic conditions and clinical signs, remedial action as stated in the individual feedlot's Animal Care Statement shall be implemented.
- The provision of shade or alternative means of cooling, such as misters and sprays, may be required and should be considered particularly where:
  a) the duration of prolonged high temperature and high humidity with decreased air movement is likely; or
  b) the temperature exceeds 30°C for an annual period of 750 hours (Garrett WN, unpublished), as depicted in the Bureau of Meteorology Temperature Map (Appendix 2.2A.1).
- Movement of cattle should not be attempted during extreme heat conditions.

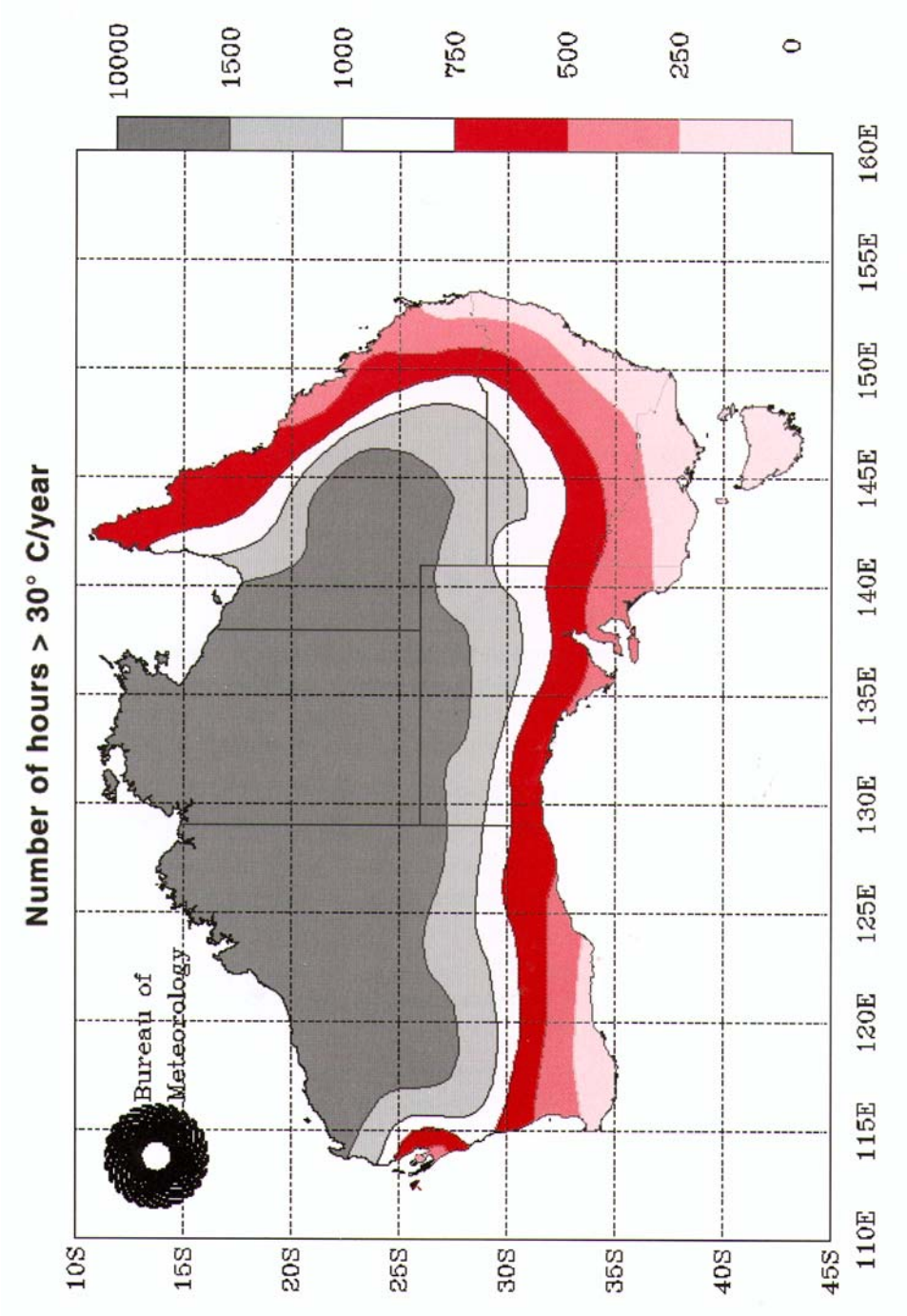
7.3 Where cold stress predominates, shelter (e.g. windbreaks, mounding) and allowance for additional nutrient requirements should be considered.

Reference

Garrett WN (unpublished) "Importance of Environment and Facilities in Beef Production". Prepared for a symposium on the importance of environment and facilities in swine and beef production. American Society of Animal Science - August 14 , 1963, Corvallis, Oregon.

Appendix 2.2A.1

Bureau of Meteorology Temperature Map



Appendix 2.2A.2

Animal Care Statement Proforma

Animal Care Statement

This document provides details of how the feedlot operator intends to comply with the provisions of the *Australian Code of Practice for the Welfare of Cattle* in *Beef Feedlots* (1996) and the appropriate provisions of the *Australian Model Code of Practice for the Welfare of Animals — Cattle* (1992). These *Codes of Practice* provide suggested standards for the handling and care of cattle. It is essential that cattle in feedlots are managed to minimise any stress.

Purpose

1 For feedlot owners/managers/operators to formally state their responsibility in animal welfare and to highlight some of the key factors relative to feedlot operation; and

2 provide documentary evidence for the appropriate state or territory government welfare agency that management are, in fact, addressing this area; and

3 provide a document, against which a feedlot's compliance on welfare issues can be audited, as required as part of the National Feedlot Accreditation Scheme.

Government agencies are nominated in objective 2 because of the commercial-in-confidence nature of the information that will be included in the Animal Care Statement (ACS).

Clarification

Where the ACS Proforma requires a position to be nominated, this refers to the position responsible for an operation, or for implementation of necessary action.

Positions can be identified by the number given on the management chart (section 2.2).

Re 2.1 - "nature of operation" asks whether this is a continuously operating feedlot, or used only periodically as a management aid, or to take advantage of prevailing economic opportunities.

Re 3.2.1 and 3.2.2 "Position" - if the proponent wishes to include supporting detail, this is acceptable, but not obligatory - eg, that yard staff have been trained by the veterinary service provider in detection and possibly treatment of sick animals.

Regarding 3.3 - Emergency procedures:

3.3.2 includes both *Emergency Slaughter* and *Carcass Disposal*.

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Where emergency slaughter is required, there must be compliance with the requirements of the *Australian Model Code of Practice for the Welfare of Animals — Cattle*. In addition, the operator must provide plans for both the disposal of individual carcasses and the emergency disposal of large numbers of carcasses in the event of widespread mortalities

Note that details of carcass disposal may be adequately addressed in another part of the application, or, for feedlots undergoing accreditation, in the feedlot's Quality Assurance manuals. A cross reference should be adequate, rather than full duplication.

3.3.3 Water/Feed Failures

A brief outline of the contingency plans, particularly in the event of water failure, is required in this section.

Timetable for Completion

Existing Feedlots

The ACS Proforma should be completed within three months from the date of posting and returned to the appropriate state agency with responsibility for Animal Welfare.

Feedlots seeking accreditation must supply a completed ACS with their documentation.

New Feedlots

At the Planning Focus Meeting, proponents will be given copies of the Feedlot Code of Practice and the ACS Proforma.

The development application should note the proponent's commitment to compliance with the appropriate *Codes of Practice* and should provide an undertaking to complete the ACS after feeding operations commence.

A partially completed ACS should be lodged with the appropriate agency, when the development application is lodged with the consent authority.

However, the ACS will not be completed until after the feedlot commences operating.

Generally the completed ACS would be lodged at the time the feedlot applies for accreditation.

Notwithstanding this, the completed ACS must be lodged with the appropriate state government agency within six (6) months of commencing operation.

Animal Care Statement for Beef Cattle Feedlots

1. Feedlot Details

Name of Feedlot . . . . . .

Contact Person/Position . . . .

Site Address . . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .

Postal Address (if different to above) . . . . . .
. . . . . .
. . . . . .
. . . . . .

Phone (. . . . .) . . . . . .

Fax (. . . . .) . . . . . .

2. Management

2.1 Management Statement

This should include details of size, nature of operation, stocking density, staff training etc.

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. . . . . .
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. . . . . .
. .. .
. . . . . .
. . . . . .
. . . . . .

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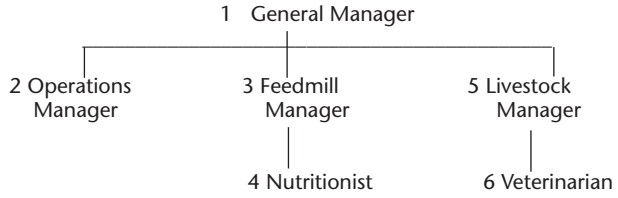
2.2 Management Structure



NB This example is for a major operation. Many smaller operations may only involve one person. Positions should be numbered, then the numbers given can be used in answers to all further questions.

3. Responsibilities and Procedures

3.1 Facilities

3.1.1 *Yards*:

Maintenance - Position . . . . . .

Cleaning - Position . . . . . .

Frequency details . . . . . .
. . . . . .
. . . . . .

3.1.2 *Water Troughs:*

Maintenance - Position . . . . . .

Cleaning - Position . . . . . .

Frequency details . . . . . .
. . . . . .
. . . . . .

3.1.3 *Feed Troughs:*

Maintenance - Position

Cleaning - Position

Frequency details . . . . . .
. . . . . .
. . . . . .

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3.1.4 *Shelter Provisions*:

Is it provided? Yes No

If yes, advise details (natural, artificial, type - eg, windbreak, shade etc and area involved). If no, why do you consider it is not required?

. . . . . .

. . . . . .

. . . . . .

3.1.5 *Roads/Lanes*

Maintenance - Position . . . . . .

3.1.6 *Do the facilities adequately cover animal welfare considerations?* Yes No

If no, advise details.

. . . . . .

. . . . . .

. . . . . .

3.2 Livestock Management

3.2.1 *Health Program*

Position

i) **Receival/Induction**

Outline the various movements from receival through induction, into the yard, eg "identify, weigh, preventative health maintenance program, draft into feedyards."

Procedures. . . . . .

. . . . . .

. . . . . .

ii) **Records kept** (of health treatment)? Yes No

If "yes" give details, if "no" what alternative procedures?

. . . . . .

. . . . . .

. . . . . .

iii) **Are Sick Pens available to segregate sick cattle?** Yes No

If "yes" give details, if not available, what alternative procedure is used?

. . . . . .

. . . . . .

iv) **What is the procedure for identification and/or segregation of cattle that have been treated with any substance that has a witholding period?**

. . . . . .

. . . . . .

. . . . . .

v) **Veterinary: Service available, on site.** Yes No

If no, what is alternative procedure (ie, contract, on-call, or other)?
If "other", give details.

. . . . . .

. . . . . .

. . . . . .

3.2.2 *Stock Supervision*

Position

Frequency Details

. . . . . .

. . . . . .

3.2.3 *Nutrition and Food Safety*

Position

Do you have a nutritionist? Yes No

If no, how is formulation derived?

. . . . . .

. . . . . .

3.2.4 *Transport*

i) Position responsible for inspection of stock on arrival, for detection of any sign of injury or disease?

. . . . . .

ii) Position responsible for fitness at load-out for health and loading density.

. . . . . .

3.3 Emergency Procedures

3.3.1 *Disease Outbreak*

Position

Details of contingency plans:

. . . . . .

. . . . . .

. . . . . .

3.3.2 *Emergency Slaughter and Carcass Disposal*

Position

Details of contingency plans:

. . . . . .

. . . . . .

. . . . . .

3.3.3 *Water/Feed Failures*

Position

Advise alternatives:

. . . . . .

. . . . . .

. . . . . .

3.3.4 *Extreme weather*

Position

Details of contingency plans:

. . . . . .

. . . . . .

. . . . . .

2.3 Approval Process

2.3.1 Introduction

These guidelines set out principles for the environmental impact assessment and approvals procedures for cattle feedlots.

Each State/Territory Government is responsible for the detailed implementation of the legislative and administrative arrangements needed in its own jurisdiction to achieve compatible approval processes across Australia.

2.3.2 Objectives

The objectives of the approval process are to:

- ensure that the feedlot proposals are fairly assessed on their merits without unnecessary delays or costs;
- provide for public participation in the decision making process for feedlot proposals;
- ensure that feedlots are only established if they are demonstrably able to meet appropriate environmental and animal welfare performance objectives and are compatible with the continued use of surrounding land and amenity of the community;
- ensure informed decision making for feedlot proposals.

2.3.3 Approval Procedures

Each State/Territory should publish detailed specific information which sets out:

- all approvals, permission and licences, etc. required to operate a feedlot;
- the steps in the approvals process for cattle feedlots;
- the means of lodging applications;
- the names, addresses and roles of the relevant agencies;
- relevant provisions of legislation;
- an indicative timetable for the approval process;
- the rights and obligations of applicants and other parties;
- the information required to accompany each application;
- services and data available from relevant agencies; and
- other relevant aspects of the approvals procedure.

The approval procedures for new feedlots and expansions should be based on the following:

- Feedlots shall not be exempt from the general approval process requirements applying to all developments. The approval process should be simple, prompt, fair, predictable and targeted at resolving key issues.
- Any application for approval of the establishment or expansion of a feedlot will include the associated activities and facilities (effluent and manure utilisation, mills, cattle handling yards etc).
- Feedlot development applications should include an *Animal Care Statement* — Proforma in Appendix B 2.

- The elected Local Authority is generally the appropriate body to give the Head approval with input from relevant experts, agencies and the public. This Head decision should be made having considered the full range of social, economic, environmental and animal welfare concerns, before any other licences or permissions are approved.
- Applications for major proposals involving capacities of more than 1000 head[2] need an Environmental Impact Statement (EIS) or equivalent document and full public exhibition and participation. Within this category, the rigour applied to assessment of proposals will depend on the size of the development and/or its proximity to sensitive areas.
- In Victoria, each proposal is assessed individually and the documentation required is determined by the sensitivity of the proposed site, rather than the proposed numbers.
- Applications for medium sized proposals (50–1000 head capacity) generally need a simpler approach and less detailed documentation than an EIS. Public notification and participation provisions are generally necessary.
- Where located outside sensitive areas, small feedlots (that is less than 50 head) or short term feedlots do not generally need approval prior to establishment, but this depends on the requirements of the local Council and of that Council's Local Environment Plan.
- Those feedlots not requiring approval prior to establishment must notify their establishment to the relevant Local Authority or the Lead State/Territory agency.
- Special provisions may apply for certain sensitive areas (for example, catchment areas and areas close to housing, etc). Such areas should be clearly defined by map or words in the approval procedure documentation. All feedlots need approval in such areas.

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2. In Queensland, South Australia and Victoria feedlot approvals and licences refer to capacity in terms of Standard Cattle Units. Use of the term is accepted in New South Wales, but is not mandatory.

   A Standard Cattle Unit (SCU) is an animal with a live weight at exit from the feedlot of 600 kg. (See Glossary)

   Expressing the approved/licensed capacity in Standard Cattle Units makes it easy to change markets, while maintaining a similar environmental impact in terms of manure and urine production. This gives management flexibility, without requiring fresh approvals. However, when capacity is approved only as a number of cattle, as may happen in NSW, a 50% increase in numbers would require a fresh approval, even though the numbers in SCUs are the same. For example, this could happen when changing production from 750 kg export steers to 400 kg domestic steers.

   Conversion factors, related to metabolic body weight, hence the potential to produce manure and urine, are provided in the Glossary.

   In South Australia, if targetted final weights are between the weights listed in the conversion table, weights are rounded up to the next higher value. For example, an animal with a target turnoff weight of 420 kg is equivalent to 0.81 SCUs.

- Advice from State/Territory Government agencies to Local Authorities and to applicants should be coordinated by the Lead State/Territory Government agency (preferably the Department of Agriculture/Primary Industries) which would ensure that the advice reflected a considered view and would resolve any disagreements between agencies.
- The Lead State/Territory Government agency should publish information to assist applicants and Local Authorities.
- Before the application is prepared, a Planning Focus Meeting (see Glossary) may be convened by the Lead Government Agency to inspect the site and discuss the suitability of the site, particular requirements for the EIS/approval documentation and the design of the proposal. State/Territory Government agency comments should be reported formally (in writing) promptly after the meeting.
- Planning Focus Meetings should be held routinely for feedlots of more than 1000 head. For smaller feedlots Planning Focus Meetings should only be held where the circumstances warrant.
- The Local Authority or appropriate State/Territory agencies should be empowered to hold a public hearing, if appropriate, prior to making a decision, but after public exhibition of the EIS/approval documentation and time for objections/submissions.
- The decision making body should provide the reasons for its decision.
- The applicant should have the right of appeal to a Court against a refusal/conditions in any decision by a Local Authority or State/Territory Government Agency. The applicant should also have the right of appeal against unreasonable delay by the decision making body. Objectors should also have rights of appeal under some circumstances applicable under the appropriate legislation of each State/Territory.
- Notwithstanding all of the above, feedlots of any size which, in the opinion of the Local Government Authority or the relevant State/Territory agency, are causing objectionable pollution or cruelty to animals should be subject to on-going monitoring and control. Such feedlots may be shut down if appropriate and the approval withdrawn.

2.3.4 Feedlot Application Documentation

The following tables indicate the typical data requirements to accompany applications for feedlots of different sizes. Additional information may be required for sensitive sites or to comply with non-feedlot related provisions of the approval process. The requirements for additional information would be decided at a Planning Focus Meeting.

Items marked (PFM) indicate areas that are likely to be discussed at the Planning Focus Meeting. If the issue is obviously sensitive, data should be provided prior to the Planning Focus Meeting in order to save time in processing the application.

Where the site is clearly suitable for the proposal, simpler documentation may be acceptable.

Within the 50-1000 head capacity category, different levels of detail and substantiation of data will generally be required, to reflect the scale of the proposed feedlot and the sensitivity of the location.

Feedlot Application Documentation

1. Application & Site Information

Documentation Required	Feedlot Capacity (head)			
	0–49*	50–1000	1001–5000	>5000
Name, Postal address, Telephone, Facsimile of: 1. Applicant 2. Owner of Subject Land 3. Feedlot Manager Tail tag number	YES	YES	YES	YES
Real Property Description of Subject Land including Portions, Parish, County, Local Government Authority and land area. Total farm area to be stated	YES	YES	YES	YES
Locality Plan No. 1 Cadastral plan of vicinity (preferably 1:25000)	NO	YES	YES	YES
Locality Plan No. 2 Topographic plan showing location of all buildings, commercial and recreation facilities and clearly denoting occupancy, use and separation distances	YES	YES	YES	YES
Locality Plan No. 3 Topographic plan showing				
• location of all watercourses and drainage line	YES	YES	YES	YES
• limit of 1 in 100 year flood	YES	YES	YES	YES
• environmentally sensitive sites	YES	YES	YES	YES
Locality Plan No. 4 Land Use plan showing local government zoning and land use in vicinity of the feedlot	NO	YES	YES	YES
Aerial (Survey) Photograph of Site (most recent Photograph)	NO	YES	YES	YES enlargement preferred

Notes: The data required in the locality plans may be shown on one plan providing that the data is clear.
*If application required.

2. Climatic Information

Documentation Required	Feedlot Capacity (head)			
	0–49*	50–1000	1001–5000	>5000
Mean Annual Rainfall	YES	YES	YES	YES
Average Monthly Rainfall	NO	YES	YES	YES
Rainfall Intensity Data 1 in 20 year, Design Storm 1 in 20 year, 24-hour storm	NO	YES	YES	YES
Average Monthly Evaporation	NO	YES	YES	YES
Monthly Maximum and Minimum Temperatures	YES	YES	YES	YES
Wind Speed and Direction	NO	YES	YES	YES

Notes: Data from nearest recording station. Data limitations and collection site to be indicated
*If application required.

3. Feedlot Information

Documentation Required	Feedlot Capacity (head)			
	0–49*	50–1000	1001–5000	>5000
PROPOSAL OUTLINE documentation outlining the proposal including cattle numbers and weight, stocking density, proposed management and other relevant details	YES number only	YES	YES	YES
SITE PLAN showing location on subject property of feedlot pens and infrastructure, buildings, roads, drainage lines and waste utilization areas	NO	YES	YES	YES
PEN LAYOUT PLAN showing layout of pens, cattle lanes, feed alleys, induction facility, etc. Pen dimensions and water/feed facilities to be shown	NO	YES	YES	YES
DRAINAGE PLAN showing extraneous drainage exclusion system, pen slopes, drains, sedimentation systems, holding ponds, etc	NO	YES	YES	YES
EFFLUENT & MANURE UTILISATION PLAN showing the location, area and proximity to watercourses of all land on which effluent and manure will be utilised, estimates of quantities and whether effluent or manure	NO	YES	YES	YES
TRAFFIC details of traffic volumes, routes and access to be used	NO	NO	NO (PFM)§	YES (PFM)§
WATER SUPPLY documentation on source, quality and adequacy of supply	YES	YES	YES & Details of licences to be included	YES & Details of licences and annual consumption
CARCASS DISPOSAL PLAN showing location and method of disposal of carcasses	NO	YES	YES	YES

Notes: The data required on the various plans may be shown on one plan providing that the data is clear.
* If application required.
§ Requirements likely to be discussed at a PFM

4. Soils & Groundwater Information

Documentation Required	Feedlot Capacity (head)			
	0–49*	50–1000	1001–5000	>5000
SOIL DESCRIPTION Detailed data showing the suitability of soils for purposes intended, basic physical and chemical properties for pens, ponds, effluent, irrigation and manure utilisation	NO	Brief description laboratory analysis (PFM)**	Detailed description including laboratory analysis	Detailed description including laboratory analysis
BORE LOCATIONS plan showing location, depth of and depth to Standing Water Level of all bores on the property and all relevant neighbouring properties	NO	YES	YES	YES
SPRINGS, SEEPS AND SALT SCALDS plan showing location of any of these	NO	NO (PFM)**	YES	YES
GROUNDWATER ANALYSIS chemical and microbiological analysis of existing groundwater	NO	NO	NO (PFM)§	YES
VEGETATION documentation of existing vegetation and extent of proposed clearing	NO	YES If relevant to odour impact assessment	YES If relevant to odour impact assessment	YES
GEOLOGY Documentation of geology underlying the property	NO	NO Brief Description (PFM)**	YES Existing geological maps	YES Existing geological maps
HYDROGEOLOGICAL ASSESSMENTS detailed report assessing impacts on groundwater	Site specific			

Notes: The data required in the various plans may be shown on one plan providing that the data is clear.
* If application required
** PFM will only be held where the circumstances warrant
§ requirements likely to be discussed at a PFM

5. Manure Utilisation Information

Documentation Required	Feedlot Capacity (head)			
	0–49*	50–1000	1001–5000	>5000
SOILS CONSERVATION PLAN showing location of existing and proposed soil conservation works on manure application area	NO	NO (PFM)**	YES	YES
DRAINAGE PLAN showing drainage from application area and separation from watercourses	NO	YES	YES	YES
NUTRIENT AND SALT BALANCE documentation showing that the size of the application area is sufficient to handle the nutrient and salts expected in the manure; off farm arrangements to be specified	NO	NO (PFM)**	YES	YES
MANURE STOCKPILE plan showing size and location of manure stockpile and runoff controls	NO	YES	YES	YES
MANURE SPREADING PROGRAM documentation outlining method, frequency and management program for manure spreading	NO	YES	YES	YES

Notes: The data required in the various plans may be shown on one plan providing that the data is clear.
* If application required
** PFM will only be held where the circumstances warrant

6. Effluent Management Information

Documentation Required	Feedlot Capacity (head)			
	0–49*	50–1000	1001–5000	>5000
SOIL CONSERVATION PLAN showing location of existing and proposed soil conservation works on utilisation area	NO	NO (PFM)**	YES	YES
DRAINAGE PLAN showing drainage from application area and separation from watercourses	NO	YES	YES	YES
HOLDING POND/EVAPORATION SYSTEM documentation indicating capacity, annual runoff volumes, overflow frequency	NO	YES	YES	YES
SEDIMENT CONTROL SYSTEM documentation showing size and method of operation	NO	YES	YES	YES
HYDRAULIC BALANCE documentation showing that the size of the utilisation area is sufficient to handle the volume of effluent expected without runoff or seepage at flow-rates or strengths liable to cause pollution	NO	YES	YES	YES
NUTRIENT AND SALT BALANCE documentation showing that the size of the application area is sufficient to handle the nutrient and salts expected in the effluent	NO	YES	YES	YES
IRRIGATION METHOD documentation outlining irrigation method	NO	YES	YES	YES

Notes: The data required in the various plans may be shown on one plan providing that the data is clear.
* If application required
** PFM will only be held where the circumstances warrant

7. Odour, Noise & Dust Information

Documentation Required	Feedlot Capacity (head)			
	0–49*	50–1000	1001–5000	>5000
ODOUR assess generation, impact and control of odour nuisance	NO	YES	YES	YES
DUST statement outlining dust control measures considered necessary	NO	NO	YES	YES
NOISE statement outlining noise control measures considered necessary	NO	NO (PFM)**	NO (PFM)§	NO (PFM)§

Notes: *If application required
** PFM will only be held if circumstances warrant
§ requirements likely to be discussed at a PFM

8. Animal Welfare

Documentation Required	Feedlot Capacity (head)			
	0–49*	50–1000	1001–5000	>5000
ANIMAL CARE STATEMENT statement of compliance with the *Australian Code of Practice for the Welfare of Cattle in Beef Feedlots* and the appropriate provisions of the *Australian Model Code of Practice for the Welfare of Animals — Cattle* as endorsed by the Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ)	YES	YES	YES	YES

Note: *If application required

9. Sundry Information

Documentation Required	Feedlot Capacity (head)			
	0–49*	50–1000	1001–5000	>5000
PEST CONTROL outline of proposed pest control measures	NO	NO	NO	YES
VISIBILITY statement outlining the degree of visibility of the development by the public	NO	NO	YES	YES
ECONOMIC CONSIDERATIONS employment, exports, value added, local costs and benefits	NO	NO	YES	YES

Note: *If application required

3 Glossary

The definitions in this Glossary refer to the meaning of the words when used in these Guidelines.

Aerobic

A process or condition that occurs in the presence of dissolved or free oxygen.

Anaerobic

A process or condition that occurs without the presence of dissolved or free oxygen.

Animal Care Statement

A document that provides details of the way a feedlot operator will comply with the provisions of the *Australian Model Code of Practice for the Welfare of Animals - CATTLE*, including the Feedlot Code.

Biochemical Oxygen Demand (BOD)

The quantity of oxygen utilised in the biochemical breakdown of organic matter in the effluent. Usually refers to a 5-day test (BOD_5). It is expressed in milligrams per litre (mg/L).

Buffer Zone

An area of land set aside for uses that are compatible with both the feedlot and receptors sensitive to feedlot emissions (for example, residential, commercial and recreation areas). The buffer zone should protect sensitive receptors from being impacted by the feedlot, and it should protect an established feedlot from the encroachment of potentially sensitive receptors.

Controlled Drainage Area

The feedlot pens, receival and load-out yards, cattle handling areas and all areas on site where runoff may be contaminated and therefore is directed to holding ponds, through sedimentation systems. All upslope external runoff is excluded from this area

Effluent

Effluent refers to the contaminated runoff from the controlled drainage area and stored in the holding pond.

Environment

Includes all aspects of the surroundings of human beings, including :

- the physical features of those surroundings, such as the land, the waters and the atmosphere;
- the biological factors of those surroundings, such as animals, plants and other forms of life; and
- the aesthetic factors of those surroundings, such as the appearance, sounds, smells, tastes and textures.

Environmental Impact Report (EIR)

A document describing the proposal including design and management measures to protect surface and groundwaters and community amenity and

to ensure animal welfare standards are maintained. In New South Wales an EIR is required with the Development Application for feedlots with capacities of 50 to 1000 head.

Environmental Impact Statement (EIS)

A document describing the proposal and its impacts on the environment in sufficient detail to satisfy both the intelligent lay mind and experts. Generally a requirement for larger proposals (capacities more than 1000 head).

Freeboard

The height of the pond embankment crest above the design full storage level. The freeboard prevents overtopping of the pond embankment during spill events and includes allowances for wave action and construction inaccuracies.

Groundwaters

Sub-surface water contained in a saturated zone of the soil and/or a geologic stratum.

Hard Stand Areas

All land within the controlled drainage area, excluding vegetated or cultivated areas.

Head Approval

The principal or leading approval (which includes planning approval) to enable the feedlot to proceed at a specified location according to the proposal described in the applications and subject to any prescribed conditions. Other approvals or licences generally deal with matters of detail or components of the development.

Head Decision

The principal or leading decision made on a feedlot application on the basis of the full range of social, economic, environmental, animal welfare and planning concerns.

Hydraulic Load

The input of water via precipitation and irrigation applications.

Land Degradation

The decline in the condition or quality of the land, frequently as a consequence of misuse or overuse. It can include soil structure decline, soil salinisation, soil erosion and soil acidification.

Manure

The solid waste produced by cattle. In the context of cattle feedlots, manure refers to all the material collected from the surface of the cattle pens and the drainage system. It may also contain some dust and spilt feed, but only in small quantities.

Nutrient

A food essential for a cell, organism or plant growth. Phosphorus, nitrogen, and potassium are essential for plant growth. In excess they are potentially serious pollutants encouraging nuisance growth of algae and aquatic plants

in water. Nitrate-nitrogen poses a direct threat to human health. Nitrogen is much more mobile and its form is primarily mediated by microorganisms. Phosphorus is considered the major element responsible for potential algae blooms.

Offensive Odour

Offensive odour means an odour that by reason of its nature, character, components, quality or strength, or at the time at which it is made, is likely:

- to be harmful to and/or
- to be offensive to and/or
- to interfere unreasonably with

the comfort or rest of people at or beyond the boundaries of the premises from which the odour originates.

Peak Flow Rate

Is the maximum runoff flow rate for a given storm.

Planning Focus Meeting (PFM)

A meeting attended by the proponent(s), relevant regulatory authorities and advisory bodies. The purpose is to establish the issues, plus the degree of information required, which should be addressed by the proponent in the Development Application, and to provide advice to the proponent on the acceptability of the proposal.

Pollution

Emission or discharge of matter, be it solid, liquid or gaseous, which causes a deleterious change in the physical, chemical or biological condition of the environment.

Precipitation

The deposits of water, either in liquid or solid form, that reach the earth from the atmosphere. It includes rain, sleet, snow and hail, dew and hoar frost.

Proponent

The person proposing to carry out the activity.

Recharge

Recharge refers to the replenishment of a groundwater body, by gravity movement of surplus soil water that percolates through the soil profile.

Runoff

Runoff consists of all surface water flow, both over the ground surface as overland flow and in streams as channel flow. It may originate from excess precipitation that can't infiltrate the soil or as the outflow of groundwater along lines where the watertable intersects the earth's surface.

