FINAL REPORT

Development of reporting tools for the Australian Livestock Processing Industry Animal Welfare Certification System

PROJECT CODE:	2016.1410
PREPARED BY:	Leisha Hewitt
DATE SUBMITTED:	14 May 2017
DATE PUBLISHED:	13 July 2018
PUBLISHED BY:	AMPCs

The Australian Meat Processor Corporation acknowledges the matching funds provided by the Australian Government to support the research and development detailed in this publication.

TABLE OF CONTENTS

TABLE OF CONTENTS 2

1.0 EXECUTIVE SUMMARY 4

2.0 INTRODUCTION 9

3.0 PROJECT OBJECTIVES 9

3.1 Summary of project objectives 9

3.2 Milestone Achievement Criteria 10

4.0 METHODOLOGY 11

4.1 Summary of project methodology 11

4.2 Methodology for Objective 1 – Identification of key performance indicators 12

4.2.1 Key Performance Indicators (KPIs) included in the industry standard 12

4.2.2 Key performance indicators used during external audits to verify conformance with retailer standards and AAWCS 13

4.2.3 Review of audit data and industry survey 18

4.3 Methodology – Objective 2 18

4.3.1 Current system of reporting animal welfare outcomes - establishment level 18

4.3.2 Current system of reporting animal welfare outcomes - Industry level 19

5.0 PROJECT OUTCOMES AND DISCUSSION 22

5.1 Objective 01 - Collation and review of KPI information, correlation with audit outcomes 22

5.1.1 Fitness to transport 23

5.1.2 Animal handling 25

5.1.3 Efficacy of stunning and slaughter 29

5.1.4 Industry survey findings - testing the KPIs 31

5.2 Objective 02 - Reporting framework 33

5.2.1 Recommended establishment reporting framework 33

5.2.2 Recommended industry reporting framework 34

6.0 CONCLUSIONS AND RECOMMENDATIONs 36

7.0 BIBLIOGRAPHY 40

8.0 APPENDICES 41

8.1 Appendix 1 – EFSA tool box assessment criteria compared with those used in other international standard 41

8.2 Appendix 2 – Guidance for KPI measurement during stunning slaughter 44
8.3 Appendix 3 – Recommendations for industry reporting pro-forma 46
8.4 Appendix 4 – Industry survey..... 51

1.0 EXECUTIVE SUMMARY

The Australian Meat Industry Council (AMIC) through the Australian Meat Processing Corporation (AMPC) has developed an industry best practice standard to address animal welfare compliance. The Federal Government has accepted this standard and the associated verification process (on-plant verification and external auditing) via the Australian Livestock Processing Industry Animal Welfare Certification Scheme (AAWCS) as meeting their regulatory compliance, providing that relevant monitoring and audit information is shared. The current verification method on-plant involves monitoring of on-going performance against a number of Key Performance Indicators (KPIs), supported by external audits. The external audits (as part of the AAWCS) independently verify conformance with the standard by auditing against the same KPI criteria. This project is designed to establish a single standard, verification and reporting process to address regulatory and quasi-regulatory requirements and audit duplication. It aims to deliver reporting tools at an establishment and industry level to facilitate government recognition of the AAWCS. The project is separated into two parts.

- Development of an annual industry animal welfare report (and proposed communication strategy) using KPIs and audit outcomes
- Circulation of proposed industry pro forma and establishment focused documentation to industry for feedback

The overall project objectives can be summarised as follows:

OBJECTIVES	DESCRIPTION
1	• Identify KPIs from the existing recorded data that are suitable to be reported on a regular basis by an AAWCS accredited establishment to demonstrate compliance with AAWCS
2	• Publish a comprehensive, easy to understand report on the state of the industry's compliance with its voluntary and mandatory animal welfare standards
3	• Consider future R, D & E activities in the area of animal welfare

Table 1 Project objectives and description of activities

An outline of the project approach and methodology is summarised in the table below (Table 2)

OBJECTIVE	OUTCOME	SUMMARY OF METHODOLOGY	ACHIEVEMENT
1	Analyse the KPIs reported in audit reports and processor data at plant level	• KPIs used in the Industry Animal Welfare Standards for Livestock Processing Establishments were reviewed - This included a review of scientific papers that provided validation of the KPIs used • The suitability of the KPIs were reviewed according to species, stunning method, throughput etc • Possible KPIs (from plant data) to reflect fit to load were identified • Correlation of KPI achievement with audit outcome • Preparation for testing KPIs in a range of establishments • Project progress report prepared and submitted	Project progress report submitted and approved by AMPC
2	Development of a pro-forma that can be published at regular intervals to show how industry is achieving good animal welfare outcomes through the implementation of its industry standard	• Review of the information that should be included in an industry level report – reporting methodology used in other livestock sectors • Development of a self-contained, electronic format, suitable for publishing on the web • Tailor information for a public audience • Development of a system for the collection, collation and presentation of KPI data for incorporation into summaries and trends over time • Incorporation of summaries and trends in a manner that is not attributable to a specific establishment or region that could be identifiable to a specific establishment • Submission of a milestone report to recommend the pro-forma for consideration by AMIC and AUS-MEAT and then to EMIAC through the EMIAC Animal Welfare Subcommittee • Development of a reporting and communications strategy to support the annual report	Project progress report submitted and approved by AMPC
3	Consider future R, D & E activities in the area of animal welfare	• Discussion and conclusions based on findings of previous objectives	Submitted in final report

Table 2 Summary of project methodology

Key Performance Indicators (KPIs) are used to measure the result of a system relative to the aim; or to measure the 'success' of a system. The use of KPIs allows more flexibility in the method of delivering an acceptable welfare outcome and avoids the use of overly prescriptive requirements. A moderate body of research exists regarding the use of objective KPIs to assess the welfare of cattle, sheep and pigs, in the abattoir (Milestone 1). Translation of theory into commercial practice has warranted further development in some areas during the course of the project. It was obvious from the initial analysis of the industry survey data that there was variation between application, measurement and recording of KPIs, between establishments; and between industry and the certification body. It was therefore recommended (Milestone 1) that in-plant monitoring activities be revised to take into account latest scientific research and recommendations, before being incorporated into an establishment or industry level reporting framework. KPIs that best reflect animal welfare program compliance and are supported by current scientific understanding were selected. The revised KPIs measures were tested for a range of establishments.

The project milestones were achieved and the recommendations for further R, D & E are shown in Table 3.

CONCLUSIONS AND RECOMMENDATIONS		
Finding	**Explanation**	**Reporting**
Industry Standard animal welfare KPIs require some revision to take into account latest scientific research and recommendations	Changes to KPI criteria required to ensure that they: / are aligned with current scientific understanding / follow the recommendations made by EFSA and OIE / meet customer expectations (eg. Incorporate changes in customer standards, such as recent changes to AMI guidance / meet the requirement for valid, objective measures of animal welfare	- Reported in final report - Included in revised Industry Standard – AMIC project AW2 and future revisions of industry standard - Included in revised AUS-MEAT Animal Welfare Certification Program Rules for Livestock Processing Establishments - During update of industry training material - Findings of this project to be incorporated into training and industry extension material - Communicated to minimum standard working group during consultancy period
In-plant animal welfare monitoring activities require some revision to take into account latest scientific research and recommendations	Changes to in-plant animal welfare monitoring protocol required to ensure that they: / are aligned with current scientific understanding / follow the recommendations made by EFSA and OIE / meet customer expectations (eg. Incorporate changes in customer standards, such as recent changes to AMI guidance / are aligned with external audit measures	- Revision of Industry Standard and external audit protocol (where appropriate) - Revised monitoring protocols incorporated into training and industry extension material - Alignment of in-plant monitoring criteria with external audit activities
Alignment of fit to load KPIs with the requirements of the Land Transport Standard and Guidelines is necessary	- There is an information gap between the industry standard and the Land Transport Standards and Guidelines, particularly in the 'fit to load' criteria and associated KPIs	- Industry extension material may be useful to improve communication with producers. - Update of industry training material - Revision of industry standard - Minimum standard stakeholder consultancy period
In-plant monitoring data and external audit data is not regularly collated and analysed to determine and report establishment and industry performance	- Scheduled analysis of establishment data is required to demonstrate compliance and continuous improvement, particularly during the period between external audits	- Implementation of establishment and industry reporting systems - Update of industry training material (Meat Plant Auditor Course)

	- Industry reporting demonstrates change over time and continual improvement in animal welfare standards (including compliance with regulatory requirements).	- Work with AUS-Meat to produce revised audit guidance document (AAWCS.AG) - Circulation of proposed industry report pro-forma to industry representatives
Inconsistencies between internal monitoring activities and external audit processes identified	- Consideration should be given to the production of industry guidance to compliment the existing monitoring training. This will ensure consistency between industry and external auditors regarding verification of non-conformance criteria.	- Update of industry training material - Revision of industry standard - Minimum standard stakeholder consultancy period
As the number of plants certified under AAWCS increases, there is a requirement to ensure that an increased number of auditors still results in a consistent audit process	- Consideration should be given to the production of audit guidance to compliment the existing auditor training. AUS-MEAT have produced a guidance document (AAWCS.AG) that can be refined to fulfill this requirement.	- Update of industry training material (Meat Plant Auditor Course) - Work with AUS-Meat to produce revised audit guidance document (AAWCS.AG)
Investigation into alternative analysis and reporting of KPI monitoring and audit data is required	- Consideration of the implementation of a welfare index, using KPI data - PHI approach	- Industry report pro-forma presented in final report - Further industry discussion required

Table 3 Recommendations for KPI monitoring and reporting (establishment and industry level)

2.0 INTRODUCTION

The Australian Meat Industry Council (AMIC) through the Australian Meat Processing Corporation (AMPC) has developed an industry best practice standard to address animal welfare compliance. The Federal Government has accepted this standard and the associated verification process (on-plant verification and external auditing) via the Australian Livestock Processing Industry Animal Welfare Certification Scheme (AAWCS) as meeting their regulatory compliance, providing that relevant monitoring and audit information is shared. The current verification method on-plant involves monitoring of on-going performance against a number of Key Performance Indicators (KPIs), supported by external audits. The external audits (as part of the AAWCS) independently verify conformance with the standard by auditing against the same KPI criteria. The purpose of the project was to establish a single standard, verification and reporting process to address regulatory and quasi-regulatory requirements and audit duplication. The aim was to deliver reporting tools at an establishment and industry level to facilitate government recognition of the AAWCS. The project objectives were twofold:

- Identify Key Performance Indicators (KPIs) that demonstrate compliance with AAWCs
- Publish a report on the state of the industry's compliance with animal welfare standards

The overall objectives were achieved in-full, although the delivery of milestones was delayed. This was because an early objective within milestone 1 was to correlate industry KPI information with audit outcomes. However, it was discovered that on-plant monitoring data is not collected by AUS-MEAT and therefore could not be accessed. Consequently, analysis of any correlation between internal monitoring data and external auditing data could not be completed. As an alternative approach, it is recommended that an industry survey be carried out to allow on-plant monitoring data for a selection of facilities to be reviewed, analysed and reported.

3.0 PROJECT OBJECTIVES

3.1 Summary of project objectives

The overall project objectives can be summarised as follows (Table 4):

OBJECTIVES	DESCRIPTION
1	• Identify KPIs from the existing recorded data that are suitable to be reported on a regular basis by an AAWCS accredited establishment to demonstrate compliance with AAWCS
2	• Publish a comprehensive, easy to understand report on the state of the industry's compliance with its voluntary and mandatory animal welfare standards
3	• Consider future R, D & E activities in the area of animal welfare

Table 4 Summary of project objectives

3.2 Milestone Achievement Criteria

Table 5 provides an overview of the project milestones and the associated achievement criteria.

MILESTONE	ACHIEVEMENT CRITERIA
1	**PART A** • Collation and analysis of KPI information, correlation with audit outcomes • Preparation for testing of KPIs in a range of establishments • Project progress report containing review of existing KPIs submitted and approved by AMPC
2	**PART B** • Develop an annual industry AW report using KPIs and audit outcomes • Circulate to industry for feedback and address feedback • Develop communications strategy • Project progress report submitted and approved by AMPC
3	**PART A** • Selection of KPIs that best reflect AW program compliance • Testing KPIs in a range of establishments over a period of approximately 6 months • Project progress report including recommendations of KPIs submitted and approved by AMPC **PART B** • Project report, AW summary report and SnapShot presented to EMIAC AW Sub-committee for final government consultation • Final report, AW summary report and SnapShot submitted and approved by AMPC
4	• Present project findings at an AMPC event, or via a webinar

Table 5 Milestone description

4.0 METHODOLOGY

4.1 Summary of project methodology

An outline of the project approach, methodology and progress is summarised in the table below (Table 6).

OBJECTIVE	OUTCOME	SUMMARY OF METHODOLOGY	ACHIEVEMENT
1	Analyse the KPIs reported in audit reports and processor data at plant level	• KPIs used in the Industry Animal Welfare Standards for Livestock Processing Establishments were reviewed - This included a review of scientific papers that provided validation of the KPIs used • The suitability of the KPIs were reviewed according to species, stunning method, throughput etc • Possible KPIs (from plant data) to reflect fit to load were identified • Correlation of KPI achievement with audit outcome • Investigation into KPI monitoring process in a range of establishments – industry survey • Project progress report prepared and submitted	Project progress report submitted and approved by AMPC
2	Development of a pro-forma that can be published at regular intervals to show how industry is achieving good animal welfare outcomes through the implementation of its industry standard	• Review of the information that should be included in an industry level report – reporting methodology used in other livestock sectors • Development of a self-contained, electronic format, suitable for publishing on the web • Tailored information for a public audience • Development of a system for the collection, collation and presentation of KPI data for incorporation into summaries and trends over time • Incorporation of summaries and trends in a manner that is not attributable to a specific establishment or region that could be identifiable to a specific establishment • Submission of a milestone report to recommend the pro-forma for consideration by AMIC and AUS-MEAT and then to EMIAC through the EMIAC Animal Welfare Subcommittee • Development of a reporting and communications strategy to support the annual report	Project progress report submitted and approved by AMPC
3	Consider future R, D & E activities in the area of animal welfare	• Discussion and conclusions based on findings of previous objectives	**Section 6.0 – final report**

Table 6 Project methodology and progress

4.2 Methodology for Objective 1 – Identification of key performance indicators

4.2.1 Key Performance Indicators (KPIs) included in the industry standard

The industry standard refers to a number of performance indicators that can be used by processors to demonstrate conformance with the industry standard. A large proportion relate to the integration of documented information and provision of resources (for example, facilities and equipment). The assessment of animal handling, restraint, stunning and slaughter is covered by reference to a number of measures and targets. These are reproduced in Table 7.

PRINCIPLE	TARGET
P4.1, 4.6 Expectations for assuring that livestock are fit for the intended journey are communicated to livestock suppliers to minimise the risk of receiving weak, ill or injured livestock at the establishment	• The establishment advises livestock suppliers of: ○ The plant's expectations for assessing the 'fitness' of livestock to be loaded; ○ associated legal requirements for the loading and transport of livestock; ○ any livestock that do not conform to specifications, ○ any adverse animal welfare outcomes.
P2.4 Flooring in pens, laneways, races and ramps minimise slipping, falling and injury	• A monitoring event (at least every 6 months[1]) includes the assessment of slips and falls scored for 100 animals at the point of the unloading ramp, yards, crowd pen, lead up race, and stun box. • Slip or falls are marked per animal for 100 animals (for small plants this might be done over several consignments). • If 3% of animals are observed to be slipping (loss of footing as a result of flooring, e.g. not due to behavioural contact with another animal), corrective action must be taken. • If 1% of animals are observed to fall (body touches floor), corrective action must be taken.
P2.12 Restraining equipment is designed and maintained to restrain animals effectively with minimal stress	• No more than 5% of animals (cattle, pigs only) are observed to vocalise while in the restrainer (measure from the time where the restrainer takes hold), otherwise corrective action is taken accordingly
P5.6, 5.7 Implements used to aid the handling of livestock are appropriate for the species and are used judiciously to minimise	• Electric prod use is monitored as part of the internal audit procedure • measure prod use, observe 100 animals and record prod use (e.g. mark for each animal: X = moved quietly without an electric prod, P = electric prod) from the point at the lead up race to knocking box/restrainer. No more than 25% of the 100 animals are observed to be prodded.

[1] Monitoring needs to be completed on a monthly basis for AAWCS certified abattoirs

stress and injury in livestock	
P6.2 Livestock are effectively stunned with appropriate equipment for the species and class of livestock	• Captive bolt - Correct stun on first shot to be observed for a minimum of 95% animals otherwise corrective action should be taken. • 5% variation on the efficiency of the first shot placement is permissible (misfiring, ineffective restraint etc) however in all circumstances back-up equipment is applied prior to the release of the animal from the restrainer (refer to target 2.15 above). • Gas - CO_2 concentration should be greater or equal to 90% by volume • Pigs should be exposed to CO_2 for a minimum of 100s seconds • Electrical - Correct placement of tongs is observed for at least 98% of animals. Less than 1% of animals should be observed to vocalise due to energising of the electrode before firm positioning • Cattle - 1.5A, Calves - 1.0A, Pigs - 1.3A, Sheep and Goats - 1.0A, Lambs - 1.0A. • Minimum stun duration should be 3 seconds.
P6.3 Where reversible stunning is used, sticking must be applied promptly and in a manner that ensures animals do not gain sensibility	• There must be a monitoring procedure in place to ensure that animals do not regain consciousness 24 and that corrective action is promptly taken as required. • Maximum stun to stick intervals for reversible stunning methods ○ Head-only electrical stun - (Calves - 10 seconds, Sheep - 25 seconds, Cattle - 20 seconds, Pigs - 20 seconds) ○ Non-penetrating percussive - 30 seconds CO_2 - 60 seconds after leaving the chamber
6.4 Procedures are in place to confirm that the animal has been effectively stunned and signs of insensibility are monitored to the point of death: corrective action is immediately taken where required	No less than 100% insensibility on the bleed rail is acceptable.

Table 7 Principles and targets included as 'performance indicators' - reproduced from the information in Section 3 of the industry standard

4.2.2 Key performance indicators used during external audits to verify conformance with retailer standards and AAWCS

Several international retailers require demonstration of conformance with documented animal welfare standards. The external verification audits are carried out by AUS-MEAT

The targets outlined in the industry standard are verified during external audits as part of the required retailer audits or the AAWCS process. The specific assessments undertaken are determined by the species processed and stunning methods used. This information is presented in Tables 8-10.

KPI	DESCRIPTION
Stunning efficacy first shot	• where the stun must be effective on the first application for at least 95% of 100 animals • Includes application of electrical stunning • Stunner settings (Current, voltage and duration) - for electrical stunning
Vocalisation	• Percentage of cattle that vocalise during handling. • Assess from unloading of livestock trucks and trailers through to knocking box. • Shall not exceed 3% during handling • Shall not exceed 5% during restraint
Bleed rail insensibility	• Percentage of cattle that are insensible on the bleed rail. • Shall not be less than 100%
Slipping or falling during handling	• Percentage of cattle that slip or fall during handling. Assessment to include movement of cattle from unloading of livestock trucks and trailers through to knocking box • Shall not exceed 3% for slips • Shall not exceed 1% for falls
Use of electric goad/striking of cattle	• Percentage of cattle prodded with an electric goad or otherwise struck. Assess from crowd pen through to knocking box only • Shall not exceed 25%

Table 8 KPIs audited in AAWCS in facilities processing cattle

KPI	DESCRIPTION
Stunning Efficacy - Electrical Stunning	• Percentage of pigs with correct electrode/ wand placement. • The electrodes/ wand must be positioned to ensure the current to passes through the brain. • Wands must furthermore be placed in position prior to being activated. • Omit this section if CO_2 is used for stunning purposes • Stunner settings (Current, voltage and duration)
Stunning Efficacy – CO_2 Stunning Systems	• No more than 4% of gondolas are to be overloaded • A gondola is scored as overloaded where there is insufficient room for the animal to stand or lie down without being on top of each other
Vocalisation	• Percentage of pigs that vocalise during handling. • Assess from crowd pen through to stunning only • Shall not exceed 10% during handling
Bleed rail insensibility	• Percentage of pigs that are insensible on the bleed rail. • Shall not be less than 100%
Dragging of Sensible Animals/ Deliberately Running an Animal Over a Downed Animal	• Percentage of pigs that were dragged or run-over. • Shall not exceed 0% - zero tolerance
Slipping or falling during handling	• Percentage of pigs that slip or fall during handling. • Assess from crowd pen through to stunning, and include the unloading of trailers where possible. • Shall not exceed 3% for slips • Shall not exceed 1% for falls
Use of electric goad/striking of pigs	• Percentage of pigs prodded with an electric goad or otherwise struck. Assess from crowd pen through to stunning only • Shall not exceed 25%

Table 9 KPIs audited in AAWCS in facilities processing pigs

KPI	DESCRIPTION
Electric Stunning - Proper application of electrodes to sheep	• Percentage of Sheep stunned correctly with first application of electrodes. • Shall not be <99% • Stunner settings (Current, voltage and duration)
Bleed rail insensibility	• Percentage of sheep that are insensible on the bleed rail. • Shall not <100%
Slipping or falling during handling	• Percentage of sheep that slip or fall during handling. Assessment to include movement of sheep from unloading of livestock trucks and trailers through to restraining conveyor • Shall not exceed 3% for slips • Shall not exceed 1% for falls
Use of electric goad	• Not permitted

Table 10 KPIs audited in AAWCS in facilities processing sheep

Additional criteria, classed as willful acts of abuse are also assessed. If any of these practices are witnessed during an external audit it constitutes an automatic audit failure. They are:

- Wilful acts of abuse include but are not limited to:
- Dragging a conscious, non-ambulatory animal.
- Intentionally applying prods or any object into a sensitive part of a single animal such as eyes, ears, nose, anus, or testicles.
- Deliberately slamming of gates on livestock.
- Maliciously driving of ambulatory livestock on top of one another either manually or with direct contact with motorized equipment.
- Hitting or beating and animal.

Table 11 is a summary of the KPIs used in the AAWCS audit process by species processed. The majority of the KPIs are relevant to all species, however, the targets and methodology for assessment may differ (Tables 8-10).

	Species			Comments
KEY PERFORMANCE INDICATOR	Cattle	Sheep	Pigs	
Stunning efficacy first shot			X	Mechanical stunning
Stunning efficacy - correct application of electrodes	X			Electrical stunning
Stunning efficacy - Correct loading of gondolas	X	X		Gas stunning
Vocalisation		X		
Slipping and falling				
Bleed rail insensibility				
Use of electric goad/striking animal				
Dragging livestock				Included on audit form for pigs
Stun to stick interval				Not for penetrative captive bolt[2]

Table 11 Summary of AAWCS audit KPIs by species

[2] Stun to stick interval is not recorded when penetrative captive bolt is used as a stunning method, though prompt sticking is encouraged and other KPIs relating to stunning efficacy and bleed rail insensibility still apply.

4.2.3 Review of audit data and industry survey

The industry standard (to address animal welfare compliance) was developed by AMIC through AMPC. It is pitched at a higher compliance standard than the regulatory requirements. Implementation of the standard is voluntary, but is gaining ever expanding acceptance. Verification of compliance involves the use monitoring activities and the routine collection of KPI data. Unless customer specifications require a more stringent assessment process, the audit sample is determined using the guidance in the AMI Recommended audit and animal handling guidelines 2012, where the number of animals assessed equates to 10% of the hourly production. Independent approved third party auditors verify effective stunning during scheduled on-plant audits. At the time of writing, audit data from the most current external audit for each plant was reviewed (2014/2015), with initial results presented in Section 6.1. During the course of the project, it was established that on-plant monitoring data was not routinely collected by AUS-MEAT and therefore could not be accessed. Consequently, analysis of any correlation between internal monitoring data and external auditing data could not be completed during Milestone 1. Part of the external audit process is however to verify that the monitoring data is reflective of the actual process outcomes witnessed during the audit. Testing the suitability of the identified KPIs for industry implementation therefore comprised of an industry survey (to establish the KPIs already being used and the associated monitoring processes) and analysis of the information provided in order to develop a draft list of KPIs for review and approval by AMIC and AUS-MEAT and then to EMIAC through the EMIAC Animal Welfare Subcommittee (Appendix 4). There is a requirement in the Industry standard for monitoring activities to be undertaken on a 6 monthly basis, however, there may be a need to increase this frequency, for example, AAWCS certified plants are required to implement a monthly monitoring process. The current regulatory process may involve checking on-plant monitoring data for day to day compliance but does not does not involve an in-depth analysis of data to determine on-going performance.

4.3 Methodology – Objective 2

4.3.1 Current system of reporting animal welfare outcomes - establishment level

The Industry Standard

The industry standard (to address animal welfare compliance) was developed by AMIC through AMPC. It is pitched at a higher compliance standard than the regulatory requirements. Implementation of the standard is voluntary, but is gaining ever expanding acceptance. Verification of compliance involves the use monitoring activities and the routine collection of KPI data. Unless customer specifications require a more stringent assessment process, the audit sample is determined using the guidance in the AMI Recommended audit and animal handling guidelines 2012, where the number of animals assessed equates to 10% of the hourly production. The industry standard refers to a number of performance indicators that can be used by processors to demonstrate conformance. A large proportion relate to the integration of documented information and provision of resources (for example, facilities and equipment). The assessment of animal handling, restraint, stunning and slaughter is covered by reference to a number of measures and targets.

The Federal Government has accepted this standard and the associated verification process (on-plant verification and external auditing) via the Australian Livestock Processing Industry Animal Welfare Certification Scheme (AAWCS) as meeting their regulatory compliance, providing that relevant monitoring and audit information is shared. The current verification method involves monitoring of on-going performance against a number of Key Performance Indicators (KPIs), supported by external audits. The external audits (as part of the AAWCS) independently verify conformance with the standard by auditing against the same KPI criteria. There is currently no requirement for an establishment to report monitoring data, unless specifically requested by the regulatory authority. There is an expectation that monitoring data will be made available during the external audit process.

External audit reporting

The KPI targets outlined in the industry standard are verified during external audits as part of the required retailer audits or the AAWCS certification process. The specific assessments undertaken are determined by the species processed and stunning methods used. An overview of the type of assessments used is presented in Tables 8-10. On-plant monitoring data is not collected by AUS-MEAT, though part of the external audit process is to verify that the monitoring data is reflective of the actual process outcomes witnessed during the audit. However, this does not involve an in-depth analysis of data to determine on-going performance. There is a requirement in the Industry standard for monitoring activities to be undertaken on a 6 monthly basis, however, other customer programmes may require the implementation of a monthly monitoring process. The current regulatory process may involve checking on-plant monitoring data for day to day compliance, usually in response to an identified issue.

4.3.2 Current system of reporting animal welfare outcomes - Industry level

There is currently no formal framework in place for industry reporting of animal welfare outcomes in certified establishments and information provided through the AMIC and AMPC websites is limited to general scheme details and overview of the certification process.

AMIC Website

The AMIC website contains the following in respect to the industry standard and the animal welfare certification system:

- Introduction to the Industry standard and The Australian Livestock Processing Industry Animal Welfare Certification System (AAWCS)
- Overview of the scope of the scheme - Compliance with:
  - Industry Animal Welfare Standards for Livestock Processing Establishments Preparing Meat for Human Consumption' (The Standards)
  - AUS-MEAT Animal Welfare (AW) Certification Program Rules for Livestock Processing Establishments' (The Rules)
- Approval of certification system auditors

- Video explaining the structure and function of the Industry Standard and providing links to the certification program manager

The website does not contain specific information on certified facilities or reference to industry performance.

AUS-MEAT annual reports and industry presentations

The AUS-MEAT website provides additional information on the certification process and links to the AAWCS rules and requirements. AUS-MEAT also analyse annual industry audit data and have presented the main findings and trends at industry meetings and conferences, for example, the MINTRAC MI and QA conference (personal communication, Andrew Little AUS-MEAT) (Examples shown in Tables 12 and 13). The total number of certified facilities (as of 28/10/2015) and their distribution across the states is shown in Table 12, of which:

- 42 certified for processing cattle
- 21 certified for processing sheep
- 8 certified for processing pigs
- 15 abattoirs are categorised as multi-species and would therefore be certified for more than one species.

CATEGORY	DOMESTIC	EXPORT	TOTAL
NSW	0	18	18
NT	0	1	1
QLD	1	19	20
SA	0	6	6
TAS	1	2	3
VIC	0	12	12
WA	1	5	6
TOTAL	3	63	66

Table 12 Establishment certification by state - supplied by AUS-MEAT

	KEY PERFORMANCE INDICATOR (KPI)					
YEAR	Stunning efficacy	Vocalisation	Bleed-line insensibility	Slipping	Falling	Use of prod
2006	97.1	3.8	100.0	0.3	0.0	11.5
2007	97.6	1.7	100.0	0.0	0.0	12.6
2008	96.5	1.8	100.0	0.2	0.0	11.8
2009	96.7	1.9	100.0	0.2	0.0	8.1
2010	93.3	2.5	100.0	0.7	0.0	9.0
2011	96.8	3.0	100.0	0.2	0.0	9.2
2012	97.7	2.4	100.0	0.1	0.0	7.8
2013	96.9	1.8	99.9	0.1	0.0	6.8
2014	97.4	3.1	100.0	0.2	0.0	5.9

Table 13 Industry audit summary data for KPIs (as measured and recorded during the external audit) (Australian industry data) - supplied by AUS-MEAT. Red boxes indicate Industry KPI performance that does not meet the required standard.

5.0 PROJECT OUTCOMES AND DISCUSSION

5.1 Objective 01 - Collation and review of KPI information, correlation with audit outcomes

The total number of certified facilities (as of 28/10/2015) and their distribution across the states are shown in Tables 14 and 15. The external audits reviewed during the course of the project covered audits performed in 2014/2015 for certified facilities, of which:

- 42 certified for processing cattle (with a total throughput of 29,134 cattle per shift). A total of 3,235 cattle (across the 42 facilities) were assessed during the audit process. The total number assessed per facility being dependent on the throughput of each shift (see Section 4.2.3).
- 21 certified for processing sheep (with a total throughput of 62,099 sheep per shift[3]). A total of 2,040 sheep (across the facilities) were assessed during the audit process. The total number assessed per facility being dependent on the throughput of each shift (See section 4.2.3).
- 8 certified for processing pigs (with a total throughput of 9,544 pigs per shift[4] for the 6 plants operating gas systems and less than 500 pigs per shift for the 2 plants using electrical stunning). A total of 600 pigs (across the 6 facilities using gas) and 90 pigs (Across the 2 facilities using electrical stunning) were assessed during the audit process. The total number assessed per facility being dependent on the throughput of each shift (See section 4.2).
- 15 abattoirs are categorised as multi-species and would therefore be certified for more than one species.

CATEGORY	COUNT
Certified	64[5]
Cancelled	1
Pending	2

Table 14 Establishment certification status as at 28/10/2015 - supplied by AUS-MEAT

[3] The auditor did not record the number of animals processed per shift for four plants - This data is therefore missing from the total count.

[4] The auditor did not record the number of animals processed per shift for one plant - This data is therefore missing from the total count.

[5] Includes 5 further processing facilities certified as AAWCS trademark users - no slaughter on-site

CATEGORY	DOMESTIC	EXPORT	TOTAL
NSW	0	18	18
NT	0	1	1
QLD	1	19	20
SA	0	6	6
TAS	1	2	3
VIC	0	12	12
WA	1	5	6
TOTAL	3	63	66

Table 15 Establishment certification by state - supplied by AUS-MEAT

5.1.1 Fitness to transport

In a 2009 survey, during a review of the AMIC Industry Standard, the fitness of livestock for loading was reported to be a key issue that processors felt needed considerable improvement. Transport related issues were reported by 80% of respondents in the survey as some of the most influential factors on animal welfare management at the processing plant. The Industry Standards requires that expectations for assuring that livestock are fit for the intended journey are communicated to livestock suppliers to minimise the risk of receiving weak, ill or injured livestock arriving at the establishment. Currently, this requirement is managed primarily through conditions placed on livestock suppliers (producers, feedlots and transporters), such as:

- Inclusion of transport related requirements, for example contingency planning, curfews, specifications for fitness to travel and handling at receival, in their Quality Assurance system
- Adherence with relevant quality assurance programs, such as truckcare.
- Provision of consignment related information at receival, such as livestock condition at loading, injuries, illness and curfew information
- Implementation of emergency procedures, including contact details for out of hours arrival, humane destruction and breakdown/delays
- Implementation of standard operating procedures covering selection for transport, transport conditions and handling

The AAWCS audit includes the following requirements which have a direct or indirect impact on the condition of animals arriving at the abattoir:

- The establishment must have in place written humane handling guidelines for transporters. Guidelines must be posted to or delivered to transporters
- The facility is responsible for the actions of livestock transporters whilst on the facilities property.
- Animals should be unloaded promptly on receival, ideally unloading should commence within 1/2 hour of arrival and be completed within an hour (North American Standard incorporated into AAWCS audit).
- Transport vehicles should be cleaned regularly to prevent heavy accumulation of faeces. Vehicles must have slip resistant floor, and no potential injury points (broken glass, sharp metal edges etc.)
- Less than 5% of animals should be electrically prodded (Use of prods on sheep is not permitted)
- Animals that have become non-ambulatory in transport are to be handled humanely as per company's established procedures
- The establishment is to have on file a current edition Livestock Production Assurance (LPA) National Vendor Declaration Waybill (NVD) / Post Sales Summary / Animal Status Declaration Card (NZ ASD) for each lot of animals slaughtered - **(Immediate failure of audit if unavailable).**
- Any Dead On Arrival (DOA's) carcases should be staged out of public view. DOA's should be recorded and tracked.
- Where the transport of livestock is scheduled by the establishment, journeys are planned so as to not exceed the maximum times off water
- Standard Operating Procedures available that detail actions for:
    - delays in slaughter
    - equipment breakdown and power failure
    - extremes of weather;
    - out of hours for the management of livestock
    - industrial disputes
- Contractual arrangements with livestock suppliers detail specifications for the expected fitness of livestock arriving at the establishment, the maximum time(s) off feed and water and expectations in relation to livestock handling practices

5.1.2 Animal handling

Behaviour is often the most obvious indicator that the animal is experiencing difficulty in coping with its environment. There are a number of behavioural indicators which can be used to identify the inability of an animal to cope or adapt to an environmental challenge. The most common of these, that may be exhibited at the processing plant, is difficulty with animal movement. This can have a number of causes, such as fatigue from transport, inappropriate flooring and facilities, previous lameness, behaviour of the stockperson and handling methods. Movement difficulties are mostly created by poor physical conditions such as inappropriate flooring or pathways (eg lameness associated with poor flooring, slipping on flooring and inappropriate ramp slopes). This can be assessed practically in a processing plant by recording slips, falls and baulking as livestock are moved through the handling system (Grandin, 2012). Grandin (2012) recommends a target of <1% for falls and <3% for slips. The most recent audit results for slipping and falling for certified facilities are shown in Table 16. The results show that for the abattoirs analysed, the industry result was within the targets stipulated in the AAWCS and outlined in the scientific data (Grandin ,2012). Results for individual establishments showed that all abattoirs met the required standard.

ANIMAL HANDLING					
			Species		
			Cattle	Sheep	Pigs
Abattoir (sample)		Count	42 (3235)	21 (2040)	8 (690)
	No Slip	Count	3226	2040	689
		Percentage	99.7%	100%	99.9%
	Slip	Count	9	0	1
		Percentage	0.3%	0.05%	0.1%
	No fall	Count	3234	2039	690
		Percentage	99.97%	99.95%	100%
	Fall	Count	1	1	0
		Percentage	0.03%	0.05%	0%

Table 16 KPI measurement for animal handling (slips and falls) in certified abattoirs

Vocalisation in livestock, particularly cