Appendix 1.

Standard operating procedures for waste management and utilisation

This appendix provides suggested standard operating procedures for feedlot manure, compost and effluent management and utilisation that could be incorporated into a feedlot quality assurance system.

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Manure and effluent management procedures

1. Pen cleaning/manure removal

- Pens are cleaned regularly at intervals of 13 weeks or less.
- Pens are best cleaned when the manure is moist but not wet. However, they have to be cleaned regularly regardless of the manure moisture content.
- Manure is first removed from under fencelines, around water troughs, shade posts, and along and behind the aprons using a bobcat, under-fence pusher, slider blade or other equipment.
- Manure is then scraped from the pen surface into a mound. If an interface layer is to be retained, great care is taken with depth control. The depth to the interface layer is determined by pushing a screwdriver through the manure pad and noting the depth at the change in resistance at the interface layer. Box scrapers and graders provide good depth control and often are the best equipment for retaining an interface layer. If the manure will be removed down to the gravel pad, a wheel loader or excavator can also be used. Under wet conditions, an excavator may be useful.
- Generally the manure will be removed promptly either to the manure stockpiling/composting area or off-site. A front-end loader is used to transfer the mounded manure to a truck or trucks (using two trucks will minimise downtime while the manure is transported). The trucks are best parked within the pen close to the mound for loading, but otherwise along the bottom fenceline.
- Under some circumstances, a mound will be retained in the pen, but can be formed successfully only from manure that is moist. The manure also needs to be compacted so that it is not dispersed by the cattle. Mounds need to be shaped so they shed runoff, and located so that they do not interfere with pen drainage. In unshaded pens, they should be situated in the centre of the pen with their long axis running down the slope. In pens with shade, they should be located downslope of the shade structure.
- Any potholes or depressions in the pad are repaired (see Procedure 3).

2. Under-fence cleaning

- Under-fence cleaning is done at every pen cleaning, but also between pen cleanings as needed to remove accumulated manure that will obstruct pen drainage. This is particularly important for manure that has accumulated under the fenceline at the bottom of the pen.
- Manure is moved from under the fencelines into the pen and is collected during pen scraping/cleaning operations. Alternatively, it is taken immediately to the manure stockpiling/composting area. It should never be left in the drains.

3. Elimination of wet patches and potholes in the pens

- Pens are inspected after rainfall and any wet patches or potholes are repaired or noted for repair at the next pen cleaning.
- Any wet or loose material is removed before the pothole or depression is backfilled with moist gravel. This material is rolled and compacted to ensure the pen surface retains a smooth uniform slope.
- At the same time, water troughs are checked for leaks. Any leaks detected are repaired promptly.

4. Removal of feed residues from feed bunks

- Feed residues are removed from feed bunks on a daily basis.
- Spoilt or wet feed is removed from the bunks using a shovel or brush. The material is either thrown into the pen area for removal during pen cleaning operations or is taken straight to the manure stockpiling/composting area.

5. Water trough cleaning

- Water troughs are cleaned at least once a week.
- Troughs are cleaned by
  - checking for any leakages
  - turning off the water supply tap to the trough
  - removing the bung and draining half of the water from the trough, then replacing the bung
  - scrubbing any algal growth and other foreign matter from the sides and bottom of the trough

  - removing the bung and draining the remaining water and foreign material from the trough
  - replacing the bung and turning the water supply tap back on
  - checking the trough has refilled with clean water.

6. Drain and sedimentation device cleaning and maintenance

- Generally drains should be free of vegetation. Where drains or diversion banks need to be vegetated, the grass should be kept short by regular mowing or slashing.
- Following runoff events, the level of the settled sediment in the drains and sedimentation device is checked. Excess sediment is allowed to dry before being removed.
- The drains and sedimentation device are cleaned using a box-scraper, bobcat, slider blade, front-end loader or an excavator working from the bank. Sediment is removed from the device and the weir and transported to the manure stockpiling/composting area.
- The drains and sedimentation device are checked to confirm that they have a smooth, uniform slope.
- Any potholes or low areas in the floor or walls of the sedimentation device or drains are backfilled and compacted to produce a durable surface.

