

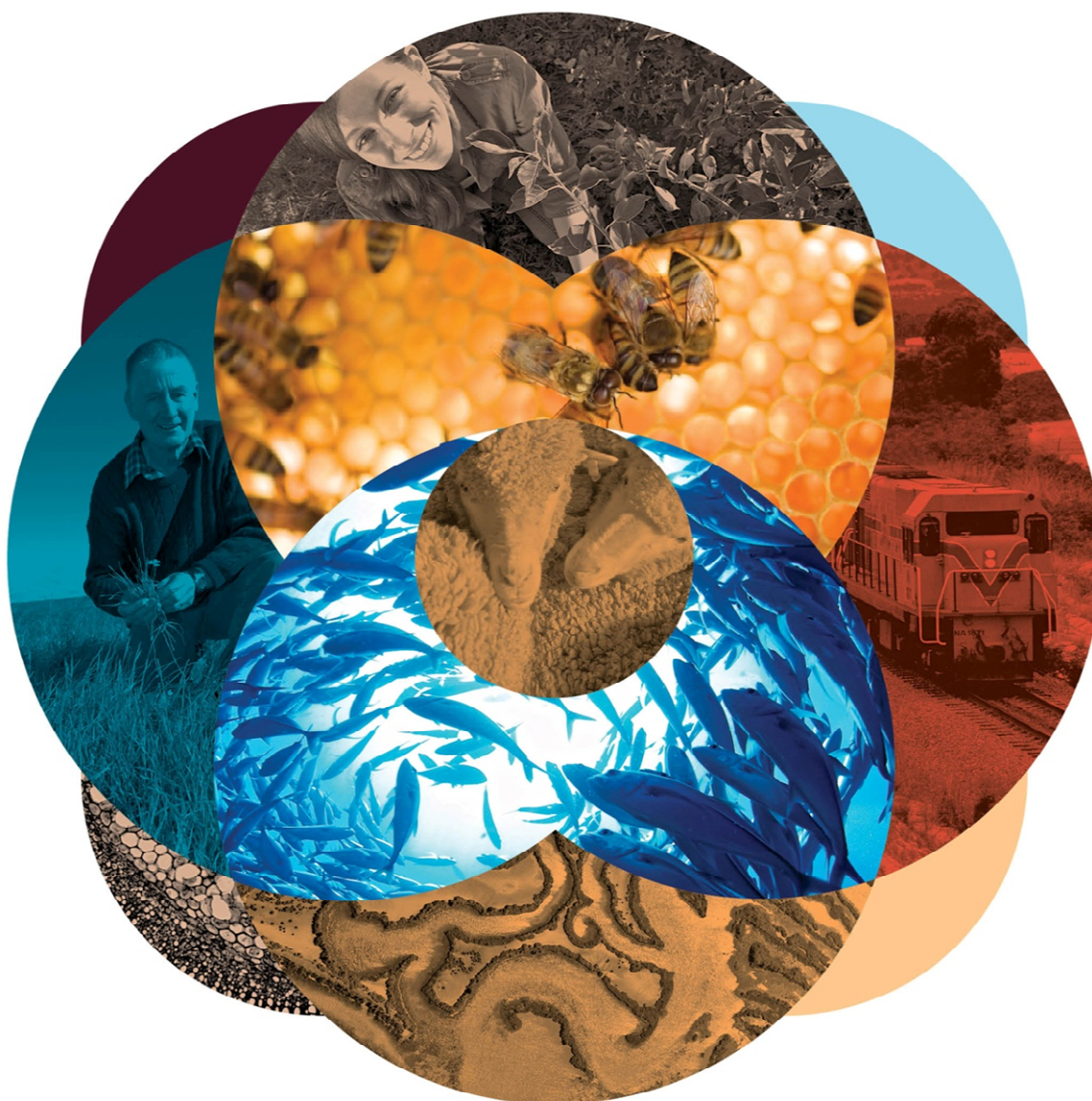


Australian Government
Department of Agriculture
and Water Resources

Review of the Australian Standards for the Export of Livestock: Sea Transport

Final report

Technical Advisory Committee



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Summary

The Australian Standards for the Export of Livestock (ASEL) set requirements to ensure animals are fit to export from Australia, and their health and welfare is managed throughout the export voyage. The current standards, v2.3, have been in place since 2011. The purpose of this review is to ensure the standards remain fit for purpose and reflect the latest science.

The committee consulted widely in forming its views. It also considered the findings of a literature review commissioned by the Department of Agriculture and Water Resources (the department). On the basis of information received, and its own analysis, the committee has recommended a number of changes to the standards to help ensure the welfare of animals. They include changes in relation to:

- Sourcing and preparation of livestock—with controls to remain on sourcing certain livestock, and more time provided in registered premises for stock to rest and prepare for the export journey.
- Space on export vessels—with more space to be provided in most circumstances.
- Circumstances in which a heat stress risk assessment needs to be conducted—with an assessment required for all export voyages that cross the equator, to be implemented in stages.
- On-board management, including bedding and fodder provisions.
- Personnel needed to manage animals on the vessel.
- Reporting requirements.

The recommendations were formed based on welfare considerations. But, as required by the committee's terms of reference, the practicalities of livestock management and industry sustainability were also considered. The committee's analysis of financial implications are provided in Chapter 9 of this report. There will be costs, and they will need to be shared between exporters, producers, and ideally, the end consumer.

The committee is mindful that the current standards are predominately input based, rather than outcomes based. This approach assumes that if the inputs are controlled, then a satisfactory animal welfare outcome will follow. The committee also notes that, while best practice is to focus on the outcomes desired, there still needs to be a minimum set of standards that clearly articulate what society expects all exporters to meet. The committee's recommendations have been made with this risk/debate in mind. Notwithstanding that, the committee believes there should be scope for the regulator to reward superior performance based on demonstrated outcomes, and that over time, the standards could evolve to a more outcomes driven approach.

As required by the terms of reference, the committee also produced a reformatted version of the standards. Given that the review of the standards with respect to air transport has yet to be undertaken, the government could consider implementing the committee's recommendations in the current format of the standards (v2.3). This approach may allow the committee's welfare recommendations to be given effect more quickly, whilst providing industry participants with more time to prepare for standards that are in a different format.

Recommendations

Sourcing and preparation

- 1) That the standards should prevent *Bos taurus* cattle from an area of Australia south of latitude 26° south being sourced for export on voyages that will cross the equator between 1 May to 31 October (inclusive), unless an agreed livestock HSRA indicates the risk is manageable. Until the heat stress risk assessment model has been further developed to include all destinations across the equator, the provision should continue to apply to the Middle East.
- 2) That the standards prevent pregnant *Bos taurus* cattle from an area of Australia south of latitude 26° south being sourced for export on voyages that cross the equator from 1 May to 31 October (inclusive).
- 3) That the standard prevent *Bos taurus* cattle with a body condition score of 4 or more out of 5, or 5.5 or more out of 6 for dairy cattle, being sourced for export from, or exported through, any area of Australia north of latitude 26° south from 1 October to 31 December (inclusive).
- 4) That the standards require that all sheep to be exported by sea have no more than 25mm of wool or hair, until sufficient evidence is available to review this approach for specific breeds of hair sheep.
- 5) That for sheep held in a paddock at the registered premises, the standard continue to require that they be 10 or more days off-shears when sourced.
- 6) That for sheep held in sheds at the registered premises, the standard require they be given at least two 'clear days' between shearing and loading for export (for a definition of 'clear day' see Recommendation 8).
- 7) That the standards require that cattle and buffalo over 500kg may only be exported in accordance with a heavy cattle/buffalo management plan to be agreed with the department. The welfare of cattle and buffalo over 500kg should also be monitored over the coming 12 months to assess whether an absolute upper weight limit is needed in the standard.
- 8) That the term 'clear day' be defined in the standard as a full day (midnight to midnight), not including the day of arrival or load out, during which livestock are not subject to any fodder or water curfew, and are not shorn. Clear days do not have to be consecutive, and apply to the animal, rather than at a whole-of-consignment level.
- 9) That the standards require sheep and goats to be held at the registered premises for five clear days, irrespective of the location and design of the registered premises, the time of year, or the length of the export voyage.
- 10) That the standards require all classes of cattle travelling on short and long haul voyages to be held at the registered premises for a minimum of two clear days, irrespective of the location of the premises and the number of loading/discharge ports on the voyage. Three clear days should be required for all classes of cattle travelling on extended long haul voyages.
- 11) That the standards require buffalo to be held at the registered premises for a minimum of five clear days, irrespective of location of the premises, length of intended voyage or number of loading/discharge ports.

- 12) That the standards require that, of the five clear days for which sheep and goats are held at the registered premises (see Recommendation 9), they are fed ad libitum on pelletised fodder equivalent to the shipboard ration for at least the final three clear days (for a definition of 'clear day' see Recommendation 8).
- 13) That the standards require pelletised fodder to be fed in troughs at the registered premises, and that feeders/troughs be of a design that prevents spoilage of fodder, particularly during inclement weather. The standards should also state that livestock must have access to fodder that is neither contaminated nor spoiled.
- 14) That the existing pregnancy-related rejection criteria and pregnancy testing criteria be retained in the standards, other than:
 - a) the testing criteria relating to 'maximum days pregnant' for all livestock exported by sea, which should be amended to apply at the scheduled date of discharge, rather than the scheduled date of departure, to ensure that livestock cannot be exported in the third trimester; and
 - b) the provision relating to Damara female sheep, which should be extended to apply to all female fat-tailed sheep.
- 15) That the definition of a competent pregnancy tester be amended to cover persons permitted to undertake pregnancy testing by law in any state or territory jurisdiction, rather than just persons in the Northern Territory and Western Australia. For clarity, the circumstances in which competent pregnancy testers are permitted remains unchanged.
- 16) That the standards allow the department to extend the validity of a pregnancy test beyond 30 days only where necessitated by circumstances outside the exporter's control and where the exporter can demonstrate that the extension will not impact on animal welfare outcomes. That decision should be delegated to regional veterinarians, rather than requiring a formal dispensation from the Canberra office.

Stocking density

- 17) That the standards require that sheep and goats held at a registered premises be given a minimum space allocation of:
 - a) 0.33m² per head, where they are held at the premises for less than 10 days, with an additional 0.006m² for each 1kg increase in bodyweight above 54kg.
 - b) 0.5m² per head, where they are held at the premises for 10 days or more, with an additional 0.006m² for each 1kg increase in bodyweight above 54kg.
- 18) That the standards for stocking density in registered premises remain unchanged for cattle and buffalo.
- 19) That the standards require that a mortality report be provided for each consignment at the time it leaves the registered premises.
- 20) That the standard adopt an allometric approach to calculating default base space allowances, using a k-value of 0.03, or current ASEL, whichever is the greater.
- 21) That, for sheep voyages between 1 May and 31 October, the standards require the space allowance to be calculated using a k-value of 0.033 until a new HSRA model is in place based on heat stress welfare indicators rather than mortality (noting that this is subject to a

separate review process). Once such an HSRA model is in place, the standard should be revised to adopt the default space allowance for sheep using a k-value of 0.030.

- 22) That, for cattle voyages of less than 10 days, the standards allow the department to approve a space allowance based on a k-value of 0.027 based on proven past and continuing high performance of the exporter and export vessel for such voyages. For those voyages, the standards must require daily reports to be provided (including the information recommended in [Chapter 5](#) of this report). The regulations should also enable penalties to be imposed on an exporter when a voyage is claimed to be less than 10 days, and access to the alternate stocking rate ($k=0.027$) is approved, but the voyage exceeds 10 days.
- 23) That in relation to other special categories of livestock, the following approach should apply to space allowances:
 - a) Buffalo: on all voyages, 10 per cent more space than that required for cattle on voyages of more than 10 days.
 - b) Cattle and buffalo with long horns: 30 per cent more space than otherwise required for cattle and buffalo.
 - c) Cattle and buffalo from 500kg and above: additional space as determined by an approved heavy cattle/buffalo management plan.
 - d) All pregnant cattle and buffalo: a minimum of 15 per cent more space than otherwise required for cattle and buffalo for a given liveweight and voyage.
 - e) Rams and goats with horns: 10 per cent more space than otherwise required for sheep and goats.
- 24) That a weight gain factor should not be a requirement when determining stocking densities, but that where a curfew has been applied to livestock for more than 12 hours off fodder and water, a curfew factor of 5 per cent should be applied in calculating stocking densities.
- 25) That daily reports be required for buffalo consignments, regardless of voyage length.
- 26) That departmental officers should ensure a check of animal weights is undertaken through a sample inspection and review process at registered premises prior to and during loading to ensure accurate liveweights are being applied in load plans.

Heat stress risk assessment

- 27) That the standards be revised over time to require the application of an agreed HSRA to all livestock voyages that cross the equator, at all times of the year, from all Australian ports. This requirement will require significant model development and a staged implementation approach.
- 28) That once the (separate) review of the HSRA model for sheep exports to the Middle East is completed, the testing criteria in the standards should be revised to support the new model.
- 29) That the period 1 May to 31 October continue to be applied as defining the 'northern summer' in the relevant sections of the revised standard.

Voyage reporting

- 30) That the term 'reportable mortality level' be replaced with the term 'notifiable mortality level' in the standards.

- 31) That the notifiable mortality level for sheep, goats, camelids and deer should be set at 1 per cent, or three animals, whichever is the greater; and that an average daily mortality rate of equal to, or greater than, 0.05 per cent, calculated at the end of voyage, be added to the list of events that would qualify as a 'notifiable incident'.
- 32) That the notifiable mortality level for cattle and buffalo should be set at 0.5 per cent, or three animals, whichever is the greater; and that an average daily mortality rate of equal to, or greater than, 0.025 per cent, calculated at the end of voyage, be added to the list of events that would qualify as a 'notifiable incident'.
- 33) That the requirements for daily reports and end of voyage reports be updated as per [Appendix A](#) and [Appendix B](#) in this report including:
 - a) Inclusion of more detailed welfare monitoring in daily reports based on an assessment of at least two pens of sheep, cattle, buffalo and goats representative of each class or line, per deck, as well as a welfare assessment for any 'at high risk pens' or 'pens of concern'.

On-board resources and management

- 34) That the standard require that on all voyages, a sufficient quantity of bedding is carried, applied and managed in a manner that ensures good animal welfare outcomes for livestock; in particular, to minimise slipping (including during loading and unloading), injuries, abrasions, lameness, pugging, faecal coating.
- 35) That the standard require the consistency and depth of bedding material to be routinely monitored.
- 36) That in relation to recommendation 34, the manure pad is an appropriate form of bedding for sheep, but that a sufficient amount of material such as sawdust, wood shavings or rice hulls, must still be carried to manage moisture in the sheep manure pad, avoid slippage during loading and unloading, and manage incidents such as pen flooding.
- 37) That, in addition to the requirement in recommendation 34, the standards continue to require that for cattle and buffalo on all voyages of ten days or more be provided with sawdust, rice hulls or similar material to be used exclusively for bedding at a rate of at least 7 tonnes or 25m³ for every 1000m² of cattle/buffalo pen space (no exception).
- 38) That bedding requirements for voyages of 31 days or more be agreed in the extended long-haul management plan.
- 39) That the standard require that ammonia levels in livestock spaces not exceed 25ppm and that reduction measures be implemented if that level is exceeded in any given area of the vessel. The department should allow a 12 month transition period with respect to compliance whilst industry tests the use of currently available devices on ships.
- 40) That the standards require:
 - a) That all livestock be offered fodder and water as soon as possible after being loaded on the vessel, and at the very least within 12 hours,
 - b) That water be provided ad libitum throughout the voyage (including days of loading and discharge). The standards should also prevent any water curfew prior to unloading in the northern hemisphere summer in Middle East ports.

- c) That adequate trough space be provided per animal to ensure free access to feed during the voyage.
- 41) That the department require the use of automated watering systems on all livestock export voyages.
- 42) That the standards require that, on voyages of 30 days or less, at least 1 per cent of the fodder for cattle and buffalo be chaff and/or hay. For voyages of 31 days or more, at least 2 per cent of the required fodder must be chaff and/or hay.
- 43) That the standards require vessels to hold sufficient fodder to meet the needs of livestock throughout the voyage, including days of loading and discharge (noting livestock will be progressively loaded and unloaded during those periods).
- 44) That, in addition to Recommendations 42 and 43, the standards require that vessels carry adequate fodder reserves to ensure livestock can continue to be fed in accordance with specified allowances even if voyage delays occur. At a minimum, this must include 3 days of fodder and water, aside from voyages through the Suez Canal, Cape of Good Hope, the Panama Canal and Cape Horn, and any other voyage that is expected to take longer than 30 days, which must carry 7 days of reserves.
- 45) That the standards are further reviewed without delay once current studies into fodder quality, quantity and pellet specifications are completed. In addition, the department should regularly inspect vessels at loading to verify that fodder requirements in the standards are being met.

On-board personnel

- 46) That the standards continue to require an accredited stockperson to accompany each consignment of livestock.
- 47) That the standards require one competent stock handler (as defined in the working draft standards) per 3,000 (or part thereof) cattle and buffalo, and/or one per 30,000 (or part thereof) sheep. The standards should allow the accredited stockperson to count towards this requirement. Crew can also contribute to this requirement, provided they have the required skills/competencies.
- 48) That the standards require an AAV to accompany any export consignment where required by the department. Notwithstanding that, an AAV must accompany each consignment on long haul voyages, extended long haul voyages and voyages with pregnant livestock, unless otherwise agreed by the department.
- 49) That the standard not allow the same person to be both the AAV and the accredited stockperson on any given voyage.

1 Introduction

1.1 Australian Standards for the Export of Livestock

The first Australian Livestock Export Standards were developed in 1996–97 by industry. These were in place from 1998 until 2005, when the first version of the Australian Standards for the Export of Livestock (ASEL) were released, following a recommendation made by Dr John Keniry in his 2003 review of the live export trade. Since that time, the ASEL has set the animal welfare standards for the export of livestock from Australia by sea and by air.

The ASEL is given effect under the Australian Meat and Live-stock Industry (Standards) Order 2005, and is referenced in instruments including the Export Control (Animals) Order 2004. Exporters must comply with the ASEL to be permitted to export livestock by the Department of Agriculture and Water Resources (the department).

Four versions of the ASEL have followed since 2005, with the current version, ASEL v2.3, in place since 2011. It covers the major steps along the livestock export supply chain, including:

- Sourcing and on-farm preparation of livestock.
- Land transport of livestock for export.
- Management of livestock at registered premises.
- Vessel preparation and loading.
- On-board management of livestock.
- Air transport of livestock.

The standard currently applies to exports of cattle, sheep, goats, buffalo, deer and camelids.

1.2 This review

The last significant review of the ASEL was undertaken in 2012–13, following the [*Independent Review of Australia's Live Export Trade*](#) conducted by Mr Bill Farmer AO (the Farmer Review). The review was undertaken by a steering committee made up of representatives from state and territory governments and animal welfare, veterinary, livestock producer and industry representative organisations. The steering committee provided its final report in May 2013, recommending improvements to both the content and format of the standards and providing a draft version of the standard with several unresolved issues. The draft standard was not implemented.

In 2017, the government announced the current review process to ensure the standards remained fit for purpose and continue to be supported by the latest scientific research. A Technical Advisory Committee (the committee) was appointed to undertake the review process. The committee's full handbook (describing its role and operation) is available on the department's website, but in summary, the committee was asked to:

- make recommendations to the department aimed at ensuring all livestock that enter the supply chain are fit for export and maintain their health and welfare status throughout the export voyage

- carry out the review to facilitate the continuous improvement of the standards, considering new animal welfare research and innovations in industry practices in a timely manner
- facilitate contemporary outcomes based regulation which will allow flexibility in achieving the required animal health and welfare outcomes, encourage innovation in industry practices and adoption of relevant technological improvements
- ensure the recommendations align with the guiding principles of the committee.
- To achieve these objectives, the committee was asked to:
- conduct public submission processes to ensure all interested stakeholders have the opportunity to provide input to the standards
- ensure all technical issues, new research and scientific knowledge submitted by stakeholders relating to ASEL are properly considered and independent expert advice sought as necessary
- examine a range of viable, genuine, policy options
- clearly analyse the benefits and costs of the proposed options for affected stakeholders in a balanced and objective manner, with particular regard to the practicalities of livestock management and implications for animal welfare in Australia
- review the format of the standards and ensure they are written in line with best practice regulatory principles and other relevant standards and provide recommendations to the department where improvements may be adopted.

1.2.1 Conduct of the review

Stage 1 of the review process commenced in 2017 (Table 1). On 6 February 2018, the committee released an issues paper and a proposed reformatted version of the standard for consultation. The committee received 19 submissions and based on those views, identified a set of key issues that needed to be resolved in later parts of the review. The committee also endorsed the reformatted version of the standards for further use in the review process. The committee's Stage 1 report is available on the department's website.

In April 2018, the government commissioned a short, sharp review into the standards for sheep exported to the Middle East during the northern hemisphere summer. Dr Michael McCarthy was engaged to advise on conditions (as specified in approved arrangements), any changes to the administration of ASEL and/or any actions that would be required to assure health and welfare outcomes for sheep being transported to the Middle East during the northern hemisphere summer. The final report was provided on 11 May 2018; the government supported the 23 recommendations made in the report.

Around the same time, the Minister for Agriculture and Water Resources, the Hon. David Littleproud MP, announced that the timeline for the ASEL review would be accelerated, to conclude at the end of 2018 rather than late-2019. In response to this, the scope of the review was adjusted to exclude matters relating to export by air. The review process was also adjusted in response to the new timeline (Table 1).

Stage 2 of the ASEL review formally commenced in August 2018, with the release of an issues paper seeking comment on the key areas of contention raised in Stage 1 of the process. The

consultation period closed on 19 September 2018 and 41 submissions were received. The committee considered views outlined in submissions, and the findings of a literature review commissioned for the review process, to form draft recommendations for improving the standards. It released those draft recommendations for further consultation and testing on 31 October 2018. The consultation process closed on 27 November 2018 and 276 submissions were received. The RSPCA also separately collected 6,623 community submissions on the draft report and provided a list of submitters to the committee.

The committee engaged with a Stakeholder Reference Group during the review. The Reference Group provided a resource to discuss technical and practical aspects of the review informed by their members' extensive experience. More detail on the Reference Group and the consultation process is provided at [Appendix E](#) of this report.

Table 1 ASEL review process

Date	Activity
July 2017	Commitment to undertake review, call for committee members.
February 2018	Stage 1 issues paper released, including draft reformatted standard.
March 2018	Submissions closed.
April/May 2018	Stage 1 finalised.
17 May 2018	McCarthy Review report released.
24 May 2018	Minister for Agriculture and Water Resources, the Hon. David Littleproud MP, announced that the timeline for ASEL review would be accelerated.
23 August 2018	Stage 2 issues paper released for consultation. Stage 1 report released.
19 September 2018	Submissions closed.
31 October 2018	Draft report released for consultation. Literature review published on website.
27 November 2018	Submissions closed.

1.2.2 Out of scope

The review focused on the export of livestock by sea. Matters relating to export by air will be considered at a later stage. The committee's terms of reference also exclude the following:

- expanding the scope of the standards within the supply chain
- assessing other livestock export licencing and regulatory arrangements such as approved arrangements and the Exporter Supply Chain Assurance System (ESCAS)
- examining legislation enabling livestock exports, with the view to amending it
- reviewing the Australian Position Statement on the Export of Livestock (this is a matter for the Australian Government)
- assessing the implementation and compliance by individual exporters
- commenting on the suitability of domestic animal welfare standards for livestock
- seeking endorsement of recommendations after providing them to the department, or drafting final orders
- considering the role of independent observers

- considering the framework by which Australian Government Accredited Veterinarians (AAVs) or accredited stockpersons are engaged
- considering the Heat Stress Risk Assessment Model, which is subject to a separate review process.

A summary of submissions received is provided in this report.

1.3 This report

1.3.1 Recommended changes to the standards

The committee has adopted the principle that national minimum standards should ensure consistent welfare outcomes and provide industry participants with clear criteria for meeting their duty of care to the animals they manage along the export supply chain. The standards must, to the maximum extent possible, be evidence-based and, where available, supported by contemporary science relevant to Australian systems and the conditions faced during voyages from Australia. They also need to be enforceable. As required by the terms of reference, in developing its views, the committee has sought to balance implications for livestock welfare with the practicalities of livestock management, compliance costs and industry sustainability.

This report is structured around key areas of debate on the standards. For each issue, the report notes relevant parts of the standards, summarises the debate in submissions and outlines the committee's deliberations. A recommendation for changing the standards is then provided.

In addition to considering submissions, the committee drew on a literature review that was commissioned by the department to assist with the review process. The review considered existing science relating to the health and welfare of exported sheep and cattle, with a particular focus on heat load. The review was commissioned via a procurement process in a limited time frame to cover literature relevant to the Australian context, including peer-reviewed papers, non-peer reviewed industry reports, conference papers and other procedural documents. A significant section of the review, entitled *A systematic review of heat load in Australian livestock transported by sea*, was peer reviewed and published (Collins et al. 2018).

Where there were no contemporary or directly relevant scientific studies, the committee formed its views based on the available information and its own assessments.

1.3.2 Regulatory approach and monitoring

The committee is mindful that the current standards are predominately input based, rather than outcomes based. This approach assumes that if the inputs are controlled, then a satisfactory animal welfare outcome will follow. The committee also notes that, while best practice is to focus on the outcomes desired, there still needs to be a minimum set of standards that clearly articulate what society expects all exporters to meet. Recent high profile failures in outcome based regulatory systems in other industries have illustrated the potential problems with relying on an outcomes based approach alone. The committee's recommendations have been made with this experience in mind. Notwithstanding that, the committee believes there should be scope for the regulator to reward superior performance based on demonstrated outcomes. It will have increasing amounts of data with which to identify operators who consistently achieve better welfare outcomes including low mortality and other reportable incidents. In addition, the AAVs—and now independent observers—are able to report on the results of innovative

practices being used and their results, and how different combinations of inputs can achieve the same or better outcomes. Continuous improvement and innovation should be encouraged, not discouraged by limiting operators to just the specific methods as detailed in the standard. Future reviews should consider options to further adopt an outcomes based approach.

The committee has made its recommendations based on the available evidence. However, there are knowledge gaps in some areas and vital research is currently being performed (for example, on bedding, fodder and welfare indicators) that may inform future improvements in the regulations. The committee welcomes the department's commitment to conduct regular consultative reviews of the standards based on science, evidence and international practice. This decision follows the recommendations of the recent review of the regulatory capability and culture of the department in regulating live animal exports (the Moss Review). The matters identified in this report should be built into those review processes, adopting a continuous improvement approach. They include:

- Application of new stocking densities; review in light of performance and current research.
- Heat stress risk assessment (HSRA); extending application of the model to new routes as developed, and, adopting a welfare-based approach to HSRA for cattle and buffalo once settled for sheep (subject of a separate review process).
- Mortality rates; review in light of voyage data and the use of average daily mortality rates.
- Reporting; further develop once industry work on welfare indicators has advanced.
- Bedding for sea exports; review in light of research being commissioned by the Livestock Export Program.
- Fodder required for sea exports; review without delay once current studies into fodder quality, quantity and pellet specifications are completed.
- Reviewing pregnancy testing requirements for cattle once national standards for pregnancy testing cattle are in place.

As noted in the chapter on voyage reporting, the committee also strongly recommends an epidemiological approach to analysing data obtained through daily and end-of-voyage reports to identify changes that should be accommodated in the standards more generally.