Salinity

Electrical conductivity (EC) is the generally accepted measure of salinity (that is: of the concentration of salts in solution). The salts that occur in significant amounts are the chlorides, sulphates and bicarbonates of sodium, potassium, calcium and magnesium. In water these salts dissociate into charged ions and the electrical conductivity of the solution is proportional to the concentration of these ions, providing a convenient means of measuring salinity.

Sedimentation Systems

These systems remove entrained settleable solids from the effluent. A sedimentation system may be a pond, or basin, or terrace that bywashes to a holding pond or evaporation system.

Ponds are structures with a depth greater than 1.5 m, that do not necessarily drain after rainfall.

Basins and terraces are structures that have a drainage capability and are shallower than ponds.

Separation Distance

The distance between the point of generation of an environmental contaminant and a receptor sensitive to that contaminant. It may be used to specify the width of a buffer zone.

Soil salinity

The characteristic of soils relating to their content of water soluble salts. Such salts predominantly involve sodium chloride, but sulphates, carbonates and magnesium salts occur in some soils. High salinity adversely affects the growth of plants, and therefore increases erosion hazard.

Standard Cattle Unit (SCU)

This is an animal with a live weight at exit from the feedlot of 600 kg.

Conversion factors for different exit weights, related to metabolic body weight, are:

Exit weight (kg)	SCU
350	0.67
400	0.74
450	0.81
500	0.87
550	0.94
600	1.00
650	1.06
700	1.12
750	1.18

Surface Irrigation System

Surface irrigation systems are those where land is irrigated using bays, borders or furrows. This typically excludes spray, drip and sub-surface irrigation methods.

Surface waters

These include dams, impoundments, rivers, creeks and all waterways where rainfall is likely to collect.

Tailwaters

Tailwaters result when excess irrigation waters are applied to land and crops and such water is drained from the irrigated area. Such excess is usually collected and recycled for irrigation.

Watertable

The level within an unconfined aquifer at which the water stands. It can be measured as the water level in a bore installed into that aquifer.

.X Percentile Wet Year

The "x" percentile wet year for a site has an annual rainfall which is greater than the rainfall of "x" percent of all years on record for that site. For example, for a 90 percentile wet year, 90 years out of 100 (or 45 out of 50, etc.) have annual rainfall less than or equal to this value and 10 percent of years have rainfall greater than this value.

4 References

Anon. (September 1989) *Queensland Government Guidelines for Establishment and Operation of Cattle Feedlots*. Queensland Department of Primary Industries

Anon. (August 1995) *Victorian Code for Cattle Feedlots*. Department of Agriculture, Energy & Minerals — Victoria: Victorian Feedlot Committee

Anon. (June 1995) *Conference Proceedings Feedlot Waste Management Conference* — Ashmore, Queensland — Queensland Department of Primary Industries/ University of Southern Queensland, Toowoomba

Casey, KD. (August 1996) *Feedlot Waste Management — Final Report:* Meat Research Corporation, Project Number DAQ-079, (unpublished)

Clark, TJ., and Giles, WG. (Eds.) (June, 1994) *Guidelines for Establishment and Operation of Cattle Feedlots in South Australia*, Primary Industries, SA and Office of the Environment Protection Authority

Clarke, MB., Sparke EJ., and Morison, J. (October, 1994) *Regional Impact Of Feedlot Investment — Final Report*, Meat Research Corporation, Project DAQ-079

Garrett, WN. (1963, unpublished) in a paper on "Importance of Environment and Facilities in Beef Production". Prepared for a symposium on the importance of environment and facilities in wine and beef production. American Society of Animal Science — August 14 , 1963, Corvallis, Oregon.

Graham, JKH. *et al*. (Eds.) (November 1995) *The New South Wales Feedlot Manual* — Second edition. Inter-Departmental Committee on Intensive Animal Industries/ NSW Agriculture

Graham, JKH. (Ed.) (September 1993): *Planning Focus Meeting Handbook:* Inter-Departmental Committee on Intensive Animal Industries/NSW Agriculture

Lott, SC. and Skerman, AG. (1995) "Design of Feedlot Sedimentation Basins" in *Proceedings Feedlot Waste Management Conference* - Ashmore, Queensland, Queensland Department of Primary Industries/ University of Southern Queensland, Toowoomba

Pilgrim, DH. (1987) *Australian Rainfall and Runoff*. Institute of Engineers, Australia

Watts, P. and Tucker, R. (Eds) (1994) *Designing Better Feedlots*. Queensland Department of Primary Industries Publication QC 94002

5 Comments on these Guidelines

Any comments or suggestions for amendment of these guidelines should be directed to:

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AUSTRALIA