7. Horse stables bedding management

- The base of the horse stables is bedded with suitable material e.g. sand or sawdust. The bedding is frequently and regularly removed and replaced to ensure dry, low-odour conditions. Removed material is taken to the feedlot manure stockpiling or composting area.
- The bases of the run-out areas are inspected at least quarterly and maintained as needed.

8. Effluent holding pond maintenance

- Following rainfall runoff, the water level in the effluent holding pond is checked.
- Ideally, the effluent is stored within the holding pond for a month to reduce the pathogen load before being irrigated. However, when the effluent level reaches within 1,500 mm of the embankment crest, it is irrigated provided soil moisture and weather conditions are suitable. The effluent is managed to maintain a minimum of 600 mm of freeboard on the holding pond.
- A depth of at least 300 mm of effluent is maintained in the bottom of the holding pond after irrigations.
- The weirs are routinely checked after runoff events to ensure they are clean and operating properly. The pond walls are inspected regularly to assess their structural integrity, and any signs of problems with either the weirs or the pond walls reported to management for prompt action.
- The depth of sludge in the holding ponds is monitored. When sludge begins to compromise effluent storage capacity (e.g. more than 20% accumulation, typically every 5–20 years), it is carefully removed using a dragline, agitator and pump or excavator. Removed sludge is either spread directly onto land or is taken to the manure storage/composting area for drying before being added to the manure or compost windrows.

9. Manure stockpiling and stockpile management

- Manure is formed into windrows for aging. The windrows are long, low piles with a triangular cross-section, a base width of 3–4 m and a height of 1.5–2 m.
- The windrows are oriented with the long axes perpendicular to the contours of the area to promote free drainage around the manure piles.
- After the manure has been aged for at least six months in a windrow, it can be screened before being utilised or transferred to a stockpile for storage.
- Wet manure or sludge is never added directly to a large manure stockpile. Wet manure solids are formed into low windrows and allowed to dry first. Turning the windrows promotes more rapid drying.

10. Managing fires in manure stockpiles

- Manure fires are difficult to distinguish and can burn for many months, releasing acrid odour and smoke. Manure stockpiles are checked for fires on a daily basis so that action can be taken quickly.

- Except for very small fires, expert advice and assistance on fire extinguishment should be sought.
- If there is a very small fire in the stockpile, ignited particles can be removed with appropriate machinery (e.g. front-end loader) but *only* if this can be done safely. The ignited particles are then extinguished with water or allowed to burn out.
- In the event of a manure stockpile fire, details of the event and actions taken are recorded. If the cause of the fire can be identified, this is also recorded and manure management practices modified to prevent a reoccurrence.

11. Manure stockpile area maintenance

- The base and banks surrounding the manure stockpiling/composting area are checked at least quarterly but also after heavy rainfall; the area is maintained as necessary.
- Any potholes or low areas in the base or bank, or bank weaknesses, are backfilled and compacted to produce a durable surface.

12. Delivery of co-composting materials

- Co-composting materials include any solid matter that will be composted with the manure. These are unloaded on a suitable area within the manure stockpiling/composting pad. If these are not to be immediately mixed with manure, they are formed into windrows with a base width of 3–4 m, 1.5–2 m high with a narrow top and sloping sides.
- Details of the delivery date, type and quantity of material delivered are recorded.