1.3.3 Working draft standards

The committee's terms of reference also require it to review the format of the standards. In earlier stages of the review process the committee proposed a reformatted version of the standards. A further version of that document was released with the draft report, and has been further updated to accommodate the final recommendations in this report. This standard should be subject to legal review and practitioner testing before it could be implemented. In addition, given the fact that air exports are yet to be reviewed, the government could consider implementing the committee's recommendations in the current format of the standard (ASEL v2.3). This approach may allow the committee's welfare recommendations for sea exports to be implemented sooner whilst providing more time to further develop the reformatted standard. It may also be less onerous on those stakeholders subject to the standard in learning a new format as well as new requirements.

2 Sourcing and preparation

The way in which livestock are sourced and prepared for export has a significant impact on health and welfare outcomes during the export voyage. Several sourcing and preparation issues were identified in Stage 1 of the review for further consideration in Stage 2. These issues are discussed in the chapter.

2.1 Sourcing *Bos taurus* cattle

2.1.1 Requirements

Suitability for export varies between different types of animals. For cattle, a number of restrictions are imposed on sourcing *Bos taurus* for export at times when they are likely to experience more extreme heat (Table 2).

Table 2 Sourcing *Bos taurus* cattle

Species	Summary of requirement
<i>Bos taurus</i> (all)	Cattle from an area of Australia south of latitude 26° south must not be sourced for export to the Middle East from May to October unless an agreed livestock HSRA indicates the risk is manageable.
<i>Bos taurus</i> (fat)	Cattle must not be sourced for export from or through the ports of Darwin, Weipa or Wyndham from 1 October to 31 December (inclusive).

2.1.2 Discussion in submissions and literature review

A number of submissions discussed the risks of sourcing *Bos taurus* cattle from areas south of latitude 26° south. There were different views on acclimation and the need for an HSRA, as well as timing (May to October) and relevant voyages for which an HSRA should be required.

Some submissions argued that this class of cattle should not be exported to areas north of the equator between May to October given the risk of heat stress. Others referred to the work by Perkins et al. (2015), *Identifying the causes of mortality in cattle exported to the Middle East*, which found that heat stress was not the major cause of mortality for cattle exported to the Middle East, although it was still a risk that needed to be effectively managed. Some submissions agreed that the restriction should continue to apply for voyages to the Middle East. Others suggested the requirement should be broadened to include voyages through waters in the Arabian Sea north of latitude 11° north, during May to October. This geographical definition would take into account destinations in the Middle East, North Africa, Pakistan and Turkey.

In relation to sourcing fatter cattle for export into or through areas where they may experience more extreme heat, submissions tended towards a body condition score of 4.5 or 5 as an appropriate upper limit (note: this would equate to a 4 in the body condition score tables proposed by the committee in the working draft standard). Others argued that fatter cattle should not be exported under any circumstance due to the risk of heat stress, lameness, deck injury and pressure sores.

The literature review confirmed the importance of sourcing livestock that are suited to travel conditions, including selecting animals that have been acclimatised to warm weather conditions if they are to be transported through climatic zones of high temperature and humidity (Adams

and Thornber 2008). The review also confirmed there are pronounced differences in capacity to withstand heat load between cattle breeds, with the most dramatic being between *Bos taurus* and *Bos indicus* cattle. It referred to data from More et al. (2003) which showed that mortality rates due to heat load in *Bos taurus* and *Bos indicus* animals under identical conditions were 38.4 per cent and 0 per cent respectively.

2.1.3 Committee consideration

Bos taurus cattle sourced from southern Australia are at greater risk of heat stress than *Bos indicus* cattle. The standards recognise this by requiring that these animals are provided with additional space during certain times of year, and that an agreed HSRA be conducted for higher risk voyages at certain times of the year. While some submissions suggested that *Bos taurus* cattle should never be sourced from south of latitude 26° south for export during May to October, others claimed that the existing HSRA requirement had resulted in considerable improvement since being introduced in 2004. On balance, the committee considered that the export could continue, subject to appropriate risk management measures.

While the current provision for sourcing cattle from southern areas refers specifically to voyages to the Middle East, the committee's broader view regarding heat stress risk assessment is that it should apply to any voyage crossing the equator. This decision is discussed further in Chapter 4, and should be reflected in the provisions relating to sourcing of *Bos taurus* cattle from southern parts of Australia once a new heat stress risk assessment model has been developed. Until that point, the provision should continue to refer to the Middle East.

The committee also considered there should be a prohibition on the export of pregnant *Bos taurus* cattle during the northern hemisphere summer period if they are sourced from an area of Australia south of 26° south. Those cattle must be certified as not detectably pregnant.

Regarding the sourcing of fat *Bos taurus* cattle for export from or through northern ports during the period from 1 October to 31 December (inclusive), the committee accepted that the requirement remain. This provision aims to address the stresses on fat *Bos taurus* cattle being prepared for export in northern Australia during the "build up" to the wet season (a period of high humidity). While ASEL 2.3 refers specifically to the ports of Darwin, Weipa and Wyndham, the committee considered the provision should apply to all areas north of latitude 26° south given the broader geographical reach of the 'build up'. The committee also amended the provision to clarify the body score of fat *Bos taurus* cattle in line with the new body scoring system recommended as part of the minor amendments to the standard (discussed in Chapter 8). The committee did consider whether the time period should be extended to include January to March given the heat experienced during that part of the year. However, it concluded that further evidence was needed to demonstrate the change was needed from a welfare perspective.

Whilst not part of the standards, the committee did note that for breed-specific provisions to be effectively implemented and regulated, breed-related terminology should be used in relevant documentation, such as the load plan.

Recommendations 1 to 3

- 1) That the standards should prevent *Bos taurus* cattle from an area of Australia south of latitude 26° south being sourced for export on voyages that will cross the equator between 1 May to 31 October (inclusive), unless an agreed livestock HSRA indicates the risk is manageable. Until the heat stress risk assessment model has been further developed to include all destinations across the equator, the provision should continue to apply to the Middle East.
- 2) That the standards prevent pregnant *Bos taurus* cattle from an area of Australia south of latitude 26° south being sourced for export on voyages that cross the equator from 1 May to 31 October (inclusive).
- 3) That the standard prevent *Bos taurus* cattle with a body condition score of 4 or more out of 5, or 5.5 or more out of 6 for dairy cattle, being sourced for export from, or exported through, any area of Australia north of latitude 26° south from 1 October to 31 December (inclusive).

2.2 Shearing sheep and hair sheep

2.2.1 Requirements

Wool length is a factor which influences an animal's ability to tolerate heat on an export voyage, and as a result, the standards include a requirement that sheep have a short fleece (Table 3). There are also timeframes around how close to export a sheep can be shorn, with shorter periods permitted for sheep that are held in sheds at the registered premises.

Table 3 Shearing sheep for export by sea

Species	Summary of requirement
Wool	Cannot be more than 25mm in length, unless agreed with the relevant Australian government agency based on an agreed HSRA.
Sheep	Must either be 10 days or more off-shears when sourced, or shorn during the 10-day period before export and accommodated in sheds on the registered premises.

2.2.2 McCarthy review

The wool length of sheep is one of many factors used in calculating space and heat stress probability on voyages (to the Middle East in the northern hemisphere summer). Sheep that are 'off-shears', that is sheep that have been recently shorn, are more tolerant to heat. Dr McCarthy strongly recommended wool length categories are looked at in regards to the HSRA model and that sourcing of sheep that are 'off-shears' be investigated as a condition of an approved arrangement.

2.2.3 Discussion in submissions and literature review

Acceptable wool length and time off-shears were discussed in a number of submissions. Most submissions agreed that shorter fleece increases the capacity to withstand heat, with 25mm generally accepted as an appropriate limit to include in the standard. Some submissions argued that whilst appropriate for wool sheep, hair sheep should be excluded from the requirement because of their increased heat tolerance. However, a number of other groups stated that exporting any sheep with wool or hair over 25mm was an unacceptable risk. These submissions

argued the bulk of the coat affects space requirements and increases the risk of heat stress. They also suggested that long wool or hair makes it difficult to monitor the animal's condition on-board the vessel.

The relationship between time of shearing and export was also discussed. Time off-shears was promoted as a strategy for managing risks associated with shearing (injuries and stress) and for allowing animals to rest and access fodder and water before commencing loading. The benefits of allowing the protective lanolin coat to re-establish was also mentioned. But there was not a consistent view on what constituted adequate time off-shears, with views ranging from one clear day through to 10 days or more, depending on whether the focus of concern was shearing cuts or more general shearing stress.

The literature review referred to studies and anecdotal information which confirm the relationship between shearing and improved heat tolerance. For example, Beatty et al. (2008a) found that fleeced sheep maintained higher core and rumen temperatures and respiratory rates than shorn sheep under all environmental conditions.

The literature review, and several submissions, also referred to studies on the stress of shearing. The literature review referred to a study by Murdoch University (Aguilar Gainza 2015) which examined feeding and watering behaviours of sheep after shearing. That study found no difference in observed feed and water behaviour of sheep shorn over a six day period in a registered premises. In contrast, another study indicated that the use of cognitive bias may indicate shearing was an acute stressor (Sanger 2011).

2.2.4 Committee consideration

The committee considered a number of options for shearing, including different requirements that should apply depending on whether sheep are held in a paddock or shed at the registered premises.

It agreed to retain the requirement that sheep have no more than 25mm of wool at the time of export. This is an important part of managing heat risk. Submissions varied on the appropriate management of hair sheep, due to the different characteristics of hair and wool; and there were a range of views on whether the same requirement should apply to hair sheep. It is generally accepted that there is a genetic correlation between hair sheep, lower body fat, a concentration of fat around the tail area and a higher level of heat tolerance. However, the proportion of hair to wool in a number of these breeds varies, and cross-breeding between hair and wool breeds introduces another factor. Some submissions also expressed concern about the ability to effectively monitor long-haired sheep during the voyage if not shorn. The committee therefore agreed to require that all sheep have no more than 25mm wool or hair, until sufficient evidence is available to review this for specific breeds of hair sheep.

The committee did not accept that there should be discretion for the department to allow the export of sheep with more than 25mm of wool or hair.

For sheep held in paddocks, the committee agreed to retain the requirement that they be ten or more days off-shears when sourced. This is an important safeguard against cold stress/hypothermia should extreme cold, wet and windy weather be encountered during preparation.

Sheep held in sheds at a registered premises can currently be shorn within the 10 days prior to export. Exporting sheep immediately after shearing does carry some risks in relation to time available for minor shearing cuts or injuries to be adequately healed. It is not realistic to expect that these animals will all be picked-up at pre-export inspection, and there may be a risk of subsequent infection on-board the vessel. An appropriate period of time should therefore be provided between shearing and export to assist in managing this risk. This period of time would also assist the animal in recovering from any shearing-related stresses, although sheep have been shown to recover quite quickly after shearing.

The current standard does not specify a minimum time between shearing and loading for export. The committee considered a number of options, taking into account time needed to recover from shearing stress or injuries and the time needed for the rumen to 'kick start' following pre-shearing curfew and before pre-loading curfew. The committee has recommended at least two 'clear days' between shearing and loading for export, during which the animals are held in a pen with full access to fodder and water. The day of shearing and the day of loading must not be part of the clear day (for a definition of 'clear day' see Recommendation 8).

The committee also noted the potential for more vigilance in terms of shearing cuts/injuries to legs as a rejection criteria.

Recommendations 4 to 6

- 4) That the standards require that all sheep to be exported by sea have no more than 25mm of wool or hair, until sufficient evidence is available to review this approach for specific breeds of hair sheep.
- 5) That for sheep held in a paddock at the registered premises, the standard continue to require that they be 10 or more days off-shears when sourced.
- 6) That for sheep held in sheds at the registered premises, the standard require they be given at least two 'clear days' between shearing and loading for export (for a definition of 'clear day' see Recommendation 8).

2.3 Threshold weights of cattle and buffalo

2.3.1 Requirements

It is generally agreed that heavier animals are at greater risk of injury and lameness during sea voyages due to the increased stresses associated with their weight. The standards address this risk for cattle and buffalo by specifying threshold weights, outside which special approvals are required for export. For cattle and buffalo, the weight range is 200kg to 650kg inclusive. Above 650kg, a heavy cattle/buffalo management plan is required. This requirement is detailed in [Export Advisory Notice 2016-12](#).

2.3.2 Discussion in submissions and literature review

While there was agreement on the risks associated with exporting heavier cattle or buffalo, there were differing views on the appropriate point at which to impose additional requirements or restrictions in order to appropriately manage risk. Views on that point ranged from 450kg to 650kg or beyond, with some advocating for departmental discretion regarding upper thresholds, and others arguing for a non-negotiable cut-off. A number of submissions cited mortality

reports to demonstrate greater risks for heavy cattle and buffalo. Some AAV submissions indicated that whilst heavy cattle can have more problems, including foot and leg trauma, they can travel successfully if managed appropriately. There were several submissions which suggested an upper age limit (eight years) for buffalo.

A number of industry submissions argued that the current standard should be maintained on the basis there are few scientific studies or data sets available to suggest alternative threshold weights. One submission noted the industry project that is currently underway to produce an enhanced industry data collection system. That system should enable collection of relevant statistics to inform and assess the correlation of weight and morbidity more effectively. The project, *Animal welfare indicators pilot for the live export industry*, is expected to conclude in May 2021.

The literature review did not identify any animal-based studies that reported on the health and welfare outcomes for exported fat or heavy cattle or buffalo. However, mortality data suggests adult bulls may experience a higher mortality rate than other classes of cattle during export (Norman 2016, 2017) as well as possible heightened mortality risks due to their weight and behavioural traits (Shiell et al. 2014).

2.3.3 Committee consideration

The committee agrees that cattle and buffalo between 500 and 650kg are at increased risk, require special attention and need to be monitored. To date, this risk has been managed via additional space requirements in the standards, and the application of a heavy cattle/buffalo management plan for animals over 650kg. The committee's view is that the threshold for a heavy cattle/buffalo management plan (with its additional controls, including consideration of bedding) should be brought forward to 500kg, rather than applying from 650kg. The existing requirements of additional space should remain to provide a basis for that plan.

While the committee acknowledges the increased risks associated with exporting ultra-heavy cattle/buffalo, there was insufficient data to demonstrate there should be a strict upper limit (in other words a prohibition) applied in the standard. Rather, the existing approach should continue, with those exports assessed on a case-by-case basis (including via an approved heavy cattle/buffalo management plan). However, the committee strongly recommends monitoring the export of cattle and buffalo above 500kg over the next 12 months, with the possible need for an absolute upper weight limit on exports considered at that point.

A number of submissions suggested that an eight year age limit should be imposed on the export of buffalo. Whilst this seemed reasonable at one level, the committee considered it would be impractical to implement. This suggestion could, however, be further investigated and incorporated into the considerations of a heavy buffalo management plan.

Recommendation 7

- 7) That the standards require that cattle and buffalo over 500kg may only be exported in accordance with a heavy cattle/buffalo management plan to be agreed with the department. The welfare of cattle and buffalo over 500kg should also be monitored over the coming 12 months to assess whether an absolute upper weight limit is needed in the standard.

2.4 Minimum time at a registered premises

2.4.1 Requirements

The *Export Control Act 1982* requires that livestock which are to be exported by sea be assembled at a registered premises for preparation. The standards specify periods of time that different types of stock must spend at the registered premises with a view to ensuring the animals are adequately prepared for the export voyage. The requirements are summarised in Table 4.

Table 4 Time in registered premises, for exports by sea

Applies to	Summary of requirement
Cattle and buffalo	Required to be in the registered premises for: <ul style="list-style-type: none"> • 24 hours (short haul voyage, one port of loading or discharge). • One clear day (short haul voyage, multiple ports of loading or discharge). • Two clear days (long haul voyage).
Sheep and goats	For registered premises south of latitude 26° south, sheep and goats are required to be held for: <ul style="list-style-type: none"> • Five clear days if the stock are in paddocks during any or all of the months of May to October. • Three clear days if the stock are in paddocks during any or all of the months of November to April. • Three clear days if the stock are in sheds during any or all months of the year.

2.4.2 Discussion in submissions and literature review

Submissions generally acknowledged that time spent in the registered premises can assist with mitigating the risk of inanition and salmonellosis in sheep. This stage of the export process allows animals to adapt to pelleted fodder, and, to the extent possible, allows shy feeders, ill and diseased sheep to be identified and removed from consignments. Some submissions concluded that, based on research, the sheep should be kept in a registered premise (paddock or shed) for a minimum of 5–7 clear days, at all times of the year. Others, with alternative supporting research, suggested that additional time was unlikely to provide significant benefits in terms of animal welfare. Several industry submissions noted work underway to develop a salmonella vaccine, anticipated to be available in 2021. Industry is optimistic this will provide an effective method for managing the risks associated with salmonellosis in the future.

There appears to have been relatively little research done on the welfare benefits of providing cattle with more time in the registered premises. Some submissions suggested, that in the absence of such research, the minimum time should remain unchanged. Others were in favour of increasing the minimum time period to three clear days for all cattle voyages to allow animals to adapt to fodder and recover from any travel stresses prior to export. Most submissions supported buffalo being kept in the registered premises for longer. A number of submissions noted the risks associated with exporting wild buffalo, including that they may not adjust to handling or drinking and feeding from troughs before export.

The literature review identified a number of studies relevant to the period of time that stock should spend in a registered premises prior to export. For example:

- Access to reasonable food quality diets at a registered premises for 5–7 days can assist with recovering from fodder and water deprivation associated with mustering, pre-transport curfew and transport of up to 48 hours and 32 hours in cattle and sheep respectively (Pethick 2006).
- Sheep which do not eat at a pre-embarkation feedlot are more likely to die during a voyage than those that do eat (Norris et al. 1989b, 1990; Higgs et al. 1993).
- Animals which have suffered stress (regular handling, travel or boggy yards) during the period immediately prior to export may not cope as well on-board (Alliance Consulting and Management 2001).
- Tracking feeding and water patterns at a registered premises showed that, of the sheep that departed the registered premises, 19 per cent attended the feed trough for less than 15 minutes per day on day one; this decreased to only 2 per cent by day six (Barnes et al. 2018).
- High animal densities typical of feedlots may impact animal health and welfare through preventing animals from moving freely or from accessing fodder or water (Rice et al. 2016).
- Exposure to pellets before feedlotting for three weeks resulted in a greater number of sheep feeding at the feedlot than those that were not given prior supplementation with pellets (McDonald et al. 1988a).
- Extending the length of the feedlot period has been shown to be ineffective at stimulating fodder intake in persistently inappetent sheep (Norris et al. 1992).

2.4.3 Committee consideration

The period of time for which livestock are held in registered premises prior to export is one of a number of critically important aspects to ensuring they are well prepared for the export voyage.

Livestock need to adequately rest after sometimes lengthy journeys by road from their properties of origin. They also need sufficient time to adjust to the shipboard fodder ration. Depending on the species and overseas destination, a range of activities need to be conducted during the holding period, including treatments, vaccination and shearing. For some animals, time is also needed to adapt to human interaction. Livestock must be equally well rested and prepared irrespective of the length of intended voyage.

Holding periods in registered premises are expressed as ‘clear days’. The definition of a ‘clear day’ should be unambiguous. The committee has defined it as a day (midnight to midnight), not including the day of arrival or load out, when livestock have normal access to fodder and water (i.e. are not subject to any fodder or water curfew) and are not shorn. Wherever the term ‘clear day’ is used in the report, this is the definition that applies.

For clarity, clear days do not have to be consecutive, and the requirement applies to the animal, rather than the consignment as a whole. While the committee initially considered requiring that animals not be handled, treated or moved from their pen during a ‘clear day’, it was accepted that this could have perverse consequences by providing incentive for protocol and other treatments to be done on the day of arrival, rather than after a period of rest, with potentially worse welfare outcomes. It would also unfairly extend holding periods when for example, a pen

of stock is moved for a brief period to draft-off an animal that needs treatment or isolation, and returned to their pen.

Sheep

The committee received submissions proposing a wide range of holding periods for sheep in export feedlots; from the status quo up to a period of 10 days. While considering all submissions, the committee took particular note of a recently completed research project, *Characterisation of inappetent sheep in a feedlot using radio tracking technology* (Barnes et al. 2018). While focused on inanition, the research examined the time required for sheep to transition to pellets in pre-export facilities and whether adding oats or chaff, or being housed in sheds versus paddocks, had any positive effect on the speed of transition to the pelletised ration. The project determined that on average, it took five days in a feedlot for the majority of the sheep to transition.

The committee reached the position that a minimum holding period of five clear days was required between arrival at, and load out from, registered premises for all classes of sheep. This time period should apply irrespective of premises location and design, and/or the length of export voyage. As this period does not include days of arrival, load out, or shearing (if undertaken at the premises), the minimum elapsed period for which sheep will be held will be seven, or even eight, days.

In the absence of evidence to the contrary, holding periods for goats should mirror those of sheep. However, the committee notes that the export of goats by sea does not currently occur. It requires the express agreement of the department and a tailored management plan (see [Export Advisory Notice 2007-19](#)).

Issues relating to inanition and salmonellosis in sheep at registered premises are dealt with in Section 2.5 of this report.

Cattle

Submissions on the issues paper proposed a range of changes to the holding periods for cattle in registered premises. The committee's considerations were unfortunately not assisted by recent or relevant research directed at this component of the cattle export process. The committee made particular provisions to inform itself, including through field visits and discussions in Western Australia and the Northern Territory. Voyage investigation reports for cattle and buffalo shipments with reportable mortalities were also examined. Several of the investigation reports cited insufficient time at registered premises as a factor contributing to the poor voyage performance.

The committee's strong view was that, as for sheep, cattle in registered premises must be adequately rested and adjusted to the shipboard ration prior to loading for all voyages, and that this was far more influenced by the journey already undertaken from the property of origin than the one they were to yet to undertake. The committee noted that most or all short haul voyages depart from northern Australia where travel times to registered premises are longest and, arguably, transport conditions are harshest.

Accordingly, the committee reached the position that minimum holding times for cattle in registered premises must apply irrespective of whether the voyage will be long or short haul, or the number of loading/discharge ports. The committee also agreed that minimum holding times were too short, particularly for short haul voyages, and that a period of two clear days between

the day for arrival and day of load out is required in the registered premises for cattle, with three clear days for extended long haul voyages. As highlighted in regard to the proposed minimum holding requirements for sheep, the definition of a 'clear' day applies strictly; being a day (midnight to midnight) in which animals have normal access to feed and water in their holding pens. Those days do not need to be consecutive.

Buffalo

Buffalo exports are small in volume compared to cattle, but are not insignificant (approximately 10,000 head in 2017), and the industry is planning for growth. Exports are almost entirely from northern Australia via the port of Darwin. There were few submissions that dealt with buffalo exports, and industry research is sparse. As a result, the committee used the opportunity of a field visit to Darwin to engage with the buffalo industry and the Northern Territory Department of Primary Industry and Resources Chief Veterinary Officer, to inform itself about the nature of, and industry practices associated with, the procurement and preparation of buffalo for the export market. In essence, there is only a small population of 'domesticated' buffalo 'behind wire' in the Northern Territory. Most export buffalo are sourced from wild or feral populations in Arnhem Land, held for relatively short periods after capture for dehorning and consolidation, before being transported by road to registered premises near Darwin. Road transport is long distance, with much of it on unsealed road. It is clear to the committee that, given the circumstances leading up to their arrival, the holding period for buffalo in registered premises must provide adequate time for rest. It must also provide adequate opportunity to become accustomed to shipboard fodder.

The committee also examined voyage investigation reports for a number of buffalo shipments with notifiable mortality levels (reportable mortalities). Several cited preparation issues, including the period in registered premises, as contributing factors.

The committee reached the position that the minimum holding time for buffalo in registered premises must be five clear days. Again, this period must not include the day of arrival or the day of loading, with a clear day being a day (midnight to midnight) in which feed and water is not withheld from the animals. The five clear days need not be consecutive.

The committee noted the importance of shade for buffalo at registered premises, mindful of the evidence in the literature review on the lower heat tolerance of buffalo. It noted the existing requirement in the standard for livestock to be protected from climatic extremes, including via shade, and strongly supported its application at registered premises which hold buffalo. In addition, the committee recommends that research is initiated to better understand the requirements for buffalo preparation, transport and humane euthanasia, and, in particular, that the reporting, investigation and causes of mortalities that occur within the supply chain be prioritised. Issues in relation to the poor knowledge base on buffalo are further discussed in Section 3.2 of this report.

Related considerations

The committee accepts that the proposed increase in minimum holding periods may have implications with respect to last minute, unplanned 'top-up' of livestock numbers to make up orders, particularly for cattle given the current short minimum holding periods. The committee considers, however, that consignment procurement processes must allow for any such 'top-up' livestock to be fully prepared for the export journey. 'Topping up' should not mean those livestock are less well prepared for export.

Recommendations 8 to 11

- 8) That the term ‘clear day’ be defined in the standard as a full day (midnight to midnight), not including the day of arrival or load out, during which livestock are not subject to any fodder or water curfew, and are not shorn. Clear days do not have to be consecutive, and apply to the animal, rather than at a whole-of-consignment level.
- 9) That the standards require sheep and goats to be held at the registered premises for five clear days, irrespective of the location and design of the registered premises, the time of year, or the length of the export voyage.
- 10) That the standards require all classes of cattle travelling on short and long haul voyages to be held at the registered premises for a minimum of two clear days, irrespective of the location of the premises and the number of loading/discharge ports on the voyage. Three clear days should be required for all classes of cattle travelling on extended long haul voyages.
- 11) That the standards require buffalo to be held at the registered premises for a minimum of five clear days, irrespective of location of the premises, length of intended voyage or number of loading/discharge ports.

2.5 Management of shy feeders and inanition in sheep

2.5.1 Requirements

Inappetence and inanition (the interaction between inappetence and salmonellosis) are major causes of mortality on sheep export voyages. Recognition of susceptible sheep pre-export can have a significant impact on the rate of mortality in the export journey. The standards recognise this risk, in particular through the requirement that animals suffering ill-thrift or anorexia (inappetence) be rejected from the proposed export consignment.

2.5.2 McCarthy review

Dr McCarthy made a number of observations about the practicalities of managing ‘shy feeders’ and inanition in sheep. He noted the increased risk of salmonellosis in select lines of sheep including older, heavier and generally fatter merino wethers. His view was that the increased risk was in part due to acclimatisation to fodder during preparation. McCarthy also considered that the sourcing of sheep from sale yards, or pastoral sheep during certain months of the year (winter), were large contributors to mortality levels.

2.5.3 Discussion in submissions and literature review

The literature review confirmed that the main cause of death in registered premises is persistent inappetence—or ‘shy feeders’—and the interaction of inappetence with salmonellosis. There are a number of factors likely to contribute to inappetence, including the origin or source of the sheep, housing at the feedlot and diet. The literature review also noted that consistent feed intake is considered the key to preventing mortalities from inanition and salmonellosis. It also noted that most shy feeders will start eating within two weeks of feedlotting, but some do not appear to adjust, regardless of time.

Issues associated with inappetence/shy feeders/inanition were discussed in most submissions. The joint submission from several AAVs suggested that identification and rejection of shy feeders could be improved at registered premises, including use of individual paddock based

assessments. The use of RFID technology was suggested by other submissions, along with improved infrastructure at wharfs to assist in individually assessing sheep. The time spent in the registered premises, and acclimation to the shipboard ration during that time, were recognised as important in managing risks associated with shy feeders. The work by Barnes et al. (2018) was referenced in several submissions. That study suggested that five days in the feedlot was required to transition onto a new ration. The inclusion of chaff in the ration was advocated as a management strategy in several submissions.

Ready access to fodder, including ensuring adequate trough space per head, were mentioned as strategies for managing inanition on-board the vessel. Several submissions argued that the primary method of identifying and handling shy feeders remains the use of experienced stockpersons (Barnes et al. 2018). Some submissions argued that the exclusion of saleyard sheep would reduce the incidence of inanition, though without direct supporting evidence. The development of a salmonella vaccine was also identified as a possible mitigation strategy.