13. Compost management

- Manure and any co-composting materials are thoroughly mixed and formed into windrows with a triangular cross-section. These are 3-4 m wide at the base and 1.5–2 m high.
- The moisture content of the composting material is tested. At the ideal moisture content, the compost appears moist and little moisture can be squeezed from a handful. If the material is too dry, water or effluent can be added using the turning equipment, high-pressure jets or micro-sprinklers. Care is taken to ensure leachate is not produced. If the material is too wet, it can be turned every day or two to promote drying.
- After the windrows are formed, the core temperature and moisture content of the composting material are monitored at least weekly. The results are recorded separately for each windrow.
- The temperature is monitored by inserting a long probe thermometer deep into ten separate spots along the length of the windrow. Alternatively, a thermistor string can be used.
- Moisture is monitored by taking a handful of compost from an arm-length depth at ten sites along the windrow. The compost is classed as ‘dry’ if it appears dry and no water is released when the handful is squeezed, ‘wet’ if it has water leaching from it without being squeezed, or ‘moist’ if it appears wet but little moisture comes out when squeezed. ‘Moist’ is the ideal moisture content.
- If water is available, material that is ‘dry’ is watered before turning. Effluent is not used to water windrows after initial windrow formation. Care is taken to ensure the material does not become waterlogged and to avoid excess pooling of water around the compost piles.
- If material is ‘wet’, the windrows are turned more frequently (every couple of days) and/or dry co-composting materials incorporated into the pile.
- The compost pile is turned after high temperatures (>55°C) are maintained for at least three consecutive days. The material is turned at least three times after three days of high temperatures during the active phase. Fortnightly turning is suggested but turning can occur more frequently if the pile has heated sufficiently and equipment and labour are available.
- The active phase is considered complete when the pile no longer heats up above 55°C after turning. After completion of the active phase, the compost can be kept in a windrow or formed into a stockpile where it is allowed to cure for at least a month.
- Details are recorded of
  - the date each windrow was formed
  - the materials added
  - results of temperature and moisture content tests
  - turning and watering
  - date active phase is considered complete
  - quantity of compost removed from site.

Mortalities management procedures

14. Mortalities composting

- Mortalities are promptly transferred to the composting area using equipment that is not used for feed processing. Mortalities are lifted and carried from the pens, not dragged. This is particularly important for infected mortalities.
- Using a front-end loader bucket, spread a 60 cm deep base of absorptive material (e.g. sawdust or waste straw) that will retain fluids released during decomposition. The base should be about 5–5.5 m wide as this will allow two mortalities to be laid side-by-side. If mortalities will be stacked two high, the width should be increased to 7 m. Allow at least 2.5 m of windrow length for each tonne of mortalities.
- Generally, the thoracic cavity will be opened or the rumen punctured. However, this should not be done if the likely cause of death is a zoonosis or infectious disease.
- Mortalities are placed in a single layer on top of the absorptive layer. If the windrow will be two carcases wide, the spines of the animals are placed in the centre of the pile with the legs on the outer edges.
- The bodies are covered completely with at least 0.6 m of sawdust or manure. A second layer of mortalities can be placed on top with a further 0.6 m of cover material over it. Ideally the cover material will have a moisture content of about 50-60% wet basis. Material with this moisture content will feel moist but it should not be possible to squeeze moisture from a handful of it. If necessary, wet the material with water or effluent.
- Mortality coverage and windrow core temperatures need to be monitored weekly during the active stage.
- Using a long-stemmed thermometer, measure the core temperatures at 10 spots along the windrow. Alternatively, a thermistor string can be used. Temperatures of 50–60°C should be reached within 2–3 days of pile commencement and remain high for at least two weeks.
- Turning of the carcase windrow is recommended only after the organic material has broken down into small particles and the bones partially softened (typically 4–6 months). Turning and watering (if required) is recommended at this stage.
- The active stage is completed when the pile no longer heats after turning. The material will be a dark brown to black humus-like material. Turning is suggested at this point.
- Curing can then occur. Allow a total of 12 months for active composting and curing. To prevent regrowth of pathogens, composted material must be kept separate from uncured material.
- The finished material is screened before spreading to remove remaining bones.

15. Disposal of mass mortalities by composting

In the case of an excessive number of cattle deaths (any substantial increase in cattle mortalities)

- Contact a veterinarian to undertake post mortems.
- Report the mortalities to the relevant environment protection agency and to ALFA who will notify the Chief Veterinary Officer.
- If composting is deemed an appropriate disposal method, follow the previous procedure but take additional precautions if an infectious disease is the possible cause. Do not puncture the rumen or open the body. To achieve high temperatures that are able to kill pathogens as quickly as possible, use a 15–30 cm layer of silage or moist manure then a layer of ground straw as the cover material. Maintaining a good level of cover is crucial. Do not turn the pile during carcase decomposition. Do not excavate or spread compost until approved by the Chief Veterinary Officer. Dispose or use the compost in a manner approved by the Chief Veterinary Officer.
- Where the livestock deaths are not the result of disease, dry porous materials that do not necessarily produce high temperatures quickly can be used as cover material. The pile can be turned after 60–90 days, although this may not be necessary. Excavation and spreading of compost can occur once the soft tissues and internal organs are fully decayed (usually 8–12 months after starting the process) and curing has occurred.
- In many circumstances, the compost will be deemed safe to spread and can be screened first to remove remaining bones.
- In other circumstances, the compost will need to be buried or burnt.

Effluent irrigation procedures

16. Selection of effluent irrigation area

- When effluent needs to be irrigated, an appropriate utilisation area is selected. This is an area that has not yet received its annual effluent application rate. Areas that are known to have elevated nutrient levels are not to be selected.
- The wind speed and direction is checked to ensure the prevailing wind direction will not carry odours directly towards nearby residences or other receptors. If this is likely, an alternative area may be selected or irrigation delayed.

17. Effluent irrigation

- The weather forecast and the moisture content of the soil are checked. Effluent is irrigated only when the soil is sufficiently dry to absorb the applied liquid and should not occur within 48 hours of heavy rain. Do not irrigate if significant rainfall is expected.
- Plan to irrigate effluent from mid-morning to early afternoon when good odour dispersion is likely. Avoid effluent irrigation from mid-afternoon to evening or just before weekends or public holidays, particularly if close to a public area.
- A suitable rate of effluent irrigation is determined based on the nitrogen, phosphorus and potassium content of the effluent.
- The soil is monitored during irrigation to ensure there is no surface pooling or effluent runoff.
- Staff are advised of the risks associated with effluent irrigation and the appropriate personal protection equipment to use. This may include high quality (P2) face masks, overalls and disposable gloves.
- The irrigation system is set up to apply effluent at the target rate.
- If a travelling irrigator is used, it is checked every two to three hours to ensure it is moving in the correct direction and not creating other issues.
- Details of the following are recorded:
  - date of irrigation
  - weather forecast summary, including wind direction and rainfall
  - assessment of likelihood of amenity impacts
  - utilisation area (name of paddock)
  - target and actual rate of application (mm).

Manure utilisation procedures

18. Selection of manure spreading area

- A suitable area is selected for manure utilisation. This will exclude areas that have already had their annual allocation of manure applied or that are showing elevated nutrient levels.
- The wind speed and direction is checked to ensure the prevailing wind direction is not directly towards nearby residences or other receptors.
- Staff are advised of the risks associated with manure spreading and the appropriate personal protection equipment to use. This may include high quality (P2) dust masks, overalls and disposable gloves.

19. Manure spreader calibration

- Use plastic drop sheets or tarpaulins of at least 2 m × 2 m.
- These drop sheets are laid on the ground in the path of the spreader (some near the centre, some on the outside so that two side-by-side passes will run over the sheets).
- For each drop sheet, place a 1 m × 1 m wire square over the drop sheet.
- The spreader is passed over the sheets in two side-by-side runs at the usual operating speed.
- Weigh the manure collected from each of the wire squares.
- The weight of manure landing in each wire square (kg/m^2) is multiplied by 10 to convert it to a rate in tonnes per hectare.
- The spreader is adjusted if necessary, and the exercise repeated until the spreader is operating at the target rate.

20. Manure spreading

- Check the weather before undertaking manure spreading. Do not spread if heavy rain is expected or if it has fallen over the last 48 hours.
- A suitable manure spreading rate is determined based on the nitrogen,

phosphorus and potassium content of the manure, soil properties and the intended land use of the utilisation area. The rate should be consistent with the ability of soils and plants grown on the area to sustainably use the applied nutrients, salts and carbon in the manure or compost.

- Plan to spread manure from mid-morning to early afternoon when good odour dispersion is likely. Avoid spreading from mid-afternoon to evening. Avoid spreading manure just before weekends or public holidays, particularly if close to a public area.
- Calibrate the manure spreader to ensure it is spreading at the target rate.
- Record the following details
  - date of manure spreading
  - weather forecast summary, including rainfall and wind direction
  - assessment of likelihood of amenity impacts
  - area of application (name of paddock)
  - target and actual rate of application as t/ha.

21. Transport of aged manure and compost

- To minimise the risk of material spillage during transport, loads do not exceed vehicle capacity.
- The load is covered to minimise dust and odour emissions during transport along public roads.
- Where practical, avoid transport routes that have a large number of houses or public use areas close to the road.

22. Manure and compost removal from the site

- When manure or compost are removed from the feedlot site, the following details are recorded
  - the date, quantity and type of waste removed
  - the name of the transporter and/or operator that removed the wastes
  - the intended use of the wastes
  - the destination of the wastes (including the property owner's name and address).
- The recipient of the manure or compost is provided with a 'Duty of Care: Manure Utilisation' sheet.

Procedures following heavy rain

Also refer to the following procedures:

6. Drain and sedimentation device cleaning and maintenance

8. Effluent holding pond maintenance

9. Manure stockpiling and stockpile management

11. Manure stockpile area maintenance

23. Diversion banks and drains

- All diversion banks, drains and bunds are checked to ensure extraneous stormwater runoff cannot enter the controlled drainage area of the feedlot and the manure stockpiling/composting areas.
- Any damage to banks, drains and bunds is immediately repaired and details of the maintenance recorded.

24. Manure stockpiling/composting area

- The manure stockpiling/composting areas are checked to ensure they are freely draining.
- The layout of the manure or compost pile(s) is checked to ensure they are not blocking runoff and promoting pooling of water. When conditions allow, reconfigure any piles that are impeding drainage.
- The base of the manure stockpiling/composting area is checked for potholes and other low spots. If necessary, the base is repaired when conditions permit.
- Details of any maintenance procedures undertaken are recorded.

On-going procedures

25. Fly and vermin management

- Fly and vermin levels around the feedlot are monitored on an ongoing basis.
- Vermin baits are used and/or replaced as required.
- Bait stations are checked on a weekly basis.

26. Dust management

- Dust levels are monitored on an ongoing basis.
- Internal roads are watered as required to reduce dust.

- Where practical, stocking density in pens is increased (to within licence limits).
- Where water is available, dry manure in compost piles is watered before and during turning to suppress dust.

27. Operational recording

- Record details of all cattle introduced to and removed from the premises, including
  - number and live weight of cattle in each pen
  - date of introduction/removal
  - sickness or deaths of animals.
- Record details of routine operating procedures undertaken to prevent or minimise environmental harm, including
  - spilt feed cleaning
  - wet patch elimination
  - repairs to potholes
  - under-fence cleaning
  - pen cleaning and manure removal, storage and utilisation
  - effluent irrigation
  - fly and insect treatment and control
  - maintenance of the controlled drainage area confining the feedlot complex.
- Record details of maintenance works carried out, including
  - drainage channel maintenance
  - diversion bank and dam wall maintenance
  - sedimentation system maintenance
  - maintenance of banks within utilisation areas
  - holding pond maintenance.
- Record details of likely environmental impacts resulting from releases of contaminants into the environment.
- Record details of staff training to enhance environmental management skills and awareness of environmental issues.
- Record details of off-site movements of wastes including the following
  - date, quantity and type of wastes removed
  - name of the transporter and/or operator that removed the wastes
  - intended use of the wastes
  - destination of the wastes (including the property owner's name and address).

28. Staff training

- All staff members are trained to know their responsibilities in regard to environmental management.
- All staff members are trained in procedures applicable to their role.
- Staff members are provided with relevant technical information for reading.
- All staff members are made aware that
  - manure, particularly pen manure, contains pathogens that may cause illnesses
  - fine dust appears to pose the greatest risk
  - health risks can be minimised by adopting good hygiene practices. Always wash hands well after handling manure, compost, effluent or mortalities, especially before touching food, eating utensils, cups, your eyes or other people
  - personal protective clothing and equipment including high quality (P2) dust masks, overalls and disposable gloves provide additional protection.
- Staff members are provided with additional on-the-job training and also participate in appropriate environmental courses, seminars or workshops.

Environmental monitoring and reporting procedures

29. Environmental monitoring

- Throughout the year, environmental monitoring occurs in accordance with licence or permit requirements.
- Aged manure and/or compost are analysed at least annually before the main spreading season.
- If effluent is irrigated or used to moisten materials before composting, it is analysed at least annually, ideally just before the main usage period.
- If effluent or manure/compost are utilised on-farm, the soils of the utilisation area(s) are analysed at least annually (in the years that they are irrigated with effluent or spread with manure or compost).

- Monitoring equipment, analysis request forms and a supply of monitoring containers and sampling bags are kept on hand.

30. Annual environmental report

- An annual environmental report is prepared that includes
  - summary of pen cleaning
  - soil analysis results for samples taken from any on-farm utilisation area where effluent or manure has been spread in the reporting year
  - analysis results for effluent for irrigation and aged and/or composted manure from the stockpile area
  - summary of the effluent irrigation rate (mm) to each paddock, along with an estimate of the nitrogen, phosphorus and potassium application rate
  - summary of the manure and/or compost spreading rate on each paddock, along with an estimate of the nitrogen, phosphorus and potassium application rate (kg/ha)
  - type of crop, pasture or forage grown on each utilisation area along with an estimate of the harvested yield and the estimated nitrogen, phosphorus and potassium removal rate (kg/ha)
  - records of any manure and/or compost provided to off-site users including the date of the transfer; the name and contact details of the recipient; and the type and amount of material supplied
  - details of any complaints received, communications with the complainant, investigations into the cause of the complaint, any corrective actions taken and any changes to procedures
  - details of any environmental incidents and any associated corrective actions and reporting.

Complaint and incident management procedures

31. Community consultation

- Maintaining open lines of communication with the public is important in dealing with amenity or other issues.
- During feedlot operating hours, a telephone complaints line is operated for the purpose of receiving any complaints in relation to activities conducted at the premises.
- All neighbours are encouraged to make contact if they have any issues or any complaints concerning the feedlot or the manure and effluent utilisation practices.
- Feedlot management informs immediate neighbours of proposed effluent irrigations and manure/compost spreading events or any unusual activities that may result in nuisance.
- Any corrective actions taken in response to a complaint are reported back to the complainant. The complainant is consulted about whether this has eliminated or reduced the source of the complaint.

32. Complaint recording

- Details of all complaints are recorded. These include
  - time and date of complaint/incident
  - method of communication (telephone, fax, email, letter, personal visit)
  - name, address and contact telephone number of complainant (Note: if complainant does not wish to be identified, record as 'Not Identified')
  - wind direction and strength and any other relevant climatic conditions
  - nature of the complaint
  - any management practices that may have contributed to the complaint
  - name of person responsible for investigating the complaint
  - action taken in relation to the complaint and signature of responsible person
  - details of any further communications with the complainant
  - details of notification of the Administrating Authority (if applicable).

33. Incident recording

- Full details of all environmental incidents are recorded, including the following
  - time, date and duration of equipment malfunctions or other operational problems that may have resulted in a direct or indirect impact on the environment
  - any preventative or corrective action implemented
  - any uncontrolled release of contaminants reasonably likely to cause environmental harm
  - any emergency involving the release of contaminants reasonably likely to cause material or serious environmental harm including effluent holding pond overflows

  - any substantial increase in livestock mortalities
  - any change in management practices which may have resulted in enhanced environmental performance.
- Relevant authorities are notified of any incident reasonably likely to cause environmental impacts, in accordance with licence conditions.

Sample record sheets

- The Complaints Register and the Environmental Data Record are useful environmental management records for feedlots.
- The Complaints Register is used to record details of complaints made by the general public in relation to impacts to community amenity.
- The Environmental Data Record is used to record any items of concern noted during ad hoc or subjective assessments by feedlot staff, as well as any actions taken and the effectiveness of those actions, and any items of concern noted during monitoring or assessment of laboratory analysis or other monitoring information.
- Example copies of the Complaints Register and the Environmental Data Record follow.

COMPLAINTS REGISTER

Time and date	Method of communication	Complainant contact details	Weather conditions	Details of complaint	Action taken	Name of person responsible	Signature	Which regulatory agencies were notified?*

** Name of officer, agency and date*

ENVIRONMENTAL DATA RECORD

Date	Item	Comment/Action Taken	Effectiveness of action taken	Requirement/ recommendation for changes to procedures	Signature of officer responsible