2.5.4 Committee consideration

Inappetence is a major risk factor in registered premises and on-board sheep export vessels, and it is important that research continue to focus on minimising or eliminating this risk.

There are different views on the best method for transitioning sheep onto the pelleted shipboard ration in the lead up to export. Time in the registered premises is important, and it has also been demonstrated that allowing sheep a few days of hay or chaff, in addition to pellets, is helpful. The committee's view is that of the five clear days in the registered premises (refer Section 2.4, Recommendation 9) the sheep should be fed ad libitum on pelleted fodder equivalent to the shipboard ration for the final three clear days.

The committee also recognised that, when livestock are held in open yards or paddocks, access to pelletised fodder must not be hindered by inclement weather or other climatic factors. Accordingly, pelleted fodder must be placed in troughs and feeders/troughs to be of a design that prevents spoilage of fodder during inclement weather. Ideally, troughs would be fully sheltered, but if not, the manager of the registered premises must ensure that spoilage does not occur. The committee recommends that the standards clearly require that livestock in registered premises have access to feed and water that is neither contaminated nor spoiled.

As noted in Section 2.4, some submissions raised concerns about the practice of "topping up" consignments of sheep with sheep purchased at saleyards. The committee considered this risk in relation to inappetence, but found insufficient evidence to conclude that these sheep are necessarily at greater risk. The committee, however, recommends this be further considered by industry in terms of research and best practice guidelines.

The committee also acknowledges the current industry research focusing on the development of a vaccine for salmonellosis and management strategies to minimise the risk of inappetence in sheep.

Recommendations 12 to 13

- 12) That the standards require that, of the five clear days for which sheep and goats are held at the registered premises (see Recommendation 9), they are fed ad libitum on pelletised fodder equivalent to the shipboard ration for at least the final three clear days (for a definition of 'clear day' see Recommendation 8).
- 13) That the standards require pelletised fodder to be fed in troughs at the registered premises, and that feeders/troughs be of a design that prevents spoilage of fodder, particularly during inclement weather. The standards should also state that livestock must have access to fodder that is neither contaminated nor spoiled.

2.6 Pregnancy testing

2.6.1 Requirements

The standards aim to manage the risks associated with pregnant animals on export voyages. It includes requirements in relation to pregnancy testing (timing for tests, qualifications of personnel) as well as thresholds beyond which export is generally considered unacceptable. The requirements are summarised in Table 5.

Table 5 Pregnancy testing for export by sea

Applies to	Summary of requirements
Feeder or slaughter cattle	Determined not to be detectably pregnant by a valid pregnancy test or accompanied by a valid spay declaration.
Breeder cattle	Not more than 190 days pregnant at scheduled date of departure, tested in accordance with valid breeder pregnancy test.
Feeder or slaughter buffalo	Determined not to be detectably pregnant by a valid pregnancy test* or accompanied by a valid spay declaration.
Breeder buffalo	No more than 220 days pregnant at scheduled date of departure, tested in accordance with valid pregnancy test.
Feeder or slaughter sheep	For female sheep over 40 kg and Damara female sheep, determined not to be detectably pregnant, tested in accordance with valid pregnancy test.
Breeder sheep	Must not be more than 100 days pregnant at the scheduled date of departure and tested in accordance with valid pregnancy test.
Feeder or slaughter goats	Must be determined not to be detectably pregnant, tested in accordance with the requirements of a valid pregnancy test.
Breeder goats	Be determined to be no more than 100 days pregnant at the scheduled date of departure, tested in accordance with valid pregnancy test.
Breeder alpaca and llamas	Must not be more than 228 +/- 2 days pregnant at the scheduled date of departure, tested in accordance with valid pregnancy test.
Feeder or slaughter deer	Must be determined to be not detectably pregnant, tested in accordance with the requirements of a valid pregnancy test.
Breeder deer	Tested in accordance with valid pregnancy test and determined to be not detectably pregnant, or in the case of breeders, must not be more than 140 days pregnant at the scheduled date of departure.

Note: Criteria for valid pregnancy tests are in the standard.

2.6.2 Discussion in submissions and literature review

Pregnancy testing was widely discussed in submissions; with strong views expressed on the competency of personnel involved and the testing requirements for different types of livestock.

On competency, some submissions argued that pregnancy testing should only be undertaken by registered veterinarians (particularly for cattle), while others argued that testing could be undertaken by other skilled personnel. Several submissions noted the project that is underway through Meat & Livestock Australia to develop a national standard for pregnancy testing cattle, with the view that it apply domestically and for live exports. State government arrangements were also mentioned, including the fact that the Queensland Government is progressing legislative amendments to allow lay testers to operate in that state. The views in relation to sheep exports were more uniform, with most, but not all, submitters accepting testing by lay persons. There was no specific information provided in relation to buffalo.

In relation to testing criteria, the committee's issues paper had asked questions about:

- Changing the requirements so that only Damara sheep over 40kg need to be tested.
- Extending testing requirement to include all fat-tailed sheep, not just Damara.
- Increasing the age for testing goat kids and ewe lambs to more than five months.
- Appropriateness of pregnancy testing methods.

Submissions generally agreed that all fat-tailed sheep should be tested, not just the Damara breed. While some submitters agreed that testing could be limited to Damara sheep over 40kg, others indicated that it is possible for pregnancy to occur at lower weights. There were mixed views on increasing the age for testing goat kids and ewe lambs, but several submissions noted that it is possible for these animals to conceive from 150 days. Most submissions argued that ultrasound should continue to be an option for testing in certain circumstances, but with differing views on the competencies required to make that judgement.

The committee also asked for submissions about the requirement for pregnancy tests to be carried out within the 30 day period prior to export. Several submissions argued that this should be extended to 45 days, largely as a buffer against unforeseen loading delays. Others argued that while animals should not be subjected to unnecessary re-testing, this should not necessarily be addressed via change to the 30-day pregnancy testing window.

2.6.3 Committee consideration

The committee discussed the range of different views on the skills/competencies required to pregnancy test livestock. The committee felt that the standard should be able to rely primarily on competency arrangements deemed appropriate in each jurisdiction. However, in practice, national discussions on competency are still underway and the required national standards/regulatory arrangements are not yet developed. As a result, the committee agreed the standards should continue to specify requirements in relation to competency of testers.

The most diverse views on competency related to testing of cattle, with some arguing for veterinary-only testing, and others arguing that the criteria should allow for lay testers. The committee considered these views, as well as the different requirements that might apply in relation to breeder cattle, where the stage of pregnancy needs to be assessed, versus feeder and slaughter cattle, where the tester is confirming that the animal is not pregnant.

The committee's view is that pregnancy testing breeder cattle should remain the domain of registered veterinarians, with additional accreditation under the National Cattle Pregnancy Diagnosis Scheme (now called PREgCHECK@) required to test cattle destined for longer

voyages. The committee agreed to retain existing flexibility for testing slaughter cattle, with those animals to be tested by either a registered veterinarian or a competent pregnancy tester. As suggested by some submitters, the committee agreed that the definition of a competent pregnancy tester should be amended to provide for persons permitted by law to conduct pregnancy tests in any jurisdiction, not just the Northern Territory or Western Australia.

Manual palpation should remain the preferred method of pregnancy testing cattle. However, the committee agreed that ultrasound testing should be available where it is safer for the animal. That judgement should be restricted to veterinarians accredited under PREgCHECK®, to ensure that it is only used where required, rather than because it provides a potentially faster and less manually intensive approach to testing. This is a matter that should be reviewed once national standards for pregnancy testing cattle are in place. In the absence of specific evidence to the contrary, the committee agreed that the same pregnancy testing requirements should continue to apply for buffalo as for cattle.

The committee discussed the current approach to ‘maximum days pregnant’ for breeder cattle and buffalo, as well as other livestock. The standards currently set the maximum limits for different species of livestock, calculated at the scheduled date of departure. It noted this approach would allow livestock to be exported (i.e. travel on ships) in the third trimester. The committee’s view is that, even with additional space (see [Section 3.2](#)), this is an unreasonable risk and should be prevented. As a result, it recommends the testing criteria are amended so that the maximum gestation applies at the intended date of discharge from the vessel. In effect, this would ensure that animals are not in the third trimester of pregnancy at any stage of the export process.

For sheep and goats, the committee agreed the standard should continue to allow testing by lay testers. Evidence was not provided to suggest that an alternative approach was needed. The committee did note strong arguments for sheep and goats to be identified individually. It supported those arguments, and agreed individual identification should be incorporated into export arrangements as soon as such a system is in place domestically.

The committee agreed to extend the requirement for testing to all female fat-tail sheep breeds, not just the Damara breed as is required by the current standard. It also agreed to retain the existing age threshold for testing sheep and kid goats.

In relation to the pregnancy testing window prior to export, the committee agreed to retain the existing 30 day requirement. However, there appears to be an issue with regulatory inflexibility, and unnecessary re-testing must be avoided from a welfare perspective. It was the committee’s considered view that the department should be able to extend the validity period of an existing test beyond 30 days where necessitated by circumstances outside the control of the exporter and where the exporter can demonstrate that the extension will not impact on animal welfare outcomes. The decision on whether to approve an extension should be taken at the regional level, rather than requiring a formal dispensation from the Canberra office. Clear guidelines should be developed on when an extension may be granted.

Recommendations 14 to 16

- 14) That the existing pregnancy-related rejection criteria and pregnancy testing criteria be retained in the standards, other than:
- a) the testing criteria relating to ‘maximum days pregnant’ for all livestock exported by sea, which should be amended to apply at the scheduled date of discharge, rather than the scheduled date of departure, to ensure that livestock cannot be exported in the third trimester; and
 - b) the provision relating to Damara female sheep, which should be extended to apply to all female fat-tailed sheep.
- 15) That the definition of a competent pregnancy tester be amended to cover persons permitted to undertake pregnancy testing by law in any state or territory jurisdiction, rather than just persons in the Northern Territory and Western Australia. For clarity, the circumstances in which competent pregnancy testers are permitted remains unchanged.
- 16) That the standards allow the department to extend the validity of a pregnancy test beyond 30 days only where necessitated by circumstances outside the exporter’s control and where the exporter can demonstrate that the extension will not impact on animal welfare outcomes. That decision should be delegated to regional veterinarians, rather than requiring a formal dispensation from the Canberra office.

3 Stocking densities

The reformatted standard sets out the minimum amount of space that must be provided to different types of animals at the registered premises and on-board the vessel.

3.1 Registered premises stocking densities

3.1.1 Requirements

The standards require that livestock in registered premises be provided with an appropriate amount of space, in accordance with requirements that are set out in the standard. The space requirements are summarised in Table 6. ASEL v2.3 provides capacity for the department to approve a variation to those stocking densities.

Table 6 Space required, cattle and buffalo at a registered premises

Applies to	Held for	Summarised requirement
Cattle or buffalo, 500kg	29 days or less	4m ² per animal, variable by 0.04 m ² for each 5kg change in liveweight.
	30 days or more	9m ² per animal, variable by 0.09 m ² for each 5kg change in liveweight.

Table 7 Space required, sheep and goats at a registered premises

Applies to	Held for	Penned in	Requirement
Sheep or goats, 54kg	Less than 10 days	Sheds in groups of less than 8 animals	0.6m ²
		Sheds in groups of 9 to 15 animals	0.53m ²
		Sheds in groups of 16 to 30 animals	0.4m ²
		Sheds in groups of 31 or more animals	0.33m ²
	10 days or more	Sheds in groups of less than 8 animals	0.9m ²
		Sheds in groups of 9 to 15 animals	0.8m ²
		Sheds in groups of 16 to 30 animals	0.6m ²
		Sheds in groups of 31 or more animals	0.5m ²

3.1.2 Discussion in submissions and literature review

A range of views were presented regarding stocking densities at registered premises. Several submissions argued that the standards should align with domestic intensive housing standards, whilst others argued that the purpose of a registered premises was different (preparation for export, as compared with productive efficiency) and different space requirements should apply.

The Australian Livestock Exporters' Council provided a table which compared current ASEL requirements with an allometric approach using a k-value of 0.027 and 0.033. (see the *allometric model* described in [Section 3.2.4](#)). Those figures showed that the current standards are generally above space required using a k-value of 0.033, other than for sheep held for less than 10 days in groups of 16–30 and more than 30 animals. The densities set for smaller groups of sheep were generally regarded as redundant as sheep would very rarely be prepared in mobs of 8, 15 or even 30 animals. In the counter, several welfare submissions argued for space in line with a k-value of 0.047, with this regarded as the threshold for animals to lie comfortably at the same time, and easily access feed and water. The need for departmental discretion in relation to

stocking density was raised by some submitters, to assist with circumstances such as export delays.

Along with space in the pen, minimum trough space was identified in some submissions as an issue that warranted consideration at the registered premises.

The literature review found limited studies on stocking densities in feedlots. Rice et al. (2016) concluded that high stocking densities may impact animal health and welfare by preventing animals from moving freely or from accessing fodder or water. Close proximity to other animals, human infrastructure and human handling may induce stress responses in livestock, particularly in animals that have been transported directly from free-ranging conditions (Petherick et al. 2002).

3.1.3 Committee consideration

Adequate space allocation for livestock held at registered premises is important to ensure stock are rested, and have unfettered access to fodder and water during a period when adaption to shipboard fodder is of critical importance to minimising welfare risks during voyages.

Little evidence was provided to the committee to support significant changes to current ASEL space allowances at the registered premises. However, the committee noted the current provisions are reasonably complex. Space allocation varies with the length of time held, the group size, and the weight of stock. These complexities are discussed and addressed in the species-specific considerations which follow.

The committee did not see a need to reintroduce departmental discretion on stocking densities into the standards. It understands that the existing discretion has not been requested in practice.

Sheep and goats

The committee found little scientific evidence to indicate a need to significantly change stocking densities for sheep at registered premises. Notwithstanding this view, as detailed above, the current standard sets out different space allowances for sheep depending on the size of the group held in the pen, and the length of time for which they are held. Many submissions pointed out that sheep are almost invariably held in groups well in excess of 30 head and that the current complex approach was unnecessary. The committee accepted this view and agreed to set a single rate for sheep held for less than 10 days (0.33m² per head) and a single rate for those held for 10 or more days (0.5m² per head). Notwithstanding that decision, the committee did agree that additional space should be provided above the base rates for sheep that are heavier than the 54kg currently referenced in the standards.

In the absence of evidence to the contrary, the committee determined that the same requirement should apply for goats.

Cattle and buffalo

The committee also found little scientific evidence to indicate a need to change stocking densities for cattle or buffalo at registered premises. The committee observed first hand cattle held at registered premises in Western Australia and Northern Territory; although it recognises that there are many registered premises in a range of locations and climates around Australia with varied layouts.

The committee noted that ASEL currently requires 4.0 to 9.0 m², depending on the length of the holding period. This is consistent with stocking density standards set for Australian cattle feedlots. Accordingly, the committee proposes no change to the current standards with respect to stocking density for cattle and buffalo at registered premises.

Mortality reporting

As noted in section 3.1.3, the committee was not presented with substantial evidence to support a significant change to stocking densities at this time. It did, however, receive submissions which argued that, in the absence of mortality and welfare information about livestock at registered premises, the adequacy of space allowances could not be properly assessed. To remedy that situation, the committee recommends that a mortality report be required for each export consignment as it leaves the registered premises.

Recommendations 17 to 19

- 17) That the standards require that sheep and goats held at a registered premises be given a minimum space allocation of:
 - a) 0.33m² per head, where they are held at the premises for less than 10 days, with an additional 0.006m² for each 1kg increase in bodyweight above 54kg.
 - b) 0.5m² per head, where they are held at the premises for 10 days or more, with an additional 0.006m² for each 1kg increase in bodyweight above 54kg.
- 18) That the standards for stocking density in registered premises remain unchanged for cattle and buffalo.
- 19) That the standards require that a mortality report be provided for each consignment at the time it leaves the registered premises.

3.2 On-board stocking densities

3.2.1 Requirements

Stocking density on-board vessels is dealt with in various parts of the standards. A load plan must be prepared before animals are loaded on a vessel, using stocking densities specified in the standards. Livestock must then be segregated, loaded and penned on the vessel in accordance with the load plan. The consignment should also be checked by the exporter or their representative prior to departure to ensure that livestock are loaded in accordance with the load plan. The pen stocking density should be regularly checked throughout the voyage and adjusted as required.

The base stocking densities in the standards vary by species and liveweight, with additional space required for higher risk voyages and consignments, including:

- Larger cattle on longer voyages.
- Exports associated with a higher risk of heat stress (predominantly export of sheep and *Bos taurus* cattle between May to October to the Middle East).
- Animals with certain characteristics such as pregnancy, horned rams, goats with specific horns and sheep with more than 25mm of wool.

Current space allowances appear to be based on 1978 Marine Standards specifications, which were then incorporated into Marine Orders in 1981, and then into the ASEL. The origin of, and basis for, the 1978 standards is unknown.

3.2.2 McCarthy review

Dr McCarthy identified stocking densities as a key issue that should be addressed by regulatory reforms. His review made a number of relevant observations and recommendations, including the adoption of an allometric model for determining space on-board with a k-value of 0.033 for sheep exported to the Middle East during the northern hemisphere summer. The department accepted this recommendation and since 6 July 2018 has required the use of the 0.033 k-value on all consignments of sheep exported to the Middle East between the months of May and October. Dr McCarthy suggested the ASEL Technical Advisory Committee consider the longer term application of the allometric model beyond the end of the 2018 northern hemisphere summer (see the *allometric model* described in [Section 3.2.4](#)).

Dr McCarthy raised concerns about how the weight of livestock is taken into account when calculating stocking densities. The ASEL does not consider whether weights should be empty body weight, a curfew weight (12 hours) or a full weight. Dr McCarthy noted in passing that there can be up to 12 per cent difference between these weights. He suggested the ASEL Technical Advisory Committee address this anomaly in its review. The committee notes that as part of its Australian Meat and Live-stock Industry (Export of Sheep by Sea to Middle East) Order 2018 of 6 July 2018, the department introduced the requirement for a curfew factor of 12 per cent in stocking density calculations as well as a daily weight gain factor of 0.04 kilograms.

3.2.3 Discussion in submissions and literature review

One of the most contested issues amongst stakeholders is what constitutes a reasonable stocking density on-board vessels. Most submissions discussed the issue, with most advocating an allometric approach to determining minimum requirements. This approach reflects the fact that the space requirements of animals may be more accurately determined in three dimensions, rather than the two-dimensional approach (m²) used in the current standards.

The work of Petherick et al. (2009), which applied an allometric approach to calculating space allowance, was heavily referenced in submissions, with groups variously supporting a k-value of 0.027, 0.033 or 0.047 (see the *allometric model* described in [Section 3.2.4](#)). Submitters did agree it was important for animals to be able to lie down simultaneously, however there were different views on the k-value that would allow this to occur. The preferred lying posture, from sternal recumbency, to semi-recumbency and full recumbency, may go some way to explaining the different views, along with different views on the importance of 'time sharing' or 'synchronous lying' in determining space allocations. The physical and behavioural characteristics of the animals and the pen design are also relevant. In general, industry submissions tended towards a k-value of 0.027, with welfare organisations supporting a k-value of 0.047.

Submissions generally separated the discussion on base stocking densities from decisions on space required to avoid heat stress (to be determined via an HSRA). Pregnant animals and heavy animals were identified as cohorts requiring space beyond base levels.

The literature review also referred to the work of Petherick et al. (2009) in relation to stocking densities. Petherick concluded stocking density, or space allowance, is an important factor impacting on heat load. Of significant concern for livestock welfare, the amount of space provided governs important elements of animal behaviour that are important for their health and welfare. Another review questioned the adequacy of current space allowances with regard to concerns over heat stress and poor welfare (Caulfield et al. 2014). While another review (Shiell et al. 2013) signalled the need for ASEL to continually evolve to address any persistent issues (for example, sheep mortality on voyages to the Middle East in the northern hemisphere summer). Overall, the literature review was unable to find a scientific study/ies that gave a definitive calculation for minimum space allowance that provides for welfare needs of livestock on-board a vessel.

3.2.4 Committee consideration

The recommendations in this part of the report need to be considered alongside the committee's recommendation that the (new) HSRA model be applied to all voyages of livestock crossing the equator (see [Chapter 4](#)).

It is universally accepted that the amount of space provided to animals during periods of confinement is critically important for their health and welfare. Stocking density governs important elements of body posture and behaviour, including social interaction. It also affects access to fodder and water, influences susceptibility to disease and has a strong influence on heat load experienced by confined animals.

The amount of space required by animals is influenced by multiple factors including the duration of confinement (voyage length), the environment (heat and cold) and class (weight and volume) of stock. The current approach to stocking density on vessels has been to set a 'base' or 'default' space allowance that allows animals to rest and lie down, and to gain access to feed and water troughs invariably placed at the side/s of pens. Default space allowances also make some provision for a normal range of climatic conditions, but not for instance, exposure to periods of high heat and humidity. The latter welfare risk factor is managed through the application of an HSRA in the case of voyages likely to experience hot and/or humid conditions. The output of the HSRA may be a revised (increased) space allowance over and above the base or default level. For clarity, the current ASEL base or default space allowance is that required for shipments from November to April. For cattle, it is that set out in the default table for voyages of less than 10 days.

Other special circumstances also require extra space, such as the presence of horns, pregnancy status, location of loading port in Australia and time of year. Requirements regarding the application of an HSRA are dealt with in Chapter 4 of this report.

There is widespread agreement—from the literature and in virtually all submissions received by the committee—that the appropriate science-based approach to determining space allowances for confined livestock is through the application of allometry. Allometry is the study of the relationship between body size to animal shape and behaviour, and applied here involves understanding how the use of space by animals may differ with body shape and weight. A significant body of research has determined that the allometric equation— $\text{Area} = k \text{Weight}^{0.66}$ —can be used to calculate the space an animal occupies as a consequence of its mass. A value for the 'k' coefficient in the equation can be chosen given the particular circumstances, such as the:

- type of animal
- natural posture of the animal when lying/resting (or whether the animal group remains standing such as during road transport)
- need for, and accessibility to fodder and water
- length of the confinement.

While there was almost universal support across submissions for the use of allometry in setting base space allowances in standards, there was a wide variation with respect to the preferred value of the coefficient 'k' to be used in the allometric equation.

Determining an appropriate amount of space for penned livestock on a sea voyage is challenging. More is required than for typical long-distance road transport (where stock largely remain standing and do not have access to feed and water), yet less than required for long term confinement such as a typical feedlot or indoor housing system aimed at productivity, weight gain and feed conversion efficiency. While there is scientific evidence for the effects of different space allowances within indoor housing systems, in which animals are typically confined for long periods of their life, the committee found a paucity of scientific studies regarding appropriate stocking densities for the unique conditions that impact livestock on-board vessels, for journeys that are typically four to 30 days. The committee noted that a research project focussing on stocking density is currently underway (Livestock Export Program), albeit in the early stages of project design. The conclusions and findings from those projects will be directly relevant to livestock exports from Australia.

After extensive consideration based on research findings and Stage 2 submissions, the committee came to the position that the appropriate value of the 'k' coefficient for calculating base space allowances on typical voyages from Australia was between 0.027 (which allows for all animals to lie down simultaneously but may not provide adequate room for unfettered access to feed and water troughs) and 0.033 (which is described in the literature as providing an acceptable space allowance for production animals in long-term—typically lifetime—confinement). The committee also examined the current ASEL v2.3 space allowance tables in some depth. While the exact basis for, and origin of, these tables is unknown and not critical, the committee noted that many did not provide a constant linear increase in space with increasing liveweight. Instead, they provide disproportionately extra space for animals at higher weights, presumably based on experience and risk mitigation over time.

In examining a range of stocking density graphs based on allometry, and comparing them to the ASEL base or default tables, it was clear that allometry dictates proportionately more space (than ASEL) be given to lighter weight animals and less space (than ASEL) be given to higher liveweights. Thus simple adoption of allometric stocking density would give heavier stock proportionately less space, and lighter stock (also often younger stock) significantly more space. The committee was concerned this appeared at odds with current voyage performance data which indicates higher welfare risks associated with increasing liveweight of animals. Furthermore, the 'flatter' gradient resulting from allometrically determined stocking densities was not reflected in any international stocking density requirements for livestock transport by sea to which the committee had access (namely New Zealand, European Union and the USA). The committee was concerned to ensure the provision of more space to heavier animals continued to be reflected in the base space allowances required within the standards.

It is the committee's considered position that the appropriate 'base' or 'default' shipboard space allowances for livestock be determined using a k-value of 0.030, or the current ASEL space allocation for a given liveweight, whichever is the highest.

Use of a k-value of 0.030 would provide for an increased minimum space allowance for livestock to be exported (noting this is the base allowance) as indicated by Table 8.

Table 8 Example of increased space allocation

Stock	ASEL v2.3	Recommended (k=0.03)	Percentage increase (%)
54kg sheep	0.333 m2	0.417m2	25
400 kg cattle	1.45 m2	1.56 m2	7.9

Sheep

For sheep, the current ASEL base or default space allowance is that required for shipments from November to April. For these shipments, the committee proposes that the k-value of 0.030, recommended in section 3.2.4, apply.

Shipments from May to October are currently required by ASEL to be provided with extra space above the base or default. The committee noted Dr McCarthy's recommendation that a k-value of 0.033 to be used to calculate space allowances for sheep to the Middle East during the period May to October. This recommendation was accepted by the department and applied until 31 October 2018. McCarthy also recommended a significant change to the HSRA model away from mortality, to a focus on measures that reflect the welfare of the animal (more particularly replacing a mortality limit with a heat tolerance level). He recommended that the 0.033 k-value apply from May to October in the future unless overridden by the revised HSRA. The committee had little opportunity to assess the performance of consignments loaded to the McCarthy specifications in 2018 given the timing of the review and the small number of shipments. The committee's position is therefore that the 0.033 k-value remain in place for the May to October period until the revised HSRA recommended by McCarthy, and currently under development, is in place. The default or base space allocation could apply from that time (for example, a k-value of 0.03), and be subject to the new risk assessment model. This requirement should be kept under review in the light of voyage reports and industry performance for several northern hemisphere summer periods.

Cattle

For cattle, the current ASEL base or default space allowance is that required for short voyages of less than 10 days. For these shipments, the committee proposes that a k-value of 0.030 apply as the default setting. However, as discussed in [section 3.2.4](#), this approach does give lighter stock disproportionately more space than the current standards. For example, cattle with a liveweight of 300kg would be given 16.5 per cent more space than the current standards. The justification and evidence base for this approach was questioned widely by industry stakeholders, who also raised significant concerns regarding the implications of such a change for sustainability of the northern cattle trade.

In response to those concerns, the committee reviewed data and information relating to the performance of lighter cattle (around 300kg)—which are typically carried on short voyages such as from northern Australia to Indonesia and other south-east Asian countries. The committee accessed information regarding these voyages (from submissions, independent observers and

other sources), and found little scientific evidence or performance information to indicate that current stocking density on these voyages is a significant risk factor. Mortality rates for lighter cattle on shorter voyages are very low. The committee analysed data for 2015–16, 2016–17 and 2017–18 to compare mortality rates for voyages of less than 10 days and those of 10 days or more. The data covered 879 voyages (432 of less than 10 days, and 447 of 10 or more days) carrying a total of 3.1 million head (1.3 million on voyages of less than 10 days and 1.8 million on voyages of 10 or more days). The mortality rate for voyages of less than 10 days was 0.056 per cent while for the longer voyages it was 0.169 per cent, roughly three times higher. The lower mortality rate on shorter voyages was reflected, for example, in the historical mortality rate for one exporter, which, when expressed as a percentage of animal days at sea, was 0.008 per cent, half that of the Australian Feedlot Industry Standard for short-stay (<85 days) grain fed cattle. The main welfare risks for these short haul cattle appear to be respiratory disease and lameness.

Given the currently available data, the committee has determined that while the revised standards should set a base stocking density based on a k-value of 0.030, the department should have discretion to approve space allowances using a k-value of 0.027 for shipments of cattle on voyages of less than 10 days. That approval must only be given based on proven past (and continuing) performance of the exporter and the export vessel for such voyages. The alternate stocking rate is shown in Table C1.

The committee has made this decision based on currently available information. However, it remains concerned about relying on mortality data to demonstrate performance of these and other export voyages. Mortality alone is not suitable for assessing animal welfare outcomes. Broader measures related to the behavioural implications of space allowances, and the ease with which animals can access feed and water, must be considered. This is particularly important for subordinate animals which are likely to be the first to experience stress associated with limited space. To address the information gap, exporters who seek approval to access the alternate stocking rates must be required to provide daily reports for those consignments. As discussed in Section 5.2, those reports should include animal welfare measures such as panting scores and information on feeding behaviour. With that information, exporters and the regulator will be able to gain a more comprehensive understanding of performance on these short voyages.

In addition, the department should apply significant controls on those exporters who fail to accurately predict voyage duration (with the effect that they access stocking rates relevant to shorter voyages, when the actual voyage length is more than 10 days). The regulations should also allow for significant, strict liability penalties to be imposed on exporters who claim a voyage will be less than 10 days and which, in reality, exceeds 10 days (the only defence being significant events beyond the control of the exporter, with evidence to support the claim).

Buffalo

As discussed under the section of this report regarding registered premises, most buffalo for export are sourced from rangeland or feral populations in Arnhem Land, held for relatively short periods after capture for dehorning and consolidation, then transported by road to registered premises near Darwin. Road transport of buffalo to registered premises covers long distances and over considerable lengths of unsealed road, and under relatively harsh hot conditions. Buffalo are known to be less heat tolerant than cattle and require frequent cooling / watering rest stops during long distance transport.

The committee has examined voyage mortalities and reports for buffalo. Buffalo exports regularly exceed reportable mortality rates. Although export numbers are smaller, average buffalo mortalities for voyages over the three-year period 2015 to 2018 were approximately three times that of cattle for voyages more than 10 days, and four times that of cattle for short voyages. Many voyage investigation reports cite the feral origin and hence unhabituated nature of exported buffalo as a likely factor. Accordingly, the committee's position is that buffalo need additional space on ships to cattle, and the committee recommends that for all buffalo voyages, the standards be revised to provide buffalo with 10 per cent more space than is allocated to cattle on voyages of more than 10 days.

The committee noted the lack of data on the causes of morbidity and mortality of buffalo during export voyages, which would help guide deliberations on the optimum standards that should apply to buffalo to ensure acceptable welfare outcomes. The literature review uncovered no relevant scientific studies involving buffalo. Post-mortem investigations of buffalo mortalities are uncommon and detailed clinicopathological investigations have not occurred on ships. It seems clear to the committee that this situation will remain unless action is taken to better investigate and identify the causes of buffalo mortality and morbidity during export, and associated risk factors. As a step towards addressing the lack of data, the committee recommends that buffalo shipments be the subject of daily reporting irrespective of voyage length, as a means of collecting more information on welfare performance on-board. As per Section 5.2, the committee has recommended that industry produce a relevant pant score for buffalo to be used in daily reporting.

While acknowledging it is beyond the scope of this review, the committee also strongly recommends that the department engage with the industry and the Northern Territory Department of Primary Industry and Resources (via the Chief Veterinary Officer) to discuss actions which can be taken to improve the understanding of the nature and causes of morbidity and mortality of buffalo during the export process. These may include NLIS identification, post mortem examination and sharing of reports between government authorities.

The committee learned during its field visit that the Northern Territory provides a free investigation service for livestock in country and there is no reason this cannot apply to live export preparation and shipboard mortalities (with the obvious limitation of fresh samples not being permitted entry). There are also a number of in-country initiatives that the department is funding through the North Australian Biosecurity Strategy/Framework including the North Australian Veterinary Surveillance Network, Veterinarian training and supply of post-mortem kits to stations that could be directed in part towards buffalo export preparation, including the shipping phase.

Other factors

The committee accepted evidence that, as a principle, all pregnant cattle and buffalo should be given 15 per cent additional space above that which would otherwise apply. It also agreed that cattle with long horns should be provided with 30 per cent more space than otherwise required for cattle and buffalo. This requirement would apply to cattle with horns longer than 12cm, and buffalo with horns longer than the spread of the ears.

The committee did not receive enough evidence to indicate that livestock, particularly sheep, are fed for weight gain during voyages. The standards operate on a maintenance ration and the stocking density requirement should reflect this. Inclusion of a weight gain factor in determining

stocking densities is not recommended. The committee also considered the application of a curfew factor in determining on-board stocking densities. Where a curfew has been applied to livestock for more than 12 hours off fodder and water, a curfew factor of five per cent is to be applied in calculating stocking densities.

The committee supports the verification of livestock weights in determining stocking densities. While outside the scope of the standards to specify, the committee is of the strong view that departmental officers should ensure a check of animal weights is undertaken through a sample inspection and review process at registered premises prior to and during loading. This step is to assess the accuracy of the exporter's proposed (and final) load plan and heat stress risk assessment.

The committee strongly recommends that the revised space allowances recommended in this report be reviewed in 12 months' time in the light of industry performance and voyage reports during that time.

The effect of the committee's recommended approach can be seen in the comparison tables and graphs in [Appendix C](#).

Recommendations 20 to 26

- 20) That the standard adopt an allometric approach to calculating default base space allowances, using a k-value of 0.03, or current ASEL, whichever is the greater.
- 21) That, for sheep voyages between 1 May and 31 October, the standards require the space allowance to be calculated using a k-value of 0.033 until a new HSRA model is in place based on heat stress welfare indicators rather than mortality (noting that this is subject to a separate review process). Once such an HSRA model is in place, the standard should be revised to adopt the default space allowance for sheep using a k-value of 0.030.
- 22) That, for cattle voyages of less than 10 days, the standards allow the department to approve a space allowance based on a k-value of 0.027 based on proven past and continuing high performance of the exporter and export vessel for such voyages. For those voyages, the standards must require daily reports to be provided (including the information recommended in Chapter 5 of this report). The regulations should also enable penalties to be imposed on an exporter when a voyage is claimed to be less than 10 days, and access to the alternate stocking rate ($k=0.027$) is approved, but the voyage exceeds 10 days.
- 23) That in relation to other special categories of livestock, the following approach should apply to space allowances:
 - a) Buffalo: on all voyages, 10 per cent more space than that required for cattle on voyages of more than 10 days.
 - b) Cattle and buffalo with long horns: 30 per cent more space than otherwise required for cattle and buffalo.
 - c) Cattle and buffalo from 500kg and above: additional space as determined by an approved heavy cattle/buffalo management plan.
 - d) All pregnant cattle and buffalo: a minimum of 15 per cent more space than otherwise required for cattle and buffalo for a given liveweight and voyage.
 - e) Rams and goats with horns: 10 per cent more space than otherwise required for sheep and goats.
- 24) That a weight gain factor should not be a requirement when determining stocking densities, but that where a curfew has been applied to livestock for more than 12 hours off fodder and water, a curfew factor of 5 per cent should be applied in calculating stocking densities.
- 25) That daily reports be required for buffalo consignments, regardless of voyage length.
- 26) That departmental officers should ensure a check of animal weights is undertaken through a sample inspection and review process at registered premises prior to and during loading to ensure accurate liveweights are being applied in load plans.

4 Heat Stress Risk Assessment

4.1 Requirement for a heat stress risk assessment

4.1.1 Requirements

Voyages of certain livestock, and to certain regions, face a greater risk of a welfare event due to heat. As discussed in the previous chapter, this risk is reflected in the standards via additional space requirements for sheep and *Bos taurus* cattle on voyages to the Middle East during May to October. But in addition to that, there is a broader requirement for an HSRA to be conducted for export voyages. This requirement is currently applied to voyages to the Middle East—or for sheep—to voyages travelling through waters in the Arabian Sea north of latitude 11°N (see Australian Meat and Live-stock Industry (Export of Sheep to Middle East) Order 2018). The risk of a welfare event is taken to be manageable if:

- The HSRA output is less than a 2 per cent chance of a 5 per cent mortality.
- The HSRA cross wind output for any open decks is less than seven knots.
- The HSRA output for stocking density meets at least the relevant stocking density specified in the standard (in other words, the base stocking density rate).

4.1.2 McCarthy review

In his review, Dr McCarthy looked at the application of the HSRA to consignments of sheep travelling to the Middle East. He used the months of May to October, as prescribed in the current standards, to define the northern hemisphere summer. He did not consider the implications of heat stress on vessels travelling to destinations outside of the Middle East. According to Dr McCarthy's report, one submission to his review included analysis of seasonal patterns of mortality rates for sheep exported to the Middle East. The submission noted that mortalities were more likely to occur when voyages commenced in May to October, corresponding to the hotter months in that region.

Dr McCarthy made a number of recommendations in relation to the HSRA model itself, including moving away from an assessment based on mortality to one based on risk of heat stress. These recommendations are being considered in a separate review process. He did not make any specific recommendations to revise the time period during which an HSRA should be required, or for what region.

4.1.3 Discussion in submissions and literature review

There was a great deal of discussion on HSRA in submissions. Commentary was focused on the circumstances in which an HSRA should be required, given that the model itself is subject to a separate review process, and is not prescribed in the standards.

Some submitters argued that the standards should require an HSRA for shipments travelling through waters in the Arabian Sea north of latitude 11° North (in other words, the requirement currently applied by the department). Others suggested a 'wider net' to capture any voyage where there is a risk of heat stress, with voyages from southern Australia to China (at certain times of the year) cited as an example. As for how the 'high risk period' is defined in other parts of the standards, some argued for June to September. Others argued for the current approach of May to October.

Industry submissions raised concerns about extending the requirement for an HSRA beyond existing routes (the Middle East). They noted that expanding coverage would require significant model development, and may not be justified in terms of the actual risk of heat stress.

The literature review touched on the HSRA model. It did not provide information in relation to markets for which an assessment should be required, or what should reasonably be considered the higher risk period.

4.1.4 Committee consideration

Noting that the standards only deal with the circumstances under which an HSRA is required to be undertaken (not the nature of the assessment itself), the committee considered the two relevant aspects; namely: the voyages or destinations, and the period/s of the year when an HSRA should be required.

The committee assessed the historical mortality data for shipments over a considerable period of time, and accepted that livestock mortality on voyages has reduced significantly over time. While a range of factors have contributed to this trend, there seems little doubt that the introduction of the HSRA requirement has been a contributing factor.

In considering the voyages or destinations for which an HSRA will improve welfare outcomes, the committee was of the view that livestock will be at some risk of heat stress on any voyage that crosses the equator headed for northern hemisphere ports. Noting that the HSRA model is being revised and will be based on (heat stress related) welfare risk rather than simply mortality risk, the committee was of the strong view that the assessment should be applied to all voyages where livestock may be at risk of heat stress. Accordingly, the committee's position is that an HSRA be required for all livestock voyages that cross the equator to any destination. In reaching this position, it is acknowledged that the HSRA model will need to be adapted for application to voyages to destinations outside the Middle East, and that this requirement will therefore need a staged approach to its implementation.

With respect to the period/s of the year when an HSRA should be required, the committee, in the light of Recommendations 20 to 26 (to require an HSRA for all voyages crossing the equator), found no evidence to support introducing a time period to this requirement. Putting these together, the committee's position is that an HSRA be required for all voyages crossing the equator at all times of the year, from all Australian ports.

The current standard requires that, when undertaken, an agreed HSRA must indicate the risk is manageable as per the testing criteria in the standard. The HSRA criteria are set out in Part 4A.4 (of the working draft standard). As these include mortality-based criteria, this section of the standards will require revision in line with the new HSRA model once finalised, given that the new model is to be based on welfare outcomes not (simply) mortality outcomes.

The committee does note that the current review of the HSRA model only relates to sheep, flowing as it does from recommendations made in the McCarthy report (which was restricted to sheep). The committee stresses the need for the model to be developed for cattle also, acknowledging that this may require further research to obtain the necessary scientific data.

Related considerations

Other sections of the standards (for example on-board stocking density for sheep and *Bos taurus* cattle exported from southern ports) set particular or altered requirements to apply during the 'northern summer'. It was the committee's view that this approach should remain. The standards currently define this period as 1 May to 31 October.

A range of submissions were received concerning the period of the year that best defines the 'northern summer' when climatic conditions during the latter part of a voyage and at destination ports were most hot and humid, with most submissions providing evidence to support the current ASEL standard. This is also the period when livestock for export from southern ports in Australia are sourced and prepared in cool to cold conditions and thus less acclimatised to heat and humidity. After considering all the submissions and evidence, the committee found no basis to change the current period defined in the standards, being from 1 May to 31 October.

Recommendations 27 to 29

- 27) That the standards be revised over time to require the application of an agreed HSRA to all livestock voyages that cross the equator, at all times of the year, from all Australian ports. This requirement will require significant model development and a staged implementation approach.
- 28) That once the (separate) review of the HSRA model for sheep exports to the Middle East is completed, the testing criteria in the standards should be revised to support the new model.
- 29) That the period 1 May to 31 October continue to be applied as defining the 'northern summer' in the relevant sections of the revised standard.

5 Voyage reporting

5.1 Reportable mortality

5.1.1 Requirements

The standards set a whole-of-consignment mortality rate for livestock export voyages which, if exceeded, must be reported to the department. The rate differs by species, as summarised in Table 9. If the level is exceeded, it qualifies as a 'notifiable incident' which has the potential to cause serious harm to the health and welfare of animals. Notifiable incidents must be reported to the department as soon as possible, and within 12 hours. That report triggers an investigation by the department, including subsequent publication of investigation information on the department's website (note: the investigation and publication process sits outside of the standards).

Table 9 Reportable level of mortality

Animal	Voyage length	Reportable mortality rate
Sheep and goats	–	1 per cent, or three animals, whichever is greater.
Cattle and buffalo	Greater than, or equal to, 10 days.	1 per cent, or three animals, whichever is greater.
	Less than 10 days.	0.5 per cent, or three animals, whichever is greater.
Camelids	–	2 per cent, or three animals, whichever is greater.
Deer	–	2 per cent, or three animals, whichever is greater.

Note: The reportable mortality level for sheep exported by sea was reduced from 2 per cent by the Australian Meat and Live-stock Industry (Standards) Amendment (Reportable Sheep Mortality Level) Order 2018.

5.1.2 McCarthy review

In his review, Dr McCarthy acknowledged that on-board management of mortality is important to both the health and welfare of livestock and the crew. Dr McCarthy considered reportable mortality levels in his review, specifically in relation to public expectations. He recommended that the reportable mortality rate for sheep exported by sea be reduced to 1 per cent. The department implemented this recommendation via the Australian Meat and Live-stock Industry (Standards) Amendment (Reportable Sheep Mortality Level) Order 2018, which reduced the reportable mortality rate for sheep exported by sea to 1 per cent. While Dr McCarthy recommended this change, he noted that reportable mortality events were unlikely to increase as historically, the majority of voyages are below this level.

5.1.3 Discussion in submissions and literature review

Most submissions recognised the need for mortality reporting to support continuous improvement and transparency in the industry. While the current reportable mortality approach was regarded as a relatively blunt tool by many submitters, there was no suggestion that it should be removed entirely. Rather, the debate was around retaining the current thresholds, reducing them to reflect actual average mortality rates, or adopting a more dynamic approach, such as a threshold that moves with average industry performance, or mortality reporting by species and class. Several submissions commented on the importance of investigations and public reporting following a reportable mortality (as a notifiable incident), however, this process is separate from the standards. There was agreement that a set of animal welfare indicators

should be developed in addition to the current mortality indicator, however industry work in this area is still some time away from completion.

The literature review noted that livestock mortalities have generally been decreasing since data started being reported in 1995. It also noted that while overall mortalities have declined, the rates are not uniform across voyages. Higher mortality rates were noted for sheep transported from Australia in winter to the Middle East summer (when mortality rates approximately double); and for cattle voyages (mainly *Bos taurus*) to the Middle East where mortality rates are approximately four times higher than for shorter voyages to South-East Asia (mainly *Bos indicus*).

5.1.4 Committee consideration

On the basis of comments received in submissions, the committee noted that ‘reportable mortalities’ is a term that seems to generate some confusion. For some submitters, the term was taken to mean that these are the only mortalities that are reported to the regulator, with all other mortalities going unreported. This is not accurate. All mortalities are reported, in daily reports and end of voyage reports. It is the committee’s view that a more accurate term might help to remove confusion around general mortality reporting versus mortalities reported as a ‘notifiable incident’. The committee suggests that the term ‘notifiable mortality rate’ be used, consistent with the rate being a ‘notifiable incident’.

The objective of requiring notification of a mortality event above a threshold is to provide greater transparency to the public, to allow for independent investigation, and to provide industry with means of demonstrating continual improvement. Factors that may impact a high mortality event are varied, and allowing investigations to better understand the specific circumstances that contribute to a notifiable mortality event is important. Factors to consider in understanding any incident and future risk mitigation may include animal factors (class, type of, or farm of origin/registered premises, ship factors and management decisions), feed type and amount, space allowance and environment/climate factors including unpredictable weather.

Ideally, voyage reporting on the welfare of livestock would be based on a broad set of health and welfare measures (morbidity data) in addition to a mortality rate. However, measures of welfare are complex, requiring multiple measurements over time, and vary with many factors including livestock class and preparation and environmental context. These measures have not yet been clearly identified and described for on-farm assessment, nor adequately validated to determine thresholds to act as triggers for action. Thus the need to continue with notifiable mortality rates per consignments remains in the short term. However, it is recommended that daily voyage reports be considerably expanded to include additional morbidity and welfare data which would mean an extension of the daily data to be collected and recorded, using digital methodologies to standardise and facilitate recording and reporting (see [Section 5.2](#)).

The committee received many submissions advocating a lower notifiable mortality rate. It was noted by the committee that the current rates in ASEL were set at a time when voyage mortality rates were considerably higher than the present. For sheep, the average mortality rate for all voyages over the past three years was approximately 0.75 per cent, while the current notifiable mortality rate (2 per cent) is close to three times the three-year average. Similarly, for cattle the current notifiable mortality rate for short voyages (0.5 per cent) is some six times the three-year average of 0.08 per cent. The notifiable mortality rate for long haul voyages (1 per cent) is also

about 6 times the three-year average for such voyages (0.16 per cent). The committee believes there is a clear case for reducing the notifiable mortality rates for sheep, cattle and buffalo, and on this basis recommends that the notifiable mortality rate for sheep be revised to 1 per cent (noting that this accords with the McCarthy report), and to 0.5 per cent for cattle and buffalo for all voyages, regardless of length. To ensure consistency, the committee also agreed that the notifiable mortality rate for camelids and deer should also be reduced to 1 per cent.

There was considerable support for setting a notifiable mortality rate based on an agreed relationship with the average mortality rate, for example on a three-year rolling average basis. The committee's considered position is that the notifiable mortality rate should be regularly reviewed over time against voyage and industry performance, rather than fixing a set relationship in the standards.

Other mortality measures

The current approach using a notifiable mortality rate is relatively crude but represents a marker of voyage and industry performance that can be tracked over time. However, the committee was concerned that the current approach does not account for voyage length, reducing its usefulness (and indeed equity) in comparing voyages of varying length and transparency in identifying shipboard conditions and mortality. For example, currently, a 10-day voyage can have the same total mortalities as a much longer—say 20-day—equivalent size voyage but have and report the same end-of-voyage mortality rate. The committee was drawn to alternative or additional approaches based on daily incidence or average daily mortality rate (ADMR), or an animal-time unit, such as the number of mortalities per 1,000 animal days, as a more rational approach. With the imminent introduction of on-board digital data reporting, the ability to calculate these incidence rates should become more straightforward. The recommendation is for a notifiable ADMR of 0.05 per cent for sheep, and 0.025 per cent for cattle. This has been calculated as a percentage slightly higher than that obtained by dividing the recommended new notifiable mortality rate by the published average voyage length for sheep and cattle over recent years.

Accordingly, the committee recommends the following for sheep and goats:

- The notifiable mortality rate should continue to be required, but set at 1 per cent for sheep as recommended by Dr McCarthy and accepted by the department, for all shipments by sea.
- An ADMR of equal to, or greater than, 0.05 per cent, calculated at the end of the voyage, be added to events that would qualify as a 'notifiable incident' under the standard.

The committee recommends the following for cattle and buffalo:

- The notifiable mortality rate should continue to be required, but set at 0.5 per cent for all voyages.
- An ADMR of equal to, or greater than 0.025 per cent, calculated at the end of a voyage, be added to events that would qualify as a 'notifiable incident' under the standard.

For the avoidance of doubt, the ADMR is calculated by dividing the final voyage mortality rate by the length of the voyage (in days). This calculation would be done at the end of the voyage and included in the end of voyage report.

These recommendations introduce a new, more meaningful reporting parameter for mortality, which allows a fairer comparison of voyage performance for all shipments regardless of voyage length.

The committee recommends that these two mortality rates be monitored against voyage data, and that the level and utility of these rates be reviewed in approximately two years. This time period will provide regulatory certainty for the industry, as well as a reasonable period over which to collect actual data for comparison. The committee notes that whilst compliance arrangements are out of scope for its review, it expects this information would be useful in monitoring overall performance of the sector as well as the performance of individual exporters and shipments.

Recommendations 30 to 32

- 30) That the term 'reportable mortality level' be replaced with the term 'notifiable mortality level' in the standards.
- 31) That the notifiable mortality level for sheep, goats, camelids and deer should be set at 1 per cent, or three animals, whichever is the greater; and that an average daily mortality rate of equal to, or greater than, 0.05 per cent, calculated at the end of voyage, be added to the list of events that would qualify as a 'notifiable incident'.
- 32) That the notifiable mortality level for cattle and buffalo should be set at 0.5 per cent, or three animals, whichever is the greater; and that an average daily mortality rate of equal to, or greater than, 0.025 per cent, calculated at the end of voyage, be added to the list of events that would qualify as a 'notifiable incident'.

5.2 Other voyage reporting requirements

5.2.1 Requirements

There are a number of reports that need to be prepared for sea export voyages. The standards specify daily and end of voyage reports, and set requirements in relation to the content of those reports and personnel that must prepare them. A summary is provided in Table 10.

Table 10 Reporting for voyages by sea

Report	Prepared by	Requirements
Daily Reports	Accredited stockperson, unless an AAV is on-board.	Required for all consignments on voyages equal to, or greater than, 10 days. Must commence on day one at sea. Must include information outlined in standards.
End of voyage	Accredited stockperson, unless an AAV is on-board.	Must be provided for all consignments within five days of completion of discharge at final port, regardless of voyage duration. Must include information outlined in standards.

5.2.2 McCarthy review

Dr McCarthy considered existing voyage reporting requirements, and how they may change with independent observers and new technology becoming available. He advocated for continuous automated environmental monitoring and further research into such monitoring opportunities by industry. He recommended that all vessels travelling to the Middle East during the 2019

northern hemisphere summer have automated continuous environmental monitoring equipment installed. Dr McCarthy also suggested that a panting score and a heat stress score should be mandatory in reporting processes. His view was that a panting score, combined with a heat stress score and temperature and humidity data, would provide a complete view of livestock conditions. This requirement was implemented by the department.

5.2.3 Discussion in submissions and literature review

There were a range of different views expressed in relation to voyage reporting. Many submissions suggested additional elements for inclusion in daily and end of voyage reports, including detailed welfare indicators and environmental monitoring such as carbon dioxide, ammonia and other gas levels. However, others referred to the considerable reporting that already occurs and that more data is not necessarily better. They argued that additional reporting should only be implemented if supported by science and used to improve regulation or performance. Several submissions noted a trade-off between increased reporting and time available for veterinarians and stockpersons to manage livestock.

Several submissions suggested daily reporting should be required on all voyages, rather than those of ten or more days. A number of submissions also proposed that templates be standardised, and that industry adopt electronic reporting through app based technology.

Most people agreed that more needed to be done with the data that is already collected. One suggestion was that industry should proactively analyse existing and future data to improve practices, and that an epidemiological study could be conducted to drive improvements in the industry. Although outside the scope of the standards, a number of submissions indicated support for the publication of data on a routine basis.

The literature review noted mortalities have been generally decreasing since the available data began (1995). However, there was a suggestion that reported data may be unreliable due to the veterinarians and stockpersons being employed by exporters. It has been argued by authors of several reviews that animal welfare monitoring should not be solely restricted to addressing mortalities. Rather, it has been proposed that animal welfare management should be based on ensuring the physical and mental welfare needs of exported animals are addressed throughout the entire journey (Foster and Overall 2014; Wickham et al. 2017; Australian Veterinary Association 2018). This was echoed by the McCarthy Review, which recommended a move away from mortality towards morbidity reporting.

5.2.4 Committee consideration

The objective for collecting data other than mortality rates is to provide more detail about the welfare of animals on each consignment; to promote increased transparency, identify factors contributing to livestock outcomes, and enable improved risk mitigation for future consignments. Importantly, reporting should allow the early detection of subtle changes in animal or environmental conditions on-board and allow proactive decision-making and corrective action to reduce risk of poor welfare outcomes. Reporting may initiate communications with the exporter or the department, provide support to shipboard personnel, and facilitate detailed analysis of any adverse event. Ideally reports should include daily measures on animal welfare and morbidity and mortality data, including animal identification. This data, combined with an end of voyage report, should be analysed post-voyage with an

epidemiological approach. The analysis should involve discussion with the AAV, an exporter representative and the department.

Factors that may impact a high mortality event are also likely to result in high morbidity rates, and prevention and treatment of these animals is pertinent. Factors contributing to poor welfare outcomes are varied, complex and differ with consignment type. Having a good understanding of morbidity data is essential to better understand the specific circumstances that contribute to an adverse event and to allow continuous improvement. The inclusion of animal identification (or at least pen ID) would allow any problems to be traced back to the animal source/farm of origin.

The committee understands there are several phases for effective widespread data collection, storage and analysis subsequent to routine animal monitoring.

- **Data Collection:** Data should be collected daily at the pen and recorded simply but in a standardised way. Standardised classification at the point of data capture is vital and use of digital technology such as a smart phone app is recommended. Identification of animals requiring observation, or treatment, classification of illness/ injury and types of medications or treatments administered should also be collected and reported on.
- **Data Storage:** Once recorded, data should be appended to a secure central database to facilitate ease of reading of current daily trends and for future long-term analysis. The recording of data should be real-time (at the time of monitoring) and uploaded as soon as is practical (at least daily, or when there is internet connection). Such data and daily trends should be available to key personnel for on-board management of animals.
- **Animal Data:** Data type should include animal ID (RFID for cattle; ear tag for sheep) pen ID, and a number of standard daily pen assessments of a range of animal welfare indicators, including identification of panting scores, feeding behaviour, signs of ill-health (injury or disease), treatments or animal movement to hospital pens, mortalities or euthanasia and post mortem findings. These data may be complemented with photos of animal condition, deck condition or post mortem images.
- **Environmental data:** Data detailing environmental conditions, wet bulb globe temperature (WBGT) (dry bulb temperature and relative humidity), ammonia levels and other pertinent on-board conditions such as sea swell, or other relevant management issue (e.g. depth and moisture of manure pad (sheep), pen wash down days (cattle) or incidents such as broken water pipes leading to pen flooding). In addition, data reporting on water and fodder consumption and feeding regime (amount fed per head, feed type), and bedding type if provided. With the move towards standardised collection of data, collection of these environmental and management measures will not be overly time consuming to record.

There is research currently underway, funded by the industry to:

- develop a methodology for standardised data collection using a smart phone app
- determine practical animal welfare indicators which reflect behaviour and physiology and could be included in pen-side assessments and reporting, and
- develop ways that environmental measures can be automated by installing multiple devices per deck that report directly to a central database.

These more detailed welfare indicators require validation on ships for sheep, cattle and buffalo. As a result, the committee does not suggest they be included in mandatory reporting at this stage. Data is needed across the various consignments, stock lines and destinations to understand the typical range of measures, and how they contribute a better understanding of livestock welfare. In the interim, while research is being performed and industry develops standardised collection of data using a phone app, the committee suggests daily reports are modified to capture more detailed measures around pant scores and livestock demeanour for each livestock line and deck conditions. It is suggested that the veterinary toolbox should include one hand held environmental device capable of measuring WBGT and humidity, and that the AAV or accredited stockperson be trained in its use. This is particularly important given the microclimates that may occur on decks. It would enable the AAV/stockperson to make critical measures pen-side, particularly when animals exhibit elevated panting scores.

It was noted that current daily reports require information on health and welfare issues which can be provided as a single assessment for all animals on the voyage. This is unlikely to be useful in understanding factors affecting morbidity and welfare of a particular species or line of livestock, especially given the various microclimates within decks. The committee noted there may be resourcing implications for additional welfare reporting as data collection would currently be the responsibility of the AAV or accredited stockperson. This role could be factored into discussions about independent observers. In the meantime, the committee suggests that welfare assessments be made daily on a representative sample of pens (for example, a number of pens per species, class, and possibly line and deck). The exporter and the AAV or accredited stockperson should identify and select which pens to monitor for welfare assessments at the time of loading, based on the stowage plan and the nature, type and complexity of livestock for each consignment. As some consignments may have multiple lines of a similar class of stock, a discussion can determine the appropriate number of pens to be selected as a representative sample for assessment.

Thus, daily reports should include health and welfare monitoring for each species and class (and possibly several lines), based on an assessment of at least two pens of sheep and two pens of cattle per deck. The pens selected should be representative of the class or line, and the report should include a detailed panting score, description of animal demeanour, fodder and water intake (including animal feeding behaviour), a report on faecal type and manure pad scores, and a WBGT and humidity reading. As noted, this is similar to the existing general daily report, but relating to sufficient pens representative of the consignment. This allows environmental data to be collected at the location the animal data is also collected. In addition, as the voyage progresses, 'at high risk' pens (such as those located in areas known to have poor ventilation, adjacent to the engine, or exposed to direct sunlight) or pens 'of concern' (for example, pens identified as the voyage progresses, for example, with unexpected water leaks, poor drainage, unusually wet manure pads, poor design or inadequate trough space per pen) on each deck may be identified. Animals within those pens should also be subjected to the more detailed welfare reporting. The exporter, AAV or accredited stockperson must agree to nominate a sufficient number of suitable representative pens per class for reporting to avoid sampling bias.

The department will need to issue specific instructions for determining panting scores. The committee is aware of a number of options for sheep, including systems proposed by Dr McCarthy and the Australian Veterinary Association, and one suggested in the draft report from the HSRA model review. All use a score of 0 to 4. The committee has adopted the HSRA

model in its daily reporting requirements, noting the system is still in draft form. For cattle, the panting score (0–4.5) described in the Live Export Veterinary Handbook could be used. A panting score for buffalo does not currently exist and should be developed with high priority.

The daily reports should require that where a panting score of 2 or 3 is observed, an estimate must be provided of the total number (count) or the percentage of pens with animals showing a score of 2 or more. An estimate should also be provided of animals within those pens showing panting score (2–4). The committee notes that the requirement for this recording may depend on the outcomes of the separate review on the HSRA model for sheep, and any 'heat stress indicators' produced by that process. As a result, the requirement for this data should be reviewed in 12 months.

These, and other amendments, are shown in the requirements for daily and end of voyage reports at [Appendix A](#) and [Appendix B](#).

The committee foresees that with these changes, more detailed and valuable information will be submitted during and after each voyage. There is an urgent need for a considered review of this data after each shipment to identify any areas of concern and to pinpoint areas for improvement. An epidemiological discussion of any factor based on species and class will be far more valuable than considering data based on averages for species or deck alone. Hence, more resources will be needed in the department to analyse the information.

The committee notes that a number of submissions suggested that voyage reports should be publicly released. While the standard sets out requirements in relation to information to be collected, the decision on whether to release reports publicly is a matter for the department and should not be included in the standard.

Recommendation 33

- 33) That the requirements for daily reports and end of voyage reports be updated as per Appendix A and Appendix B in this report including:
- a) Inclusion of more detailed welfare monitoring in daily reports based on an assessment of at least two pens of sheep, cattle, buffalo and goats representative of each class or line, per deck, as well as a welfare assessment for any 'at high risk pens' or 'pens of concern'.

6 On-board resources and management

6.1 Management of bedding and ammonia levels

6.1.1 Requirements

Provision of bedding, and management of that bedding, is an important part of managing the risk of injury or other adverse welfare outcomes during export. The standards include a number of requirements in relation to bedding, summarised in Table 11. There are also requirements associated with ventilation, which is relevant to discussions around the impact of ammonia levels on animal health and welfare.

Table 11 Bedding and management for sea exports

Animal	Summary of requirements
Cattle and buffalo	Must be provided with sawdust, rice hulls or similar material on voyages of 10 or more days. Bedding must be at a rate of at least seven tonnes or 25m ³ for every 1000m ² of cattle pen space. Does not apply to cattle and buffalo loaded from Brisbane or a port north of latitude 26° south and exported to Southeast Asia or Japan.
Sheep	Bedding (straw, shavings or sawdust) of at least 1 tonne for every 10,000 sheep will be provided on voyages to the Middle East during May to October.
Deer and camelids	Must be provided with straw, shavings or sawdust on all voyages. Bedding must be at a rate of at least seven tonnes or 25m ³ for every 1000m ² of deer pen space before animals are loaded.
All	Where used, bedding must be maintained to ensure the health and welfare of the livestock and meet specified requirements.

Note: bedding for sheep is a requirement under the Australian Meat and Live-stock Industry (Export of Sheep by Sea to Middle East) Order 2018

Table 12 Ventilation for export by sea

Ventilation	Summary of requirements
Enclosed decks	When animals are loaded on vessels with enclosed decks, the ventilation system must be run continuously from commencement of loading.
Daily monitoring	Ventilation must be monitored daily to ensure adequate thermoregulation of the livestock.

6.1.2 McCarthy review

Dr McCarthy discussed bedding management for sheep export voyages. His view was that on routine sheep voyages, there was no need for bedding beyond the sheep manure pad. He did, however, note the strategic use of bedding for cattle to extend the life of the cattle pad on long haul voyages, and recommended that exporter's heat stress management plans for sheep should include strategic use of sawdust before and/or during the voyage, if required, for targeted areas on the vessel. The department implemented that recommendation through the Australian Meat and Live-stock Industry (Export of Sheep to the Middle East) Order 2018, which requires an exporter to ensure there is at least one tonne of bedding on-board per 10,000 sheep.

6.1.3 Discussion in submissions and literature review

Many submissions discussed the role of bedding on vessels, including its usefulness in managing spills, preventing slipping on loading and discharge ramps for specific pen use.

There was general agreement that the sheep manure pad constitutes adequate bedding in most circumstances, provided adequate sawdust or wood shavings is available to manage wet or boggy pens. There were however, mixed, and strong, views on bedding requirements for cattle. Submissions from welfare groups tended to argue for more bedding. Submissions from industry varied, with some suggesting additional bedding in certain circumstances and others arguing that existing bedding requirements should be retained. Issues were also raised about the practicalities of bedding, including ability to source materials in some parts of Australia, how to store and manage large quantities on vessels and the logistics of applying and removing large amounts of bedding. Views from AAVs varied. Little evidence was provided to support either increasing or decreasing existing requirements. Many submissions referred to the project that industry is commissioning to analyse the relationship between the different variables affecting bedding and the on-board environment (particularly ammonia levels), and to identify ways to effectively estimate and mitigate risks.

There was general agreement that 25ppm was an appropriate maximum level for ammonia, although measurement challenges were presented.

The literature review confirmed the appropriateness of different approaches to bedding for sheep and cattle. The manure pad from sheep is generally quite dry, and if it remains firm, dry and intact, it is considered the preferred choice of bedding material for sheep during live export (Banney et al. 2009). On the other hand, manure from cattle is more liquid and generally requires more cleaning during long haul voyages. It noted that very little specific research has been conducted on bedding on ships, and there are issues associated with most of the materials. Provision of bedding is linked to ventilation and air quality (McCarthy and Banhazi 2016), with ventilation affecting moisture content, and the removal of noxious gases produced in the bedding. An early study recommended the monitoring of ammonia levels on-board, and that ammonia levels below 20 ppm (parts per million) should be the target during live cattle export (Tudor et al. 2003).

6.1.4 Committee consideration

Bedding

There was universal agreement in submissions to the committee that some bedding material should be provided on all voyages for either specific bedding use in pens and for use in managing water spills, to prevent slipping on loading and discharge ramps and for bedding within hospital pens (particularly those with lame cattle). Bedding may also be used to potentially limit harmful emissions such as ammonia. Bedding should be dry and consist of an appropriate material that is comfortable for livestock to lie on. Vacuumed wood shavings and rice hulls are preferred over sawdust, as there was some concern expressed about the relationship between the application of sawdust and the incidence of pinkeye. However, the committee noted it was challenging to be prescriptive in the amounts to be provided.

Bedding requirements may depend on voyage length and stocking type, but when provided, it should be in amounts sufficient to ensure animals can rest comfortably. For example, pregnant breeding cattle and heavier slaughter weight cattle, which have potential for more leg injuries,

will require additional bedding. Sheep generally require much less bedding. All cattle voyages that require washing also require sufficient amounts of bedding, and long-haul voyages in particular require additional amounts. Bedding material is also useful for managing faecal pad moisture at times when it becomes too moist such as in high humidity or where there is high urine output. Given the challenges associated with prescription, the committee has recommended that the standards adopt an outcomes-based approach and require that, on all voyages, a sufficient quantity of bedding to be carried, applied and managed in a manner that ensures good animal welfare outcomes for livestock; in particular to minimise slipping (including during loading and unloading), injuries, abrasions, lameness, pugging and faecal coating. Success in achieving this outcome can be monitored through increased reporting on bedding use and management (see [Section 5.2](#)). The committee has also retained the existing cattle bedding provisions as a minimum in the standard, but with no exceptions.

The committee notes that additional research has been commissioned under the Livestock Export Program to determine bedding requirements for both sheep and cattle and its effect on welfare outcomes. Further research on the requirement and usage of bedding on vessels is also required. The standards should be reviewed when the results of that research become available. To assist with future decisions on bedding requirements, the committee agreed that bedding type and use, as well as conditions of the manure pad, should be monitored and reported as part of voyage reporting.

Ammonia levels

There was universal agreement that high concentrations of ammonia gas are known to be deleterious for welfare and health. Ammonia is a strong mucosal irritant and at harmful levels predisposes to respiratory disease due to inflammation of the respiratory tract, and adversely affects fodder intake. On ships, ammonia is produced and accumulates in livestock accommodation spaces as a result of the chemical and microbiological degradation of urine and faeces, although the exact risk factors and their interaction are not fully understood. Inadequate ventilation/air movement, high temperatures and humidity, reduced waste removal, management of bedding and high protein levels in fodder are believed to be risk factors for ammonia emission. Studies on-board vessels have demonstrated that high ammonia levels can be localised in parts of the holding areas of the vessel, and are not necessarily consistent over time.

Based on research studies, and submissions to the committee, there is a strong consensus that ammonia levels above 25ppm—as a time weighted average—are harmful to animals (and humans) and should be avoided. The committee recommends that the standards include a new requirement that ammonia levels must not exceed 25ppm, and that ammonia reduction measures (to the extent that these are understood) must be implemented if levels exceed or appear likely to exceed this level. Recording of ammonia levels should be incorporated into the daily and end of voyage reports.

The committee notes, however, that practical and consistent measurement of ammonia gas levels as a routine, regular measure is currently problematic. In particular, there is no technology currently available to provide the ongoing automated ammonia measurements that would be necessary to demonstrate compliance with such a standard, particularly to calculate a time-weighted average. A range of hand-held devices are on the market that may be suitable for use on-board ships. It is the committee's understanding that these will be evaluated as part of a

project that has been established to scientifically analyse the relationships between the different variables affecting bedding and the on-board environment (including ammonia), and to identify ways to estimate and mitigate risks. While this project is only at the commencement stage, there is a good prospect that once completed, risk factors and mitigation measures will be better understood and ammonia-related requirements in the standards can be inserted or revised accordingly.

The committee strongly recommends its requirements for bedding be reviewed in 12–18 months in light of research on bedding being commissioned by the Livestock Export Program.

Recommendations 34 to 39

- 34) That the standard require that on all voyages, a sufficient quantity of bedding is carried, applied and managed in a manner that ensures good animal welfare outcomes for livestock; in particular, to minimise slipping (including during loading and unloading), injuries, abrasions, lameness, pugging, faecal coating.
- 35) That the standard require the consistency and depth of bedding material to be routinely monitored.
- 36) That in relation to recommendation 34, the manure pad is an appropriate form of bedding for sheep, but that a sufficient amount of material such as sawdust, wood shavings or rice hulls, must still be carried to manage moisture in the sheep manure pad, avoid slippage during loading and unloading, and manage incidents such as pen flooding.
- 37) That, in addition to the requirement in recommendation 34, the standards continue to require that for cattle and buffalo on all voyages of ten days or more be provided with sawdust, rice hulls or similar material to be used exclusively for bedding at a rate of at least 7 tonnes or 25m³ for every 1000m² of cattle/buffalo pen space (no exception).
- 38) That bedding requirements for voyages of 31 days or more be agreed in the extended long-haul management plan.
- 39) That the standard require that ammonia levels in livestock spaces not exceed 25ppm and that reduction measures be implemented if that level is exceeded in any given area of the vessel. The department should allow a 12 month transition period with respect to compliance whilst industry tests the use of currently available devices on ships.

6.2 Water, fodder and chaff

6.2.1 Requirements

The standards include requirements on the types and volumes of water and fodder for export voyages. It also requires that animals have ready access to fodder and water on the export voyage. A summary is listed in Table 13.

Table 13 Water and fodder requirements

Category	Summary of requirements
Water	At time of departure, vessels must hold or be able to produce quantity of water to meet anticipated needs of animals, plus statutory reserve amounts. Must take into account species, class, age and expected weather conditions.
Fodder	At time of departure, vessel must hold at least quantity of fodder to meet anticipated needs of animals. Must also hold statutory reserve amounts. Must not contain more than 30 per cent by weight of wheat, barley or corn, unless livestock have adapted to that ration over at least 2 weeks before export. Fodder for cattle exported from a port south of 26°S must include at least 1 per cent of required fodder as chaff and/or hay. Pelleted fodder must be accompanied by manufacturer's declaration that manufactured in accordance with national pellet standards. Pelleted fodder for sheep, goats and camelids must also meet requirements in the standard. Fodder from previous voyage can remain in storage tank subject to certain requirements. For deer, where concentrates are fed, they should be included at a ratio of 1:4 with roughage. For all voyages through the Suez Canal, additional fodder (over and above the normal 3 additional days) or a plan to manage fodder shortage in light of the extended voyage length and route.

Table 14 Access to fodder and water, export by sea

Category	Summary of requirements
Water	Must have access to adequate water of a quantity and quality and frequency to maintain good health.
Fodder and water	Must be offered fodder and water as soon as possible after being loaded, and within 12 hours.
Needs of livestock	Take into consideration any particular needs of livestock species, class and age.
Fodder and water	Feed and water supply systems must be monitored day and night and maintained in good order.
Fodder and water	Adequate fodder and water must be supplied to livestock awaiting and during discharge period.

6.2.2 McCarthy review

Dr McCarthy noted that having automatic watering systems on vessels transporting sheep to the Middle East removes a level of risk. He recommended automatic watering systems should be mandatory for vessels during the northern hemisphere summer. The department implemented this recommendation for voyages of sheep to the Middle East through the Australian Meat and Live-stock Industry (Export of Sheep by Sea to Middle East) Order 2018.

6.2.3 Discussion in submissions and literature review

Fodder on-board the vessel was widely discussed in submissions; including the quantity that should be carried and the composition.

In relation to composition, a number proposed that chaff or hay should make up at least one or 2 per cent of the on-board ration. The reasons for this included the importance of chaff in enticing shy feeders or cattle onto pellets, and as a management tool for treating bloat. A number of industry submissions noted the importance of the issue and referenced work commissioned through the Livestock Export Program to review fodder quantity and quality on export voyages. The results of this study could be beneficial in setting fodder levels in the future.

In terms of quantity, several submissions raised concerns about rationing of fodder. There was support amongst many submissions for additional reserves on voyages of 10 or more days to mitigate against the risk of break down or voyage delay. The need to properly account for fodder consumed during loading and unloading was also raised.

Submissions were fairly consistent on watering systems, with most recommending that automated or ad lib water systems be mandatory for all vessels. Trough space was also discussed, with some submissions strongly suggesting that the standard specify a minimum trough allocation per animal.

Basic fodder and water allocations were not addressed in the literature review. However, fodder and water provision were mentioned in relation to heat load, with studies indicating that the timing of feeding, amount and composition can contribute to capacity of livestock to manage heat.

6.2.4 Committee consideration

The committee considered the wide range of submissions concerning the provision of fodder, information from relevant research and from AAV workshops held on this topic in 2012 and 2016.

It is clear that there is a need for improved pelletised fodder and feeding regimes for use on ships, and that the current standards are in need of substantial updating. Issues include fodder quality and quantity, and pellet specifications (including in particular the problem of pellets breaking into 'fines' when put through mechanised pellet distribution systems on ships), use of chaff or hay, and contingency reserves of fodder.

The committee noted that the Livestock Export Program has commissioned a substantial study specifically addressing fodder quality, pellet specifications, chaff volumes, contingency reserve volumes, and how fodder requirements are best calculated/quantified. It is studying fodder needs of separate classes of animals such as young animals, growing animals and adults with respect to any specific energy and nutritional needs. The project includes an updated literature review, and includes consultation with pellet manufacturers and AAVs.

In the committee's view it would be premature to recommend significant changes to the standard regarding these matters at this time, ahead of these studies being completed. Notwithstanding this position, the committee considered that some revision to the standard was necessary and timely.

It is widely accepted that the use of chaff or hay is essential as a supplement to pellets, and many submissions advocated for revising the standards to require chaff/hay for cattle voyages other than just those loaded at southern ports. The committee's view was that the evidence justifies extending the requirement that fodder for cattle and buffalo includes 1 per cent chaff/hay to all voyages, not just those loaded at southern ports. Additional chaff/hay (in other words, 2 per cent of fodder carried) was justified for extended long haul voyages (greater than 30 days).

Submissions and voyage reports indicate that, not infrequently, fodder is rationed due to concern that the voyage may potentially or actually take longer than anticipated. This is not appropriate from a welfare perspective. To avoid this, days of loading and discharge must be included in calculations of 'standard' fodder requirements and adequate reserves must be

carried beyond those normal requirements to account for voyage delays. The committee has therefore recommended that standards clarify that loading and discharge are included in standard voyage fodder calculations (noting of course that not all animals are on-board for that full period), and that, in addition to those fodder provisions, reserve amounts must be carried to ensure all livestock can continue to be fed the specified amounts in the event of voyage delays. At a minimum, the reserves should be three days, aside from voyages through the Suez Canal, the Cape of Good Hope, the Panama Canal and Cape Horn, or any other voyage expected to be longer than 30 days, which should carry seven days of reserves. Given the importance of fodder provisions in terms of welfare outcomes, the committee strongly recommends that the department regularly inspect vessels at loading to verify that fodder provisions and quantities meet what is required under the standards (as a minimum).

Access to trough space is also critical and the committee was attracted to the suggestion that the standards mandate a minimum trough space per head. However, the actual space required is heavily influenced by pen configuration and management of feed. The committee has therefore recommended an outcomes-based approach to this issue, with the standard to specify that adequate trough space be provided to ensure all livestock have free access to fodder. It has also included 'feeding behaviour' in daily reports to assist the regulator in assessing the adequacy of provisions made to meet this requirement.

With respect to requirements for water, the committee found no basis to change the requirements for calculating statutory reserves. The committee did take note of a previous concern (by Livecorp/Meat & Livestock Australia) that the health and welfare of livestock is jeopardised by any pre-discharge curfew with respect to subsequent land transport that follows. The committee has accepted the need for the standards to require water to be provided ad libitum throughout the entire voyage, and that a curfew preventing access to water to meet trade requirements should not be permitted in summer in Middle Eastern ports.

The matter of automated water delivery systems on vessels concerns the construction and design of vessels, and is out of scope for the standards under review. Nonetheless, the committee did note that all ships carrying sheep (and cattle) to the Middle East now have automated watering systems (a McCarthy recommendation), and suggests that the same should be required on all other livestock export voyages by sea.

Recommendations 40 to 45

- 40) That the standards require:
- a) That all livestock be offered fodder and water as soon as possible after being loaded on the vessel, and at the very least within 12 hours,
 - b) That water be provided ad libitum throughout the voyage (including days of loading and discharge). The standards should also prevent any water curfew prior to unloading in the northern hemisphere summer in Middle East ports.
 - c) That adequate trough space be provided per animal to ensure free access to feed during the voyage.
- 41) That the department require the use of automated watering systems on all livestock export voyages.
- 42) That the standards require that, on voyages of 30 days or less, at least 1 per cent of the fodder for cattle and buffalo be chaff and/or hay. For voyages of 31 days or more, at least 2 per cent of the required fodder must be chaff and/or hay.
- 43) That the standards require vessels to hold sufficient fodder to meet the needs of livestock throughout the voyage, including days of loading and discharge (noting livestock will be progressively loaded and unloaded during those periods).
- 44) That, in addition to Recommendations 42 and 43, the standards require that vessels carry adequate fodder reserves to ensure livestock can continue to be fed in accordance with specified allowances even if voyage delays occur. At a minimum, this must include 3 days of fodder and water, aside from voyages through the Suez Canal, Cape of Good Hope, the Panama Canal and Cape Horn, and any other voyage that is expected to take longer than 30 days, which must carry 7 days of reserves.
- 45) That the standards are further reviewed without delay once current studies into fodder quality, quantity and pellet specifications are completed. In addition, the department should regularly inspect vessels at loading to verify that fodder requirements in the standards are being met.

7 On-board personnel

7.1 Requirements

The qualifications and role of personnel on-board the vessel has been discussed in a number of reviews. The standard sets out a number of requirements for personnel, summarised in Table 15. Whilst not specified in the standards, in practice the department requires an AAV to be present on all voyages to or through the Middle East, as well as for voyages to new markets (for example export to a new country), new market trial voyages, maiden voyages, and for any other voyage at the department's discretion.

Table 15 Required personnel

Personnel	Summary of requirements
Accredited stockpersons	Accredited stock person must accompany each consignment and remain with it until discharge is complete at final port.
AAVs	AAVs must accompany each consignment where required by the department and remain with it until discharge is complete at final port.
AAVs and stockperson	AAV and accredited stockperson can be the same person.
On-board duties	Accredited stockperson and AAVs must work with the vessel's Master and crew to ensure and maintain health and welfare of the livestock.
All personnel	Requires all personnel handling and caring for stock to be able to demonstrate adequate level of experience and skill.
Pregnant livestock	Pregnant livestock must be accompanied by an accredited stockperson with experience.

7.2 McCarthy review

In his recommendations, Dr McCarthy suggested that a taskforce, or perhaps the ASEL Review Technical Advisory Committee, determine the roles and responsibilities of AAVs, independent observers and accredited stockpersons. The discussion in Dr McCarthy's report includes a number of questions around what qualifications, training, knowledge and skills are required to enable a veterinarian or stockperson to perform their role effectively. He also considered what tools or information are required, for example to perform and interpret environmental monitoring and ventilation, specifically in relation to voyages to the Middle East during the northern hemisphere summer.

The department has carriage of the independent observer program, and the consideration of their role is outside the scope of this review. The responsibilities for AAVs are also broadly contained in legislation including the Export Control (Animals) Order 2004. The framework under which AAVs and accredited stockpersons are engaged is outside the scope of this ASEL review.

7.3 Discussion in submissions and literature review

Submissions agreed that having appropriately skilled and competent personnel on voyages is essential. A large number of submissions recommended having an AAV accompany every voyage (regardless of length). Some suggested they should be independent of the exporter. Others were comfortable with maintaining the current arrangements, with the regulator having discretion to put an AAV on-board voyages as needed (see [Export Advisory Notice 2016-14](#)).

Several submissions, including one submitted by a group of AAVs, called for stockpersons to be allocated based on a ratio of stockperson to livestock. The views on what constituted an appropriate ratio differed. Others were of the view that stockpersons should be allocated on an outcomes basis to ensure livestock receive necessary care and oversight on voyages.

Several submissions raised the need for further clarification on the roles of AAVs and accredited stockpersons, particularly in light of the introduction of independent observers. Submissions defined the role of stockpersons to include basic husbandry, health care, feeding, watering and hygiene of livestock. AAVs were seen to be responsible for overall monitoring and maintenance of livestock health.

7.4 Committee consideration

In its consideration of on-board personnel and their respective roles in monitoring and managing animals, the committee noted the mutual interdependence of these personnel and the importance of good working relationships between company-employed people (for example, AAVs, accredited stockpersons and competent stock handlers) and the ship's crew. The committee also noted the importance of appropriate training for all personnel involved in the care and management of livestock.

The committee examined the specific requirements of the standards to ascertain whether any of requirements should be amended. In doing so, the committee's underlying objective was to ensure that the extent of veterinary care and supervision available is proportionate to the risk of the journey and the type and number of animals carried.

The committee concluded that the requirement that an accredited stockperson accompany each consignment of livestock should be retained in its current form.

In respect of the provisions for AAVs, the committee agreed that departmental discretion to require an AAV to accompany any export consignment should be retained. This would be used to require an AAV in circumstances such as shipments in new or recently renovated vessels or the first consignment for an exporter. However, the committee recommends that a further provision should be added to this section to require an AAV to accompany each consignment on long haul voyages, extended long haul voyages and voyages with pregnant livestock, unless otherwise agreed by the department. This proposed new provision would strengthen the risk-based approach to monitoring and managing livestock. At the same time, it would enable the department to retain some regulatory flexibility to recognise good performance based on sound performance measures. In addition, the committee suggests that the department consider the need for an AAV to accompany buffalo consignments. This decision could be made using new information obtained via daily reporting for buffalo exports (recommended in [Section 3.2.4](#)).

The committee also considered the provision in the standards which allows the AAV and accredited stockperson to be the same person (on the one voyage) if that person holds both current accreditations. The committee recommends that this provision be removed. In the committee's view, the AAV and accredited stockperson are there for specific individual purposes on the voyage which should not be taken up with duties that would otherwise be filled by one or the other.

The committee noted that a number of submissions raised concerns about the sufficiency of personnel available at loading and during the voyage to manage livestock husbandry and

welfare. This issue was also raised in the ASEL 2012–13 review. To address these concerns, the committee recommends that on every voyage there should be one ‘competent stock handler’ per 3,000 cattle or buffalo, and one per 30,000 sheep. The committee’s working draft standard defines this role, but it includes knowledge, skills and experience to handle animals humanely, efficiently and capably on-board the vessel. This person does not have to be an ‘accredited stockperson’ (as defined in the standard), although the accredited stockperson could count towards meeting the requirement for competent stock handlers. A member of the crew would also be able to fill that role, provided they meet the skill/competency requirements.

Many submissions commented on the value of training and the need for training to be commensurate with the roles and responsibilities of on-board personnel. The committee believes there would be considerable value in shipboard veterinarians completing the accredited stockpersons course as part of obtaining their AAV accreditation and that the department consider incorporating this into accreditation requirements. One submission also discussed the value of low stress stock handling skills for all crew members, and provided a practical suggestion that a number of ‘cattle talkers’ be included in the kit for all export vessels. The committee strongly suggests that the department follow up this proposal for inclusion in operational guidance.

A number of submissions also provided a set of practical suggestions that could be used to develop standardised duty statements for AAVs and accredited stockpersons. The department should consider using that information, and role descriptions developed in the 2012–13 review, to develop a set of clear roles and responsibilities for AAVs, accredited stockpersons and competent stock handlers.

Recommendations 46 to 49

- 46) That the standards continue to require an accredited stockperson to accompany each consignment of livestock.
- 47) That the standards require one competent stock handler (as defined in the working draft standards) per 3,000 (or part thereof) cattle and buffalo, and/or one per 30,000 (or part thereof) sheep. The standards should allow the accredited stockperson to count towards this requirement. Crew can also contribute to this requirement, provided they have the required skills/competencies.
- 48) That the standards require an AAV to accompany any export consignment where required by the department. Notwithstanding that, an AAV must accompany each consignment on long haul voyages, extended long haul voyages and voyages with pregnant livestock, unless otherwise agreed by the department.
- 49) That the standard not allow the same person to be both the AAV and the accredited stockperson on any given voyage.

8 Other recommendations

In Stage 1 of the review process, the committee identified a number of amendments that should be made to the standards based on agreements reached in the 2012–13 review process and comments made in Stage 1 submissions. These interim recommendations were outlined in the committee's Stage 2 issues paper, including supporting arguments. In response to views submitted, the committee has agreed to the recommendations in Table 16 Other amendments.

Table 16 Other amendments

Issue	Current committee position
Export of deer and camelids	Remove specific requirements relating to the export of deer and camels by sea and replace a requirement for consignment specific management plans. The department will need appropriate expertise to assess these plans, with the requirements in ASEL v2.3 available as a reference point.
Export of goats	Retain requirements in relation to the export of goats by sea, given that whilst exports are not occurring, they are technically possible under the terms outlined in Export Advisory Notice 2016–10 . Amend paragraph 2.A.1.1(b) to require that for export of goats by sea, a secondary inspection be conducted at the registered premises – excluding the day of arrival and final inspection prior to loading – to confirm that the goats have been held in the registered premises for five (5) days and fed appropriately.
Definitions	Update definitions, including for pastoral and station sheep, and considering definitions used in the Australian Animal Welfare Standards and Guidelines.
Body scoring	Update as outlined in the Issues Paper.
On-board veterinary medicines	Apply requirements in Table 13 (of the reformatted standard) to all cattle and buffalo exported by sea. Agree that 'Mandatory veterinary medicines and equipment' be updated following completion of the LiveCorp project on shipboard drug use, which will have findings for broader veterinary requirements. In the interim, add the following requirements for pregnant cattle: <ul style="list-style-type: none"> • 5 litres of obstetrical lubricant per 2,000 cattle • Calving ropes (1 set per ship) • Obstetrical gloves (1 box per ship) • Oxytocin (50ml per 1,000 cattle) • Additional chlorohexidine (or equivalent) of 5 litres per ship • 1 litre iodine per ship (umbilical testing) • Uterine pessaries (10 per 2,000 cattle) • Surgical equipment adequate to conduct a caesarean section.
Minimum liveweights	Increase the minimum liveweight of sheep and goats for export by sea to 32kg and 24kg respectively, to address higher mortality risk of lighter livestock.
Horn requirements	Require that horned cattle have the nonvascular tip removed to a diameter of 3cm. Retain the requirement that if horned, buffalo must have horns no longer than the spread of the ears. However, industry should quickly commission research to establish the impact of a longer horn for on-board management of buffalo, including assessing the impact on access to fodder and water. A more informed decision can then be made on horn length. In the meantime, producers and exporters must not implement inappropriate management practices to achieve a particular horn length and avoid a long horn management plan. De-horning should be conducted earlier.
Long horn requirement	Retain requirements for a long horn management plan.

Issue	Current committee position
Sourcing sheep	Remove references to sourcing through ports of Darwin, Weipa and Wyndham, and instead prohibit sourcing from all ports north of 26° south.
Water engorgement	Remove provisions relating to water engorgement.
Land transport standards	Retain requirements aimed at minimising the amount of time for which access to fodder and water is restricted. Retain curfew and rest requirements at set out in the draft standard – aimed at addressing cumulative stress of transport through the supply chain.
Extension of long haul voyage requirements	Require that all sea voyages via the Suez Canal, the Cape of Good Hope, the Panama Canal and Cape Horn, as well as any other route where the voyage is expected to be longer than 30 days, have at least seven days reserve of additional fodder.

9 Financial and economic analysis, and regulatory approach

The committee's terms of reference require it to examine:

...viable, genuine, policy options' and state that its recommendations must 'balance the implications for animal welfare with the practicalities of livestock management, compliance costs and industry sustainability.

These requirements make clear that the committee cannot focus solely on enhancing animal welfare—it must consider the impact of any proposed changes on the future viability of the industry. This chapter summarises the committee's assessment of changes proposed in previous chapters on industry sustainability.

There have been several studies and reports done about the economics of the live export trade and possible options available to farmers (Deards et al 2014 and Pegasus Economics 2017). This report will not repeat those analyses. Nor will it repeat analyses of how to value animal welfare (McInerney 2004). Its focus is limited to assessing whether or not the welfare improvements recommended in previous chapters will leave the industry in a sustainable position.

9.1 Live export trade

In 2016-17, ABARES estimated that the live export trade was worth \$1.432 billion at free on-board (fob) prices. Of this, sheep accounted for \$0.233 billion and cattle \$1.199 billion (see [Appendix D](#)). ABARES data indicates that the average fob price per head for sheep exported to the Middle East rose from \$89 in 2013-14 to \$121 in 2016-17, and the average fob price per head for slaughter cattle rose from \$790 to \$1,262 over the same period.

Data published by the department provides a breakdown of exports by origin, destination and species (see Table D4 Origin and destination of live sheep exports and Table D5 Origin and destination of live cattle exports in [Appendix D](#)). In calendar year 2017 approximately 86 per cent of all sheep exports originated in Western Australia, 13 per cent in South Australia and just 1 per cent in Victoria. The origin of cattle exports was more evenly spread between the states, although northern Australian regions dominated the slaughter/feeder trade and Victoria the breeder trade. The Northern Territory was the largest source of cattle, accounting for 36 per cent of exports, followed by Western Australia with 28 per cent and Queensland with 25 per cent.

In calendar year 2017 the major customers for sheep were Qatar (36 per cent) and Kuwait (33 per cent), while the main customers for slaughter/feeder cattle were Indonesia (60 per cent) and Vietnam (19 per cent). For breeder cattle, the main customer was China.

[Appendix D](#) provides FAO data on the major importers and exporters of live sheep and cattle. Australia ranks as the fourth largest exporter of live sheep and third largest exporter of live cattle. Saudi Arabia, a market no longer accessible to Australian live sheep exporters, is by far the largest importer, accounting for almost 43 per cent of all trade in live sheep, followed by Kuwait at 7 per cent. The largest exporters—Sudan, Romania and Somalia—all enjoy a

geographical advantage over Australia into Middle Eastern markets. Of the 10 largest cattle importers, only one—Indonesia—is a major market for Australian cattle.

Data obtained by the committee shows that in Australia's two largest sheep markets—Kuwait and Qatar—we are the major supplier with about 80 per cent of Qatar's imports and about 40 per cent of Kuwait's. And for cattle, Australia accounts for more than 95 per cent of Indonesia's imports.

As noted in several submissions, the volume of sheep exported has declined significantly from a peak of around 7.3 million in 1983. In recent times, sheep exports have fallen from 2.916 million in 2010–11 to 1.851 million in 2016–17 (ABARES, 2017). A range of factors, such as a reduction in the Australian flock, have contributed to this decline but there remains a viable industry, albeit on a smaller scale than previously.

Meat & Livestock Australia (MLA, 2018) price data shows that in 2018, the average price paid for an export sheep has been \$113. For export cattle ex-Darwin, the average price for a 'light steer' has been \$2.96 per kilogram liveweight and for a 'heavy steer' \$2.67. The corresponding prices ex-Townsville have been \$2.70 and \$2.40. The difference is, in part, due to the higher freight cost to market ex-Townsville to destination markets compared to ex-Darwin and the inability of exporters to pass on higher freight costs to end buyers (in other words, the market price in the destination sets the final amount and all logistics costs are then deducted to arrive at a price the exporter can pay the farmer).

9.2 Cost implications for the trade

Some of the proposed changes outlined in this report will have minimal impact, while others are likely to have a more significant impact. The principal changes factored into the committee's assessment of the sustainability of the trade are:

- a reduction in on-board stocking densities
- additional space requirements on-board for pregnant cattle and horned animals
- an increase in the minimum number of clear days animals must spend in pre-export facilities
- a need for veterinarians to be placed on more voyages than under the current ASEL
- the need to conduct an HSRA for all voyages that cross the equator
- an increase in the number of competent stock handlers.

While outside the committee's terms of reference, placing an independent observer on all export voyages from 1 November 2018 will increase costs for exporters and has been factored into the cost model. In addition, the phasing out of double tiered decks for sheep carriers under the revised Marine Order 43 will change the economics for some vessels but has not been factored into the committee's modelling.

9.2.1 Approach used

The sheer number of variables in the export process means it was not possible to develop a single, definitive cost model. Ship sizes and economics, different flag states, animal weights, journey lengths, weather vagaries, capital and depreciation costs across different nations,

interest rate variances, tax rate differentials, labour rate differences, etc. can all change the overall cost equation. In the reduced time available to the committee it had to curtail development of a detailed and complex model with a substantial database for one that could be achieved in the timeframe.

Given this, the committee decided to examine four typical journeys that cover Australia's major markets. They are:

- Freemantle to Kuwait (sheep)
- Darwin to Indonesia (feeder cattle)
- Townsville to Vietnam (slaughter cattle)
- Portland to China (breeder and slaughter cattle).

No mixed cargo voyages (For example, cattle and sheep, or cattle and buffalo) were modelled. Nor were the potential changes arising from any HSRA included: the scenarios represent the baseline situation only.

The committee sought assistance from ABARES and a number of commercial operators in developing a model for each journey. It also used the work done by ProAnd Associates (2016) for MLA in developing the structure of the model. On the cost side, the model covers livestock acquisition costs, land transport costs, pre-export facility costs, sea journey costs and overhead costs. On the revenue side, the model covers sale in the export destination and some minor revenue from wool gained from pre-shipment shearing of sheep.

A baseline scenario was first developed for each journey using the existing ASEL requirements. Once this was established, the inputs were progressively varied by changing those items that the committee is proposing—for example, by reducing stocking densities, the number of sheep on-board is reduced. While some costs will decrease (for example, fodder consumed on-board) others do not and have to be spread over a reduced number of sheep (for example, cost of veterinarian and port charges). By changing each of the items and slowly adding more of them in until the full suite of proposed changes was included, the impact on profitability—and hence sustainability—could be assessed.

The committee is grateful to ABARES and the commercial operators who shared sensitive information to calibrate and test the model.

There is no escaping the fact that the changes proposed by the committee will increase costs, and that there are only a few outcomes that can follow:

- the exporter is able to pass on the costs in the form of higher prices in the destination market
- the exporter passes the costs back to farmers in the form of a reduced purchase price
- the exporter absorbs the cost increases and accepts a lower profit
- a combination of the first three
- the exporter exits the market.

[Section 9.3](#) summarises the outcome of the work for the sheep and cattle markets. Buffalo rarely account for a full cargo and normally take a limited amount of space on a cattle voyage. They have not been modelled directly but can be expected to incur similar cost increases to those described in section 9.3 for cattle.

9.3 Implications for affected stakeholders

The base data used in the analysis is commercially sensitive and not for publication. The results presented in this section are summarised to maintain the confidentiality of the source data.

For both sheep and cattle, the major cost impost arising from the committee's recommendations is due to changes in stocking densities. Current ASEL stocking densities are, in most cases, already superior to those of our major competitors and the lower densities recommended by the committee will widen this gap (see Table 17). The European Union (EU) is often held up as the leader in regulating animal welfare standards but its space requirements for both sheep and cattle are considerably less—for a 50kg sheep the space proposed by the committee is 26 per cent higher than the EU requirement, and for a 400kg steer it is 20 per cent above the EU requirement (Council Regulation (EC) No 1/2005). Brazil, which has recently issued new regulations (Normative Instruction 46, 2018) concerning the trade in live animals, has adopted the space requirements as contained in ASEL v2.3.

As described in Chapter 3, the change in stocking densities is greater for sheep than cattle. The current ASEL already gives heavier cattle more space than the allometric formula generates and for lighter cattle the differences between the current space requirements and those being proposed are smaller than is the case for sheep. The implied k-values from current ASEL stocking densities for 30-65kg sheep are 0.024-0.027 and these will increase to 0.030-0.033. But for 300-550kg cattle, the implied k-value under current requirements ranges from 0.026 to 0.035 and will increase to 0.027-0.035 (depending on voyage duration). Consequently, the financial impact is less for cattle shipments than sheep shipments.

Table 17 Comparison of on board stocking densities between exporters for sheep

Species	Proposed space			Required for others		
	Middle East (Nov-Apr)	Middle East (May-Oct)	EU	USA	Brazil	NZ
Sheep (kg)						
30	0.283	0.311	0.265	–	0.26	NZ does not export live sheep
40	0.342	0.377	0.290	0.226	0.29	
50	0.397	0.436	0.315	0.260	0.31	
60	0.447	0.492	0.340	0.294	0.36	

Table 18 Comparison of on board stocking densities between exporters for cattle

Species	Proposed space			Required for others		
	Northern, >= 10 days	Northern, <10 days	EU	USA	Brazil	NZ
Cattle (kg)						
300	1.294	1.294	1.058	1.110	1.11	1.110
400	1.565	1.565	1.305	1.450	1.45	1.450
500	1.813	1.813	1.553	1.790	1.79	1.790
600	2.130	2.045	1.800	2.130	2.13	2.130

While many of the input costs are denominated in Australian dollars (for example, livestock purchase price, pre-export facility housing), some are in foreign currencies (for example, ship chartering is commonly in US dollars) and subject to currency fluctuations. Similarly, the sale price in the destination market is often specified in a currency other than the Australian dollar. The modelling has assumed a constant exchange rate throughout. A variation in the Australian dollar exchange rate and hedging practices of the exporters can have a material impact on the financial results and the following sections need to be considered accordingly.

9.3.1 Sheep

The committee modelled a large vessel capable of carrying approximately 70,000 sheep averaging 50 kg each under current ASEL requirements as the base case scenario. Two base cases were modelled, one covering November through April and the second from May through October. The space allowances used in the base case scenario for May through October were those contained in the existing ASEL, not those applied for 2018 following the McCarthy Review.

Weight ranges from 30kg to 60kg per head were modelled and the results presented here relate to the most common weight categories of 45-50kg.

Under current ASEL requirements, the model generated a margin above 10 per cent for each voyage at the 50kg class all year round. It fell to below 10 per cent at the 60kg class during November to April and fell a further 2 percentage points during May to October.

Changing the stocking densities as proposed in this report for the 50kg class reduced the margin by 6-7 percentage points during November to April and 8-10 percentage points during May to October, all other factors being held constant. In both instances the margin fell to well below 10 per cent. Given the risks involved in an export shipment, a margin of less than 10 per cent is unlikely to be acceptable to exporters and their financiers. So the committee set the margin to 10 per cent, held every variable other than the sheep purchase price constant, and derived what would have to happen to sheep prices to achieve a 10 per cent margin. The analysis revealed that sheep prices would have to fall \$13-20 per head depending on the time of year. This would reduce the total cost base sufficiently to achieve a 10 per cent margin.

Noting though that the current margin for the northern winter period is above 10 per cent at the 50kg category, setting the margin at 10 per cent implies that the cost impost from the new requirements would be split between the exporter and the farmer. If the exporter wanted to maintain current margins then sheep prices would have to fall in the region of \$25 per head.

MLA price data for export wethers at WA sales in the first ten months of 2018 shows an average sale price of \$113. A \$25 reduction would result in a sale price in the region of \$90 per head, which is at the low end of prices over the last five years (see [Appendix D](#)). Even the lowest average price over the last five years—\$89 in 2013–14—would be in excess of \$95 when inflated to 2018 dollars. The committee is not suggesting that the sheep market in WA would experience price falls of this magnitude. Farmers have other options available to them should exporters seek to pass such a price cut through to them. The market would dictate what exporters would have to pay to secure supply of sheep for live export as farmers may, for example, decide to keep sheep for wool production or domestic meat consumption. Given the alternatives available to farmers a reasonable sharing of the costs would seem more likely if exporters want to remain in business.

The committee did not consider a scenario where the sale price in the overseas market was increased to cover the increased costs as realistic. Customer countries have other options available to them to source sheep and already do so. For example, Australia supplies only 40 per cent of sheep imported by Kuwait with the remainder coming from competitor countries. Similarly, Saudi Arabia, which used to be a major importer of sheep from Australia, was able to source them readily from elsewhere. As noted in MLA's September market report, the lack of exports from Australia to the Middle East over the northern summer period in 2018 has resulted in customers sourcing sheep from other countries. Qatar and Kuwait are reported to be sourcing sheep from Somalia, Sudan and Armenia; Jordan has been importing from Romania; and Israel has been importing from Portugal.

The committee accepts that the changes it is recommending will increase costs, but it does not believe these increases will make the live sheep export industry unsustainable. It is possible for exporters to achieve a reasonable margin on shipments given the risks involved and farmers to be able to receive a reasonable price, albeit reduced from recent times. But there will have to be a sharing of the costs: the committee's analysis suggests that if the exporters are to absorb all of the cost increase then their returns will fall to unacceptably low levels given the business risks involved; and if farmers are asked to absorb all of the costs in the form of lower prices for their sheep that they are likely to pursue other options available to them.

9.3.2 Cattle

The committee modelled a medium sized vessel of 4,500 square metres of pen space for each of the journeys. The results are, in general, less dramatic than those for sheep as the changes in stocking density are not as great. The biggest changes in stocking density relate to lighter cattle (200 to 350kgs) and this affects the feeder cattle trade more than the slaughter trade. The current ASEL usually provides heavier cattle with space allowances greater than that calculated using allometry with a k-value of 0.030. In some instances, the implied k-value in the current ASEL is 0.034-0.036.

Darwin-Jakarta (Tanjung Priok)

The modelling for this route focused on feeder cattle using a live weight of approximately 300 to 350kgs and a k-value of 0.027 (which assumes the department has approved the export at this stocking density based on past and continuing performance by the exporter and vessel—see [Chapter 3](#)). At 300kg, the space allowance moves from 1.110 square metres per head to 1.165 square metres, an increase of roughly 5 per cent. The modelling resulted in a fall in the profit margin of about 2 percentage points and the total margin of well under 10 per cent. At this level, it could be expected that exporters will pass a proportion of the cost increases back to farmers in the form of lower purchase prices in order to keep an acceptable margin. As noted, there is already a price differential for cattle ex-Darwin and ex-Townsville which illustrates the practice of exporters needing to pay different prices for cattle depending on the freight costs to market.

For heavy cattle, such as those going directly into slaughter, the difference is much smaller as there are no space allowance differences. The additional costs from the committee's other recommendations (for example, time in pre-export facility) reduce the profit margin by less than 1 percentage point.

The margins for the trade to Indonesia are quite low as is evident from some publicly available data. MLA data for live export cattle ex-Darwin in 2018 show a price of \$2.97 per kilo for light feeder steers. The average sale price in Indonesia in 2018, according to the South East Asia Market Report published by Beef Central, is \$3.74 per kilo, resulting in a buy-sell spread of \$0.77 per kilo. Using the sea freight information contained in ALEC's submission the cost to ship an animal is \$132, or \$0.44 per kilo for a 300kg steer. This leaves \$0.33 per kilo to cover land transport, time in registered premises, veterinary expenses, wharfage, stevedoring expenses, fodder costs, stockperson, regulatory costs (for example, independent Observer), and overhead costs (for example, finance, insurance and administration). By the time these expenses are incorporated the net margin is modest. Table 11.4 on page 69 of the [ALEC submission to Stage 2](#) provides estimates of dollar increases and percentage increases per head from moving from current space requirements to either $k=0.027$ or $k=0.033$. This information is sufficient to calculate the current freight rate.

Townsville-Vietnam (Vung Tau)

This route has been modelled as being >10 days (including loading and unloading) and a k -value of 0.030 has been applied. The scenario looked at all weights from 300kg up to 550kg, with the results focused on the 400 to 450kg range. At the 400kg mark, the space allowance moves from 1.450 square metres to 1.565 square metres, an increase of just over 7 per cent. At this liveweight, the margin fell by 2-3 percentage points but remained at a level that the committee considered sustainable.

For lighter weights of around 300kgs where the proposed space allowance increase results in a 14.2 per cent reduction in the number of cattle that can be carried, the results were more pronounced. The margin fell to less than 2 per cent. The liveweight price for live cattle of less than 350kgs ex-Townsville in 2018 has been 270 cents per kilogram and this would have to fall to return the export margin to its current level. In this scenario, the exporter would have little choice but to reduce the price to farmers.

Portland-China (Tianjin)

This scenario covered the export of both slaughter and breeder cattle from south of 26 degrees south latitude. As with the other cattle scenarios, the impact is greatest for lighter weight cattle as the space allowances being proposed by the committee are the same as the current ASEL requirements for heavier cattle.

An export shipment of feeder/slaughter cattle was modelled first, then an export shipment of breeder cattle. Each was modelled for the May to October period and the November to April period.

For the May to October period the space allowance changes are less than for the November to April period. For a 300kg animal the space allowance increases by 5.7 per cent during May to October but by 14.2 per cent during November to April. The corresponding profit margin reductions were 2 and 5 percentage points respectively. At the 400kg point, there is no change in space allowance during May to October and minimal change in profit margin. But for November to April the space allowance for a 400kg animal increases by 7.3 per cent and the profit margin reduces by almost 3 percentage points. It is unlikely that the exporter could absorb the full cost increases and so is likely to pass some of the increases back to farmers in the form of lower prices.

For breeder cattle weights of 250 to 300kg were modelled. The results are similar to those for slaughter cattle, with the profit margin decreasing 3-5 percentage points depending on the time of year.

Summary

The modelling reveals that while the industry is likely to be able to remain financially viable, the cost imposts cannot be absorbed fully by the exporter. Nor could the full costs be passed back to the farmer and the industry remain sustainable. There would need to be a sharing of the costs between farmers and exporters, with each taking a reduction in their profit margins. The consequent reduction in the margin of both the exporter and farmers may well result in the least efficient industry participants exiting the market, with only the most efficient remaining.

9.4 Regulatory approach

The committee's terms of reference require it to:

facilitate contemporary outcomes based regulation which will allow flexibility in achieving the required animal health and welfare outcomes, encourage innovation in industry practices and adoption of relevant technological improvements.

While best practice regulation is to focus on the outcomes desired and to promote compliance via incentive based mechanisms, there still needs to be a minimum set of standards that clearly articulate what society expects all exporters to meet. Recent high profile failures in some outcome based regulatory systems in other industries have illustrated the potential problems with relying on an outcomes based approach alone.

The committee is mindful that the current ASEL is predominately an input based regulation model. It assumes that if the inputs are controlled then a satisfactory animal welfare outcome will follow. Implicitly, it assumes that there is only one way—the regulated way—to achieve the desired outcomes. However, achieving good animal welfare outcomes can be achieved by different combinations of factors and the proportion of each, and potentially in new ways as technology and animal practices evolve. Some exporters already exceed the current ASEL minimum requirements to achieve superior welfare outcomes (for example, hold stock longer than minimum period in registered premises, load more chaff and bedding, and provide pregnant cattle with more space). And some factors cannot be regulated. For example, the committee was told several times about the importance of the relationships between the exporter, the AAV, the stock persons, the ship crew and the Master of the vessel—the anecdotal stories told to the committee in submissions and meetings emphasised how excellent relationships between all the key individuals yield superior animal welfare outcomes, but this is not an area where regulation is very useful. But it should be recognised and encouraged.

The committee accepts the need for a minimum set of requirements if society's confidence in the industry is to be restored and has outlined these in earlier chapters. But the downside of a fixed, input-based system is that it discourages innovation and will always lag technological improvements.

The committee believes that there should be scope for the regulator to reward superior performance based on demonstrated welfare outcomes. It has the data to identify operators who consistently achieve better welfare outcomes including low mortality and other reportable incidents, and those that do not. The AAVs—and now independent observers—are able to report

on the results of innovative practices being used and their results, and how different combinations of inputs can achieve the same or better outcomes. This should be encouraged, not discouraged by limiting operators to just the specific methods as detailed in the standard. The committee has taken a step in this direction with the option to approve an alternate stocking rate for cattle exports on voyages of less than 10 days based on welfare performance.

In addition, the committee has recommended increased data collection (for example see [Chapter 5](#)) to identify factors contributing to livestock outcomes and to enable improved risk mitigation for future consignments. This additional data will enable the regulator to justify a more flexible approach and to incentivise continuous improvement.

The concept of ‘equivalence’ is sometimes used in regulatory systems to encourage innovation and improved compliance. The concept acknowledges that there are sometimes different ways in which to achieve the desired regulatory outcome, and that there may even be new ways of achieving compliance over time that the regulations could not possibly have contemplated at the time they were written (for example, new technology).

The committee acknowledges that an ‘equivalence’ approach has merit in the live export trade. Improved ship design and systems, improved on-board rations, improved veterinary medicines and husbandry practices, etc. may well lead to alternative methods of achieving the welfare outcomes expected by society. This should be encouraged. Analysis of mortality data suggests that some operators clearly perform better than others—their combination of stock selection, pre-voyage preparation, choice of vessel, number and skills of stock handlers, and skill in managing the whole process tightly have yielded superior performance. Those operators should be encouraged to continue their improvement and an equivalence regime would enable this.

The committee considers that in drafting the new regulations, the concept of equivalence should be incorporated. This should be done in tandem with outcomes from the Moss Review, the HSRA Review and the review of standards for the export of livestock by air so that a consistent approach is adopted. The regulator should be given the ability to vary the method of achieving the desired welfare outcomes, but not the outcomes themselves. The ability to do so should be limited to those operators who are able to demonstrate superior performance over a statistically significant number of livestock and voyages and actively monitor welfare, not just mortality. In addition, the regulator should be compelled to publish its reasons for granting an equivalence regime to an exporter. Transparency is essential if such a power is to be granted to the regulator so that all interested persons can understand it and retain confidence in the system.

In earlier stages of the review, the committee recommended that ASEL v2.3 Standard 2, Land Transport of Livestock, be deleted as it is no longer needed. The more recent Australian Animal Welfare Standards and Guidelines for the Land Transport of Livestock should apply. This removes any inconsistencies that may have existed between the two documents and also means that operators need to refer to one, rather than two, sets of requirements.

The committee’s terms of reference also require it to review the format of the standards and in earlier stages of the review the committee proposed a new framework. A further version of the reformatted standard has now been produced—the working draft reformatted standard—which incorporates the committee’s recommendations. However, the committee is mindful of other reviews and work underway (for example, HSRA Review, Moss Review), and the narrowing of

the scope of the terms of reference to exclude air transport. These processes may well result in recommendations that require further changes to the standard.

There is merit in amending the standard once—or at least as few times as possible—rather than multiple times. Those subject to complying with the regulations should not have to learn a new regulation every couple of months. Pending the finalisation of those other reviews, and the review of the standards for air transport, the regulator could incorporate the committee's recommendations into the current format of the standard pending the outcome of those other processes. This method may be less onerous on both the regulator in legislative drafting, and industry, in implementing the new requirements.

Appendix A: Sample daily reports

Daily reporting must commence on day one of the voyage and include the information listed in this sample.

- 1) Veterinarian's name and AAV accreditation number (if on-board)
- 2) Stockperson's name
- 3) Date of report
- 4) Journey day number (must be consistent with the day number used by the Master of the Vessel)
- 5) Vessel's position and estimated time of arrival at next port
- 6) The number of animals loaded by port of loading and species. See Table A1 for an example.

Table A1 Loading details

Species	Portland	Fremantle
Cattle	100	200
Buffalo	0	5
Sheep	5,000	1,000

- 7) Daily environmental recordings:
 - Average dry bulb and wet bulb temperature (°C) for each deck
 - Humidity (%) for each deck
 - Bridge temperature (°C) (ambient/wet bulb) and humidity (%)
 - Environmental conditions e.g. Sea swell; calm (1), moderate (2), rough (3)
 - Ventilation monitoring: were fans operational for 24 hours, and if not, for what period, and why.
- 8) Fodder and water consumption (average per head),
- 9) Animal health and welfare by deck/tier, based on an assessment of at least 2 representative pens of each species, representative of the class or line, per deck. The assessment must address the matters indicated in Table A2 Animal health and welfare assessment.

Table A2 Animal health and welfare assessment

Mandatory matter	Further mandatory detail	Example	Example
Pen ID	–	3FWD	3AFT
Breed/line	–	B wether	Euro steer
General pen demeanour	Alert/active/lethargic/anxious/ dull or other	alert	dull
Fodder type	Pellets only/pellets mixed with chaff	pellets	Pellets & chaff
Feeding behaviour & comment on trough space	Mild to no jostling (1), most jostling/lunging (2), aggressive/smothering (3)	1	2/inadequate trough space
Water quality and any supply issue	Clean/moderately clean/dirty	clean	moderately clean
Faeces type	Normal (1), sloppy (2), runny diarrhoea (3), firm pellets (4)	1	2
Manure pad score	Dry (1), tacky (2) and sloppy (3)	1	2
Panting score	0–4	1	1–2
If any animals at panting score \geq PS 2, describe percentage of animals in pen at each panting score; approx. how many pens have animals \geq PS 2, and duration of panting \geq PS 2.	10% PS3 90% at PS2 only x3 pens	20% PS 3 50% PS1 Most pens Most of the day	–

For sheep, use the system set out in Table A3 for panting scores. For cattle, refer to the [Veterinary Handbook](#).

Table A3 Sheep panting scores

Panting score	Description	Respiratory rate (breaths per minute)
0	Normal resting respiratory/active	40–60
1	Increased respiratory rate	61–80
2	Further increased respiratory rate accompanied by increased breathing effort, the whole animal works harder to breathe and body movements are obvious	81–120
3	Mouth open panting	121–192
4	Mouth open and tongue protruding as they pant	>192

10) Respiratory type, by class and line and by deck, per day. If a panting score of 3 or 4 is observed, wet and dry bulb readings should be taken twice per day near those pens and included in the daily report.

11) Health report for all stock, including hospital pens. Pen/Tag ID; clinical sign, medications, treatments or other actions.

Table A4 Health report

Date	Deck & Pen ID	Animal tag ID	Species/class	Clinical sign	Treatment/observe/action
[ddmmyy]	[D1,P1]	[1234]	[sheep/slaughter]	[illness/observation]	[treatment and actions undertaken]

12) Mortality details, including Pen ID and tag numbers

- By species and class of livestock and deck
 - Number of animals euthanised, including reasons if known
 - Number of animals found dead, including reasons if known
- Daily/cumulative mortality figure by species and class

Table A5 Mortality record

Mortality/ date	Species/class	Deck and Pen ID	Animal tag ID	Euthanasia (reasons)	Found dead (reasons)
Daily	Buffalo/slaughter	[D1,P2]	[1111]	[1 – BRD]	[1 – unknown]
Cumulative	Heavy bull/feeder	[D1,P1]	[1234]	[3 – BRD]	[1 – unknown]
	Buffalo/slaughter	[D1,P2]	[1111]	[1 – BRD]	

13) For sheep exported to the Middle East: number or per cent of sheep showing clinical signs of scabby mouth.

14) Births and abortions (including estimated stage of pregnancy) and ear tag ID/Pen ID

15) General comments

Appendix B: End of voyage reports

The end of voyage report must provide a general overview of the voyage, and mention any specific issues relevant to the health and welfare of the livestock.

- 1) Vessel name
- 2) Voyage number
- 3) Departure port(s), date the animals were loaded (by port if more than one) and total number of animals loaded, by port of loading and species. Do not combine cattle and buffalo.
- 4) Discharge port(s), date animals were unloaded (by port if more than one) and total number of animals unloaded, by port of unloading and species. Do not combine cattle and buffalo.
- 5) Feed and water issues, including fodder and water consumed during the voyage and detail of any issues surrounding supply, availability/accessibility and quality, were fodder rations sufficient in quantity and quality and comments about maintenance issues and equipment failure.
- 6) Planned voyage duration, including load and discharge days and actual voyage duration, including load and discharge days.
- 7) Environmental conditions, including sea conditions, wet bulb temperature (°C) and humidity (%) range on decks, ventilation, including detail on any periods for which fans did not operate, and reasons. Conditions of decks (overall and/or specify location and issue if specific problems) and condition of bedding type, amount and reasons for use per species, if used.
- 8) Detail on health and welfare of livestock, including any treatments given, reasons for the treatment and outcomes.
 - a) Number of livestock born during the voyage, and the dam(s) by species, class and ear tag
 - b) Number of abortions during the voyage, and identities of the dam(s) by species, class and ear tag
 - c) Number of mortalities (per day, by deck/tier, species and class of livestock) including reasons (where known), pen ID and tag numbers. Separately identify animals that were euthanised, including pen ID and tag numbers. Provide details of post-mortem if conducted.
 - d) Average daily mortality rate (calculated by dividing the final voyage mortality rate by the length of the voyage in days).
- 9) Relationships with Master/crew/accredited stockperson/AAV
- 10) Comments on discharge operations
- 11) Information about any unexpected animal health or welfare issues. Information can include video and photographs, animal identification and location on the vessel and information which may allow trace backs.
- 12) Stockperson's name and veterinarian's name and AAV accreditation number (if on-board)

Appendix C: Vessel stocking densities

Table C1 Cattle minimum pen area, voyages of 10 days or less, default and alternate

Liveweight (kg)	Minimum pen area (m ² /head)		Liveweight (kg)	Minimum pen area (m ² /head)		Liveweight (kg)	Minimum pen area (m ² /head)	
	Default (a)	Alternate (a)		Default (a)	Alternate (b)		Default (a)	Alternate (b)
200 or less	0.990	0.891	360	1.460	1.314	520	1.861	1.78
205	1.007	0.906	365	1.473	1.331	525	1.873	1.794
210	1.023	0.921	370	1.486	1.348	530	1.884	1.808
215	1.039	0.935	375	1.500	1.365	535	1.896	1.822
220	1.055	0.949	380	1.513	1.382	540	1.908	1.835
225	1.070	0.963	385	1.526	1.399	545	1.919	1.849
230	1.086	0.977	390	1.539	1.416	550	1.931	1.863
235	1.102	0.991	395	1.552	1.433	555	1.942	1.877
240	1.117	1.005	400	1.565	1.45	560	1.954	1.89
245	1.132	1.019	405	1.578	1.459	565	1.966	1.904
250	1.148	1.033	410	1.591	1.468	570	1.977	1.918
255	1.163	1.046	415	1.603	1.487	575	1.988	1.932
260	1.178	1.060	420	1.616	1.505	580	2.000	1.945
265	1.193	1.073	425	1.629	1.519	585	2.011	1.959
270	1.207	1.087	430	1.641	1.533	590	2.022	1.973
275	1.222	1.100	435	1.654	1.547	595	2.034	1.987
280	1.237	1.113	440	1.666	1.56	600	2.045	2.000
285	1.251	1.126	445	1.679	1.574	605	2.056	2.014
290	1.266	1.139	450	1.691	1.588	610	2.067	2.028
295	1.280	1.152	455	1.704	1.602	615	2.079	2.042
300	1.294	1.165	460	1.716	1.615	620	2.090	2.056
305	1.308	1.178	465	1.728	1.629	625	2.101	2.07
310	1.323	1.190	470	1.741	1.643	630	2.112	2.084
315	1.337	1.203	475	1.753	1.657	635	2.123	2.098
320	1.351	1.216	480	1.765	1.67	640	2.134	2.112
325	1.364	1.228	485	1.777	1.684	645	2.145	2.126
330	1.378	1.240	490	1.789	1.698	650	2.156	2.14
335	1.392	1.253	495	1.801	1.712	655	2.167	2.154
340	1.406	1.265	500	1.813	1.725	660	2.178	2.168
345	1.419	1.277	505	1.825	1.739	665	2.189	2.182
350	1.433	1.290	510	1.837	1.753	670	2.200	2.196
355	1.446	1.302	515	1.849	1.767	675	2.21 (b)	2.21

a Allometric figures. **b** Figures from ASEL v2.3. Default uses $k=0.03$, or ASEL when greater. Alternate uses $k=0.027$, or ASEL when greater.

Table C2 Cattle minimum pen area, voyages of more than 10 days, default

Liveweight (kg)	Minimum pen area (m ² /head) (a)	Liveweight (kg)	Minimum pen area (m ² /head) (a)	Liveweight (kg)	Minimum pen area (m ² /head) (b)
200 or less	0.990	360	1.460	520	1.861 (a)
205	1.007	365	1.473	525	1.875
210	1.023	370	1.486	530	1.892
215	1.039	375	1.500	535	1.909
220	1.055	380	1.513	540	1.926
225	1.070	385	1.526	545	1.943
230	1.086	390	1.539	550	1.96
235	1.102	395	1.552	555	1.977
240	1.117	400	1.565	560	1.994
245	1.132	405	1.578	565	2.011
250	1.148	410	1.591	570	2.028
255	1.163	415	1.603	575	2.045
260	1.178	420	1.616	580	2.062
265	1.193	425	1.629	585	2.079
270	1.207	430	1.641	590	2.096
275	1.222	435	1.654	595	2.113
280	1.237	440	1.666	600	2.13
285	1.251	445	1.679	–	–
290	1.266	450	1.691	–	–
295	1.280	455	1.704	–	–
300	1.294	460	1.716	–	–
305	1.308	465	1.728	–	–
310	1.323	470	1.741	–	–
315	1.337	475	1.753	–	–
320	1.351	480	1.765	–	–
325	1.364	485	1.777	–	–
330	1.378	490	1.789	–	–
335	1.392	495	1.801	–	–
340	1.406	500	1.813	–	–
345	1.419	505	1.825	–	–
350	1.433	510	1.837	–	–
355	1.446	515	1.849	–	–

a Allometric figures. **b** Figures from ASEL v2.3. Default uses k=0.03, or ASEL when greater.

Figure C1 Cattle minimum pen area, voyages of 10 days or less, default and alternate

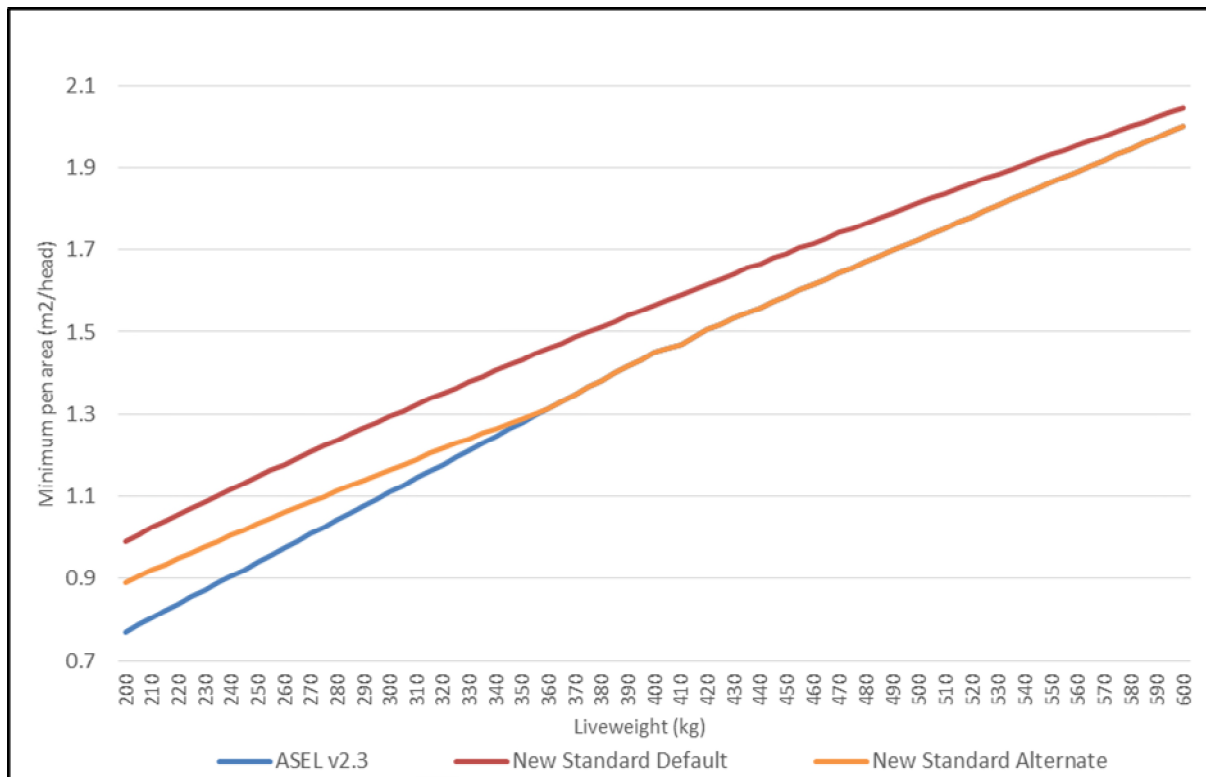


Figure C2 Cattle minimum pen area, voyages of more than 10 days, default

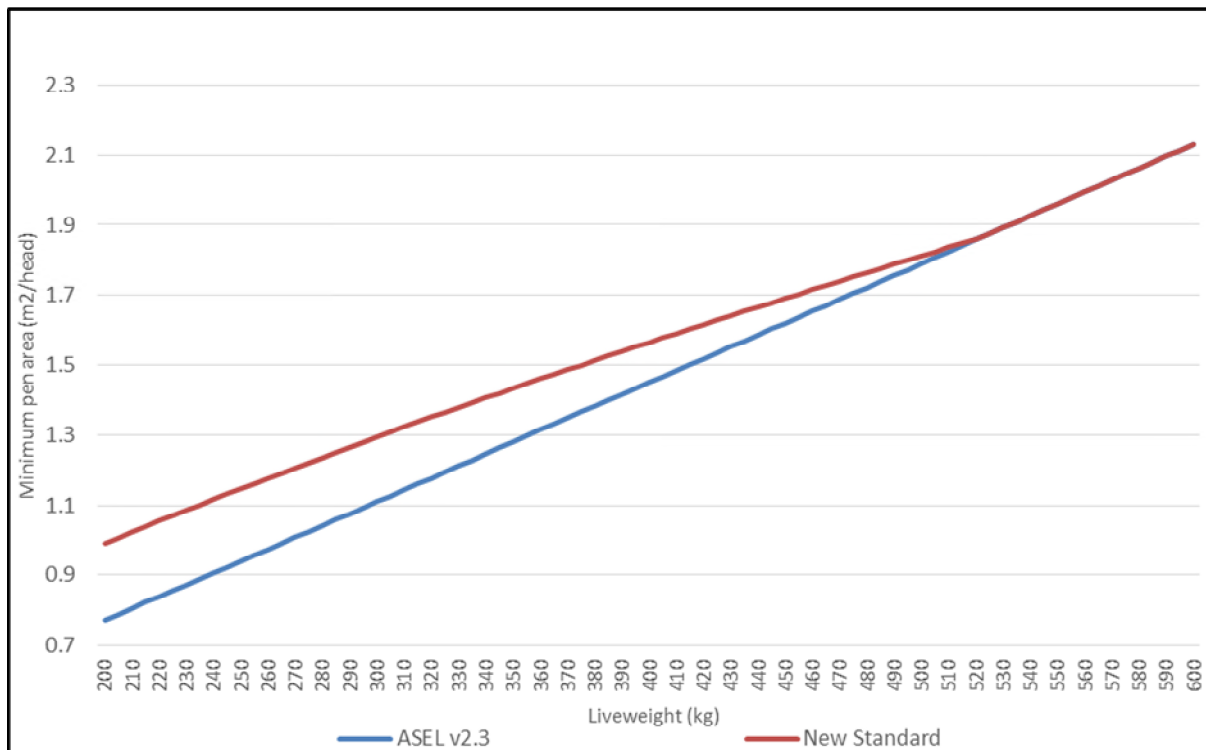


Table C3 Minimum pen area, cattle exported by sea from a port south of latitude 26° south, 1 May to 31 October

Liveweight (kg)	Minimum pen area (m ² /head) (a)	Liveweight (kg)	Minimum pen area (m ² /head) (a)	Liveweight (kg)	Minimum pen area (m ² /head) (b)
200 or less	0.990	300	1.294	400	1.668
205	1.007	305	1.308	405	1.688
210	1.023	310	1.323	410	1.707
215	1.039	315	1.337	415	1.727
220	1.055	320	1.351	420	1.746
225	1.070	325	1.364	425	1.766
230	1.086	330	1.378	430	1.785
235	1.102	335	1.392	435	1.805
240	1.117	340	1.406	440	1.824
245	1.132	345	1.419	445	1.844
250	1.148	350	1.433	450	1.863
255	1.163	355	1.446	455	1.883
260	1.178	360	1.460	460	1.902
265	1.193	365	1.473	465	1.922
270	1.207	370	1.486	475	1.961
275	1.222	375	1.502 (b)	480	1.98
280	1.237	380	1.52 (b)	485	2
285	1.251	385	1.539 (b)	490	2.019
290	1.266	390	1.558 (b)	495	2.039
295	1.280	395	1.613 (b)	500	2.06

a Allometric figures. **b** Figures from ASEL v2.3. Default uses k=0.03, or ASEL when greater.

Table C4 Minimum pen area, cattle exported by sea from a port south of latitude 26° south, 1 November to 30 April

Liveweight (kg)	Minimum pen area (m ² /head) (a)	Liveweight (kg)	Minimum pen area (m ² /head) (a)	Liveweight (kg)	Minimum pen area (m ² /head) (a)
200 or less	0.990	320	1.351	440	1.666
205	1.007	325	1.364	445	1.679
210	1.023	330	1.378	450	1.691
215	1.039	335	1.392	455	1.704
220	1.055	340	1.406	460	1.716
225	1.070	345	1.419	465	1.728
230	1.086	350	1.433	470	1.741
235	1.102	355	1.446	475	1.753
240	1.117	360	1.460	480	1.765
245	1.132	365	1.473	485	1.777
250	1.148	370	1.486	490	1.827 (b)
255	1.163	375	1.500	495	1.88 (b)
260	1.178	380	1.513	500	1.932 (b)
265	1.193	385	1.526	505	1.984 (b)
270	1.207	390	1.539	510	2.035 (b)
275	1.222	395	1.552	515	2.086 (b)
280	1.237	400	1.565	520	2.137 (b)
285	1.251	405	1.578	525	2.157 (b)
290	1.266	410	1.591	530	2.176 (b)
295	1.280	415	1.603	535	2.196 (b)
300	1.294	420	1.616	540	2.215 (b)
305	1.308	425	1.629	545	2.235 (b)
310	1.323	430	1.641	550	2.255 (b)
315	1.337	435	1.654	–	–

a Allometric figures. **b** Figures from ASEL v2.3. Default uses k=0.03, or ASEL when greater.

Figure C3 Minimum pen area, cattle exported by sea from a port south of latitude 26° south, 1 May to 31 October

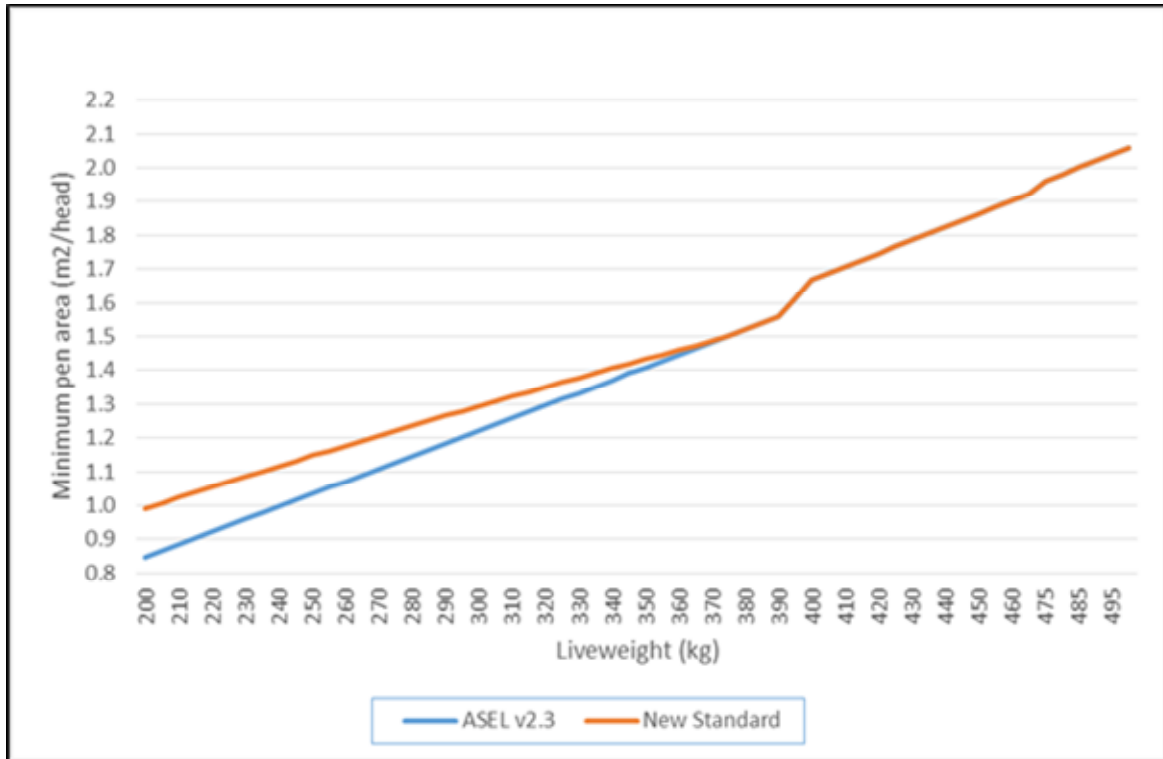


Figure C4 Minimum pen area, cattle exported by sea from a port south of latitude 26° south, 1 November to 30 April

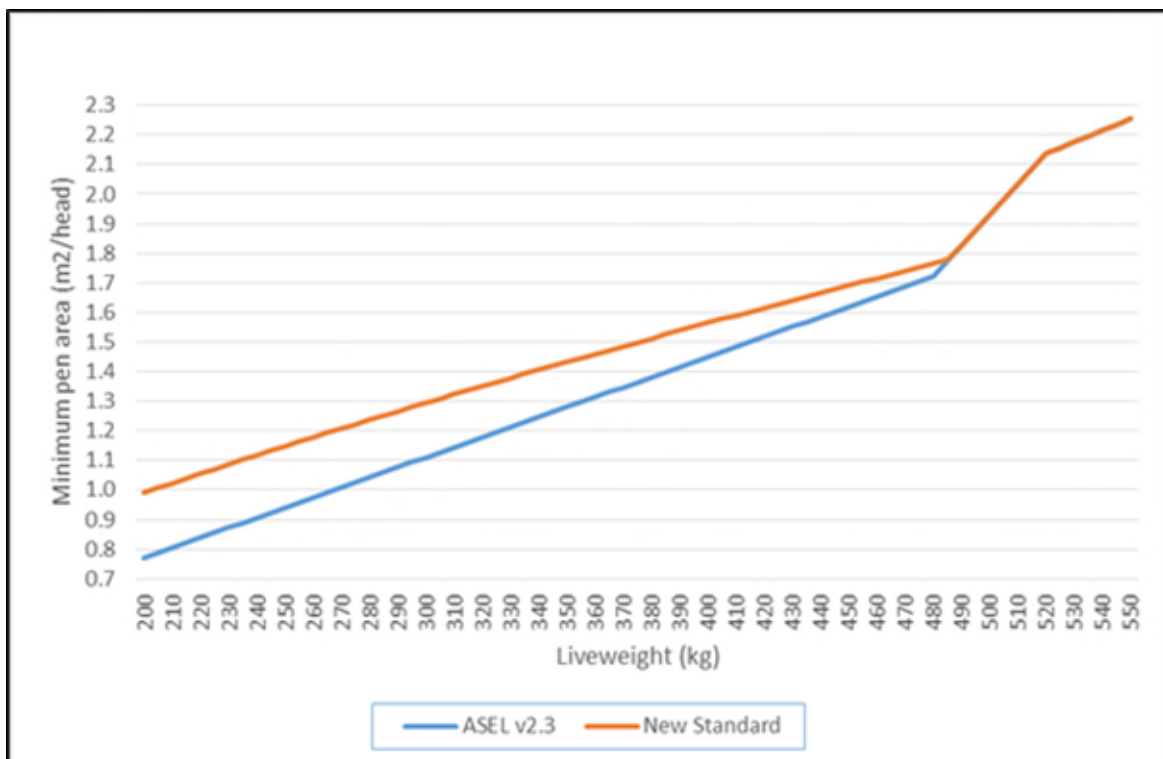


Table C5 Minimum pen area per head for buffalo exported by sea

Liveweight (kg)	Minimum pen area (m ² /head) (a)	Liveweight (kg)	Minimum pen area (m ² /head) (a)	Liveweight (kg)	Minimum pen area (m ² /head) (a)
200	1.089	355	1.591	510	2.021
205	1.107	360	1.606	515	2.034
210	1.125	365	1.620	520	2.047
215	1.143	370	1.635	525	2.063
220	1.160	375	1.650	530	2.081
225	1.177	380	1.664	535	2.100
230	1.195	385	1.678	540	2.119
235	1.212	390	1.693	545	2.137
240	1.229	395	1.707	550	2.156
245	1.246	400	1.721	555	2.175
250	1.262	405	1.736	560	2.193
255	1.279	410	1.750	565	2.212
260	1.295	415	1.764	570	2.231
265	1.312	420	1.778	575	2.250
270	1.328	425	1.792	580	2.268
275	1.344	430	1.806	585	2.287
280	1.360	435	1.819	590	2.306
285	1.376	440	1.833	595	2.324
290	1.392	445	1.847	600	2.343
295	1.408	450	1.861	605	2.362
300	1.424	455	1.874	610	2.380
305	1.439	460	1.888	615	2.399
310	1.455	465	1.901	620	2.418
315	1.470	470	1.915	625	2.437
320	1.486	475	1.928	630	2.455
325	1.501	480	1.941	635	2.474
330	1.516	485	1.955	640	2.493
335	1.531	490	1.968	645	2.511
340	1.546	495	1.981	650	2.530
345	1.561	500	1.995	–	–
350	1.576	505	2.008	–	–

a Allometric figures. **b** Figures from ASEL v2.3. Default uses $k=0.03$, or ASEL when greater.

Figure C5 Minimum pen area per head for buffalo exported by sea

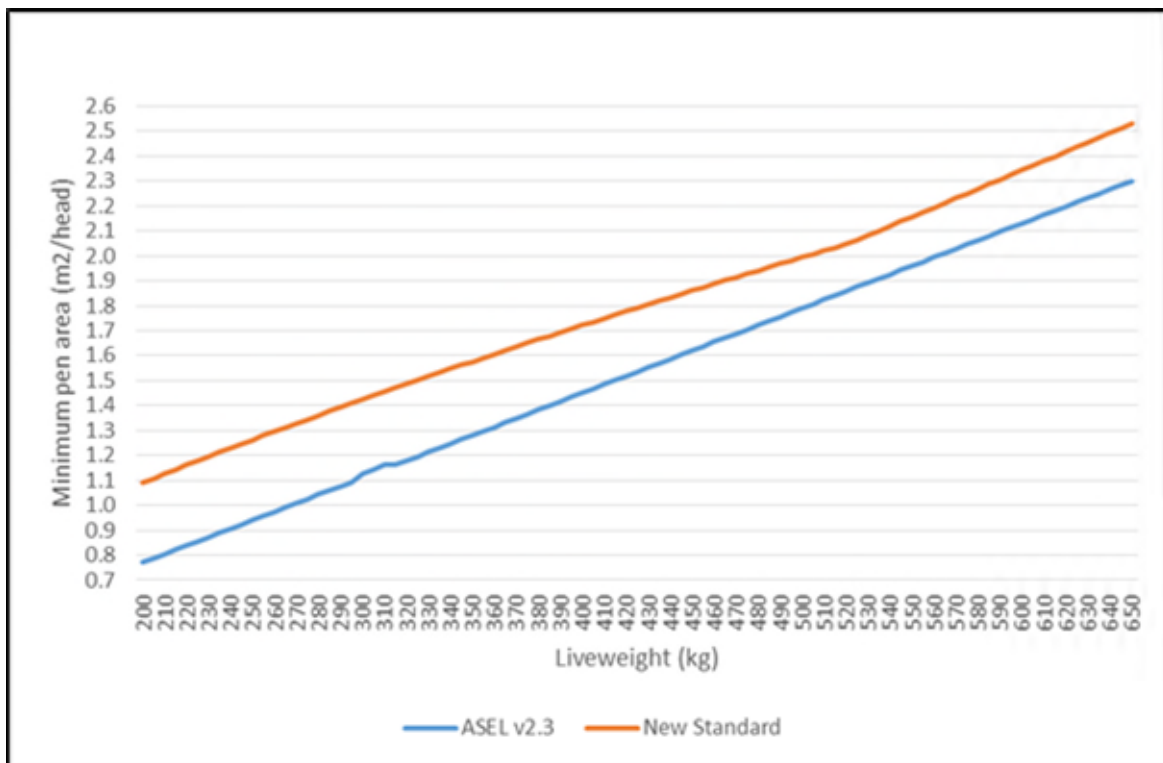


Table C6 Minimum pen area per head for sheep and goats exported by sea

Liveweight (kg)	Minimum pen area (m ² /head)		Liveweight (kg)	Minimum pen area (m ² /head)	
	November to April k=0.03 (a)	May to October k=0.033 (a)		November to April k=0.03 (a)	May to October k=0.033 (a)
28	0.271	0.298	51	0.402	0.442
29	0.277	0.305	52	0.407	0.448
30	0.283	0.311	53	0.412	0.453
31	0.289	0.318	54	0.417	0.459
32	0.295	0.325	55	0.422	0.465
33	0.302	0.332	56	0.427	0.470
34	0.308	0.338	57	0.433	0.476
35	0.313	0.345	58	0.438	0.481
36	0.319	0.351	59	0.442	0.487
37	0.325	0.358	60	0.447	0.492
38	0.331	0.364	61	0.452	0.498
39	0.337	0.370	62	0.457	0.503
40	0.342	0.377	63	0.462	0.508
41	0.348	0.383	64	0.467	0.514
42	0.354	0.389	65	0.472	0.519
43	0.359	0.395	66	0.476	0.524
44	0.365	0.401	67	0.481	0.529
45	0.370	0.407	68	0.486	0.535
46	0.375	0.413	69	0.491	0.540
47	0.381	0.419	70	0.495	0.545
48	0.386	0.425	75	0.518	0.570
49	0.391	0.431	80	0.541	0.595
50	0.397	0.436	90	0.585	0.643

a Allometric figures. November to April uses k=0.03, or ASEL when greater. May to October uses k=0.033, or ASEL when greater.

Figure C6 Minimum pen area per head for sheep and goats exported by sea from 1 November to 30 April

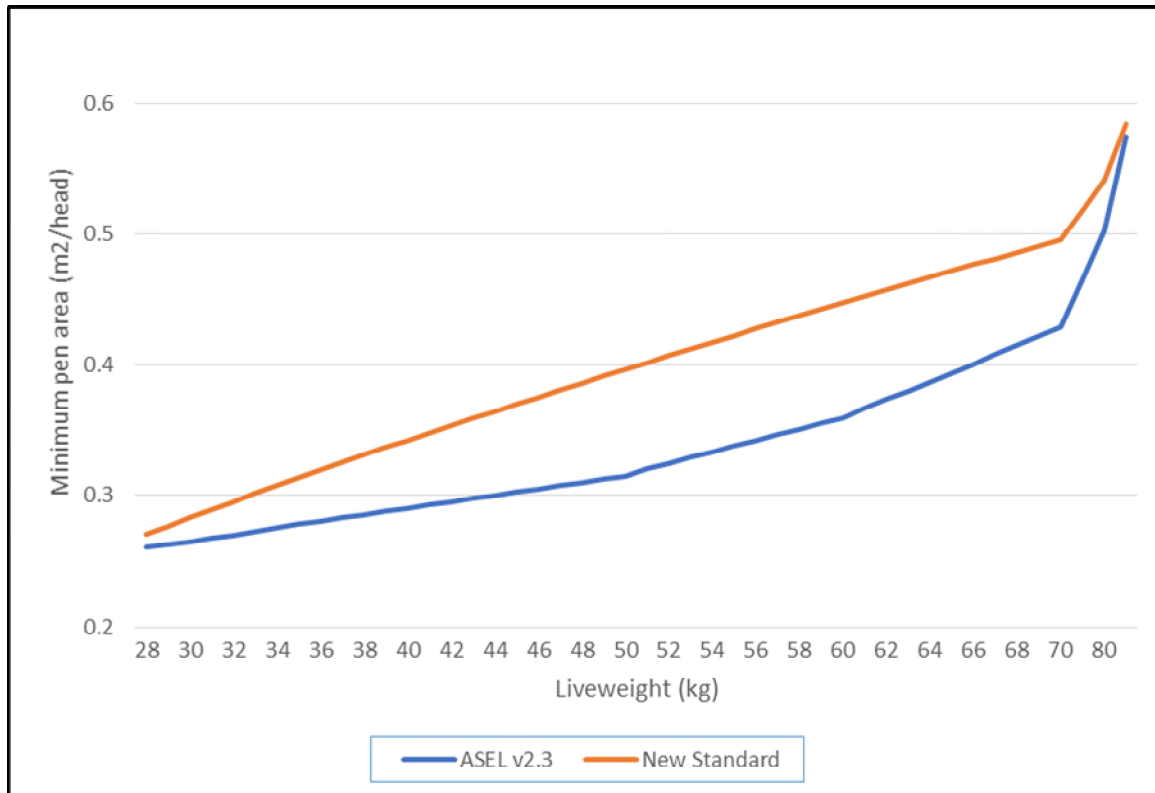
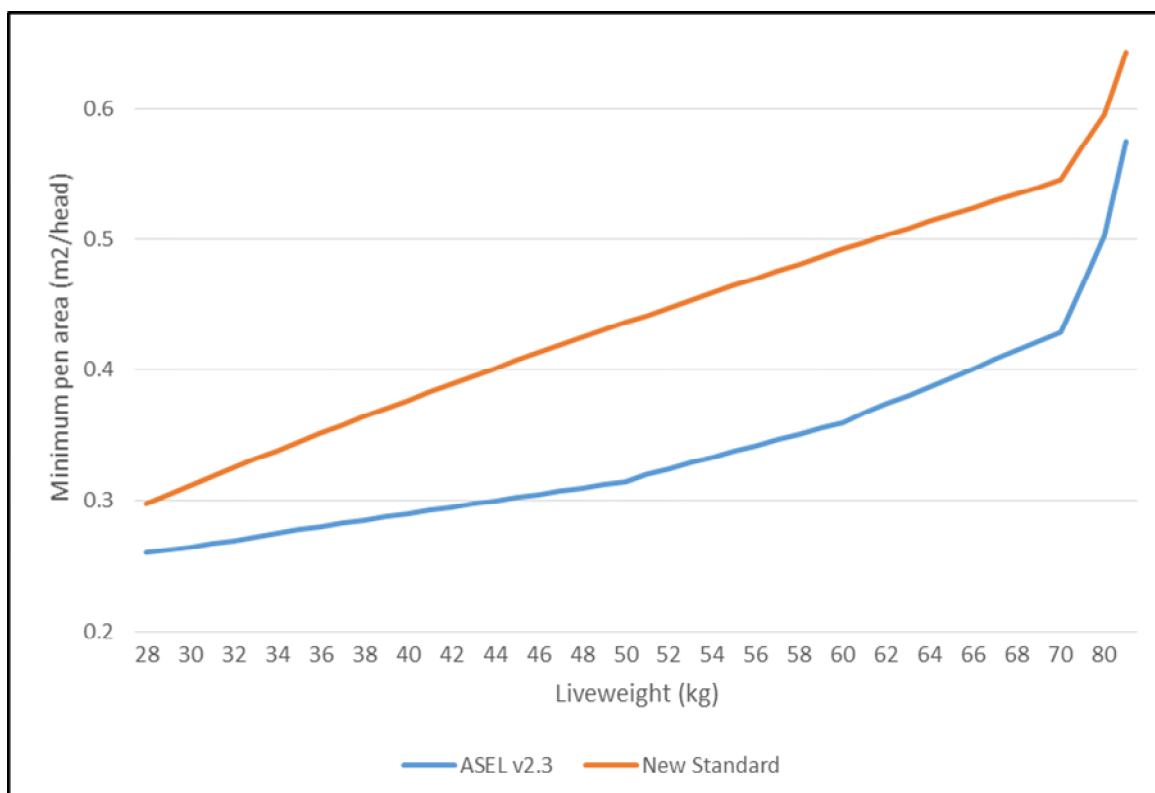


Figure C7 Minimum pen area per head for sheep and goats exported by sea from 1 May to 31 October



Appendix D: Chapter 9 tables

Table D1 Exports of live sheep, 2010–11 to 2016–17

Category	Country	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16	2016–17
Number ('000)	Middle East	2,447	2,232	1,903	1,968	2,038	1,782	1,788
	Other	469	330	97	52	142	77	63
	Total	2,916	2,562	2,000	2,020	2,180	1,859	1,851
FOB value (\$m)	Middle East	295	300	183	176	213	209	216
	Other	53	45	11	9	32	19	17
	Total	348	345	194	185	245	228	233
Average FOB value per head	Middle East	\$121	\$134	\$96	\$89	\$105	\$117	\$121
	Other	\$113	\$136	\$113	\$173	\$225	\$247	\$270
	Total	\$119	\$135	\$97	\$92	\$112	\$123	\$126

Table D2 Exports of live cattle, 2010–11 to 2016–17

Category	Country	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16	2016–17
Number ('000)	Indonesia	456	375	266	614	741	562	518
	Vietnam	0	1	16	132	307	277	161
	Other	272	203	231	260	247	275	138
	Total slaughter	728	579	513	1,006	1,295	1,114	817
	Breeders	77	105	121	127	84	144	99
FOB value (\$m)	Indonesia	287	252	165	452	595	578	620
	Vietnam	0	1	12	124	319	365	243
	Other	212	159	162	219	249	337	168
	Total slaughter	499	412	339	795	1,163	1,280	1,031
	Breeders	161	239	251	255	192	271	168
Average FOB value per head	Indonesia	\$629	\$672	\$620	\$736	\$803	\$1,028	\$1,197
	Vietnam	na	na	\$750	\$939	\$1,039	\$1,318	\$1,509
	Other	\$779	\$783	\$701	\$842	\$1,008	\$1,225	\$1,217
	Total slaughter	\$685	\$712	\$661	\$790	\$898	\$1,149	\$1,262
	Breeders	\$2,091	\$2,276	\$2,074	\$2,008	\$2,286	\$1,882	\$1,697

Table D3 Exports of live sheep and cattle combined, 2010–11 to 2016–17

Category	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16	2016–17
Number ('000)	3,721	3,246	2,634	3,153	3,559	3,117	2,767
FOB value (\$m)	\$1,008	\$996	\$784	\$1,235	\$1,600	\$1,779	\$1,432

Source: ABARES, Commodity Statistics

Table D4 Origin and destination of live sheep exports, 2017

Destination	Origin			Total	Per cent of total (%)
	SA	Vic.	WA		
Israel	–	–	84,336	84,336	5
Jordan	–	–	53,702	53,702	3
Kuwait	74,594	1,990	528,094	604,678	33
Oman	6,000	–	108,820	114,820	6
Qatar	96,893	9,834	551,273	658,000	36
Turkey	53,958	–	144,345	198,303	11
United Arab Emirates	11,824	–	122,982	134,806	7
Total	243,269	11,824	1,593,552	1,848,645	1
Per cent of total (%)	13	1	86	–	–

Source: Department of Agriculture and Water Resources

Table D5 Origin and destination of live cattle exports, Northern Territory, Queensland and South Australia, 2017

Destination	NT			Qld			SA		
	Slaughter	Breeder	Total	Slaughter	Breeder	Total	Slaughter	Breeder	Total
Brunei	3,872	0	3,872	0	0	0	0	0	0
China	0	0	0	0	0	0	0	0	0
Indonesia	237,935	0	245,544	136,838	2,430	139,268	0	0	0
Israel	0	0	0	0	0	0	0	0	0
Japan	0	0	0	12,375	0	12,375	0	0	0
Jordan	0	0	0	0	0	0	0	0	0
Kuwait	0	0	0	0	0	0	0	0	50
Malaysia	12,745	512	13,257	0	0	0	0	0	0
Pakistan	0	0	0	0	0	0	0	0	0
Philippines	0	0	0	3,116	0	3,116	0	0	0
Qatar	0	0	0	0	0	0	199	0	199
Sabah	0	2,640	2,640	0	0	0	0	0	0
Sarawak	800	1,943	2,743	0	0	0	0	0	0
Sri Lanka	0	0	0	0	0	0	0	0	0
Thailand	800	0	800	0	0	0	0	0	0
Turkey	0	0	0	0	0	0	2,240	0	2,240
UAE	0	0	0	0	0	0	0	0	0
Vietnam	39,989	0	39,989	63,115	213	63,328	0	0	0
Total	296,141	12,704	308,845	215,444	2,643	218,087	2,489	0	2,489
% total	35	1	36	25	0	25	0	0	0

Table D6 Origin and destination of live cattle exports, Victoria, Western Australia, 2017

Destination	Vic.			WA			Australia	
	Slaughter	Breeder	Total	Slaughter	Breeder	Total	Total	Total (%)
Brunei	0	0	0	739	0	739	4,611	1
China	5,524	66,283	71,807	1,726	1,969	3,695	75,502	9
Indonesia	0	2,128	2,128	123,738	1,936	125,674	512,614	60
Israel	0	0	0	32,405	0	32,405	32,405	4
Japan	0	0	0	0	0	0	12,375	1
Jordan	0	0	0	10	0	10	10	0
Kuwait	0	0	0	554	0	554	604	0
Malaysia	0	0	0	717	0	717	13,974	2
Pakistan	0	5,988	5,988	0	684	684	6,672	1
Philippines	0	0	0	0	0	0	3,116	0
Qatar	0	0	0	1,449	0	1,449	1,648	0
Sabah	0	0	0	0	0	0	2,640	0
Sarawak	0	0	0	0	0	0	2,743	0
Sri Lanka	0	3,030	3,030	0	0	0	3,030	0
Thailand	0	0	0	0	0	0	800	0
Turkey	0	0	0	18,551	0	18,551	20,791	2
UAE	0	0	0	45	0	45	45	0
Vietnam	1,787	0	1,787	59,111	0	59,111	164,215	19
Total	7,311	77,429	84,740	239,045	4,589	243,634	857,795	100
% total	1	9	10	28	1	28	4,611	1

Source: Department of Agriculture and Water Resources

Table D7 FAO data on major exporters of live sheep, 2017

Exporters	Head	Percent (%)
Sudan	4,843,747	28
Romania	2,553,171	15
Somalia	2,161,706	13
Australia	1,870,412	11
Spain	1,132,960	7
Iran	556,680	3
Hungary	553,782	3
France	486,650	3
Jordan	436,801	3
Other	2,666,941	15
Total	17,262,850	100

Table D8 FAO data on major importers of live sheep, 2017

Importers	Head	Percent (%)
Saudi Arabia	7,171,647	43
Kuwait	1,185,835	7
Italy	1,103,678	7
Libya	1,092,151	7
Jordan	650,560	4
Greece	547,356	3
Qatar	533,517	3
Oman	406,785	2
Senegal	400,000	2
United Arab Emirates	382,031	2
Yemen	380,000	2
Israel	317,567	2
Other	2,565,154	15
Total	16,736,281	100

Table D9 FAO data on major exporters of live cattle, 2017

Exporters	Head	Percent (%)
France	1,480,824	14
Mexico	1,130,460	11
Australia	1,130,328	11
Germany	827,024	8
Canada	765,914	7
Mali	314,263	3
Uruguay	307,131	3
Brazil	292,515	3
Ethiopia	287,000	3
Romania	276,470	3
Other	3,507,546	34
Total	10,319,475	100

Table D10 FAO data on major importers of live cattle, 2017

Importers	Head	Percent (%)
United States of America	1,708,174	17
Italy	1,150,563	11
Indonesia	652,547	7
Spain	643,342	6
Netherlands	576,501	6
Turkey	494,194	5
Nigeria	400,000	4
Lebanon	343,308	3
South Africa	263,060	3
Laos	234,724	2
Other	3,569,599	36
Total	10,036,012	100

Appendix E: Consultation

Overview

A Technical Advisory Committee (the committee) was appointed by the Department of Agriculture and Water Resources (the department) to review the standards. The committee's membership structure was designed to ensure a breadth of skills and expertise relevant to the standards in order to facilitate equitable consideration of issues and sound advice to the department.

The committee was chaired by Dr Chris Back from January 2018 until May 2018, and then by Mr Steve McCutcheon from July 2018. The other members were:

- Dr Teresa Collins, Animal Health and Welfare Expert
- Dr Hugh Millar, Animal Health and Welfare Expert
- Mr Russell Phillips, Regulation Specialist
- Mr Kevin Shiell, Livestock Export Industry Expert

The committee consulted widely to ensure that they heard views from the diversity of stakeholders affected by any regulatory changes. The committee was also aware of the high level of community interest in the welfare of exported livestock. The review process included three rounds of public consultation where written submissions were sought. Key steps in the process are outlined in Table E1 Public consultation milestones.

The committee also engaged with a **reference group** of bodies with direct interest in the livestock export industry. The role of the reference group was to provide the committee with a resource to discuss technical and practical aspects of the review, drawing on their experience with export conditions relevant to Australian livestock species and export processes. Members included: RSPCA; Australian Livestock Exporters' Council; Australian Veterinary Association; Cattle Council of Australia; Sheep Producers Australia; Australian Dairy Farmers; Australian Alpaca Association; Australian Buffalo Industry Council; Australian Camel Industry Association Inc.; Deer Industry Association of Australia and the Goat Industry Council of Australia.

Table E1 Public consultation milestones

Date	Activity
6 February 2018	Public consultation on Stage 1 opens
20 February 2018	Meeting with Reference Group
20 March 2018	Public consultation on Stage 1 closes
17 August 2018	Meeting with Reference Group
23 August 2018	Public consultation on Stage 2 Issues Paper and reformatted standards opens
19 September 2018	Public consultation on Stage 2 Issues Paper and reformatted standards closes
25 October 2018	Meeting with Reference Group
31 October 2018	Public consultation on Stage 2 draft report and reformatted standards opens
27 November 2018	Public consultation on Stage 2 draft report and reformatted standards closes
3 December 2018	Meeting with Reference Group

Stage 1

Stage 1 of the review commenced in 2017. In February 2018, the committee released a reformatted version of the standards for public consultation. It received 19 submissions from individuals, business, industry, animal welfare organisations and government departments (see Table E2 Stage 1 submissions).

Table E2 Stage 1 submissions

Submitter	Submitter
Agriculture Victoria	Pastoralists and Graziers Association, WA
Australian Livestock Exporters' Council	RSPCA
Australian Veterinary Association	Sentient
Cattle Council of Australia	Song Fountains
Deer Industry Association of Australia	Sheep Producers Australia
Department of Agriculture and Water Resources	Stop Live Exports
Department of Primary Industries and Regional Development, Western Australia	Townsville Against Live Exports
LiveCorp	Vets Against Live Exports
LiveShip	Wellard Rural Exports
Michael Ryan	–

Note: Only submitters that agreed to be identified are included in the table.

The committee used the information provided in submissions to produce an endorsed version of the reformatted standard and a workplan for future review stages. Those documents were released in August 2018, along with a consultation report from Stage 1. Further information is available at [ASEL review stage 1](#).

In response to stakeholder views provided in Stage 1, the department commissioned an independent review of scientific literature relevant to the standards. The literature review can be found at [Technical Advisory Committee for the Review of the Australian Standards for the Export of Livestock](#).

Stage 2

Stage 2 began in August 2018 with the release of an issues paper and the endorsed reformatted standards for further public consultation. The issues paper posed a series of questions regarding key issues identified in Stage 1 of the review.

The consultation opportunity was advertised on the department's homepage, live animal export page and *Have your Say* site. A departmental media statement was released. Alerts and reminders were issued via social media platforms such as Twitter. The committee also made direct contact with members of the stakeholder reference group, AAVs and state and territory governments.

Consultation closed on 19 September 2018. The committee received 41 submissions from individuals, businesses, industry, animal welfare organisations and government departments (see Table E3 Stage 2 Issues paper consultation).

Table E3 Stage 2 Issues paper consultation

Submitter	Submitter
AAV ASEL Review Group	Livecorp
Adrian Baker	NSW Farmers Association
Agriculture Victoria	Northern Territory Cattlemen's Association
AgForce Queensland Farmers	Pastoralists & Graziers Association of WA
Animals Australia	Peta Australia
Australian Ethical Investment	RSPCA
Australian Livestock and Rural Transporters Association	Sentient
Australian Livestock Exporters Council	Sheep Producers Australia
Australian Veterinary Association	The Hon. Mark Furner MP
Cattle Council of Australia	The Hon. Rick Mazza MLC
Consolidated Pastoral Company	Townsville Against Live Export (TALE)
Ecana International	Vets Against Live Export (VALE)
Farm Management System	WA Department of Primary Industries and Regional Development
Harmony Agriculture and Food Co.	WA Farmers Federation
Harvey Benton	WA Livestock Exporters Association
Jan Kendall	

Note: Only submitters that agreed to be identified are included in the table.

Of the submissions, 53 per cent were from organisations or individuals directly involved in the live export industry. A breakdown is provided in Table E4 Stage 2 Issues Paper submission breakdownTable E4. The non-confidential submissions are available on the department's web page [Review of the Australian Standards for the Export of Livestock](#).

Table E4 Stage 2 Issues Paper submission breakdown

Category	No. of Submissions	Percent (%)
Individual (affiliation not specified)	6	15
Individual (veterinarian/other profession)	2	5
Individual (Livestock producer)	1	2
Representative Organisation (animal welfare)	9	22
Representative Organisation (industry)	12	29
Business	7	17
Government (State, Federal, Agency)	4	10
Scientific/Research/Academic	0	0

The committee used the information provided in submissions and the literature review to form draft recommendations for changing the standards. It released the recommendations with a draft report, and a further version of the reformatted standards, for public consultation on 31 October 2018.

The committee asked for feedback on the recommendations, new information that could impact on the recommendations, and implementation and cost concerns.

The consultation opportunity was again advertised on the department's homepage, live animal export page and Have your Say site. A departmental media statement was released. Alerts and reminders were issued via social media platforms such as Twitter. The committee also made

direct contact with members of the stakeholder reference group, Australian accredited veterinarians (AAVs) and state and territory governments.

Consultation closed on 27 November 2018. The committee received 276 submissions from individuals, businesses, industry, animal welfare organisations and government departments (see Table E5 Stage 2 Draft report submissions).

Table E5 Stage 2 Draft report submissions

Submitter	Submitter	Submitter
AgForce Queensland	Ian Woodgate	Roslyn Jolly
Alexsandra Poros	Jan Kendall	RSPCA
Andrew Blease	Jane Speechley	Ruchita Saklani
Angela Filardi	Jayne Stickler	Rural Export and Trading WA
Angus Haigh	Jill Pickering	Salome Argyropoulos
Animal Defenders Office	Jo-Anne Oertel	Samantha Prentice
Animals Australia	Joe Hupp	Sandra Riley
AnimalsFeel	Josephine Norman	Sarah Capo
Australian Livestock Exporters' Council	Karen Eckermann	Sarah May
Australian Veterinary Association	Kate McCarthy	Sentient
Belinda Ciurleo	Kaylene Muller	Serica Goodliffe
Bev Pope	Kerrin Walder	Shanelle
Bronwen Evans	Kimberley Pilbara Cattlemen's Association	Sheep Producers Australia
Bruce D. Watson	Kirstie O'Leary	Shelley Waite
Carolyn Jones	Kris Farley	Stella Bartlett
Cassandra Hannagan	Lawrence and Geraldine Borg	Stephanie
Cathy Roberts	Lee Hawkins	Sue Forte
Cattle Council of Australia	Lee Howard	Susan Beer
Charles Davis	Lena Bodin	Susan Guy
Chelsea Livestock Services	Linda McDowell	Susan Kachaniwsky
Cheryl Forrest-Smith	LiveCorp	Suzanne Goodliffe
Christine Selmes	Livestock Express	Taylor
CJ Goudman	Lyal Hammond	Terri Tamlin
Colleen Pearson	Margaret Evans	The Law Society of NSW Young Lawyers
Corinne Mackenzie	Mary Forbes	Tim Oseckas
Craig Rogers	Meaghan Hughes	Tony Beston
David Hearne	Michael Edmund Coates	Tony Tibbs
David Ollett	Natasha	Vanessa Cartland
Dona LaSchiava	Nathan Jordon	Vegan Australia
Ecana International	Nicola Heywood	Vets Against Live Export (VALE)
Ellena Johnson	Nicole Luhrs	Victoria Sundaram
Emily Cook	NSW Farmers' Association	WA Department of Primary Industries and Regional Development
Erna Stein	NT Livestock Exporters Association	WA Livestock Exporters Association
Fiona Sim	Onn Ben-David	Wendy
G.E. Ashby and Sons	Pastoralists and Graziers Assn of WA	Will
Glenys Fraser	Patricia Beer	World Animal Protection
Gwyn Jolley	Penny Hocking	
Heidi Jenkins		

Note: Only submitters that agreed to be identified are included in the table.

Of those submissions, 9 per cent were from organisations or individuals directly involved in the live export industry. A breakdown is provided in Table E6 Stage 2 Draft Paper submission breakdown.

The RSPCA also separately collected 6,623 community submissions on the draft report and provided a list of submitters to the committee.

Table E6 Stage 2 Draft Paper submission breakdown

Category	No. of submissions	Percent (%)
Individual (affiliation not specified)	239	87
Individual (veterinarian/other profession)	2	0.7
Individual (Livestock producer)	1	0.4
Representative Organisation (animal welfare)	9	3
Representative Organisation (industry)	20	7
Business	2	0.7
Government (State, Federal, Agency)	2	0.7
Scientific/Research/Academic	1	0.4

The non-confidential submissions are available on the department's web page [Review of the Australian Standards for the Export of Livestock](#).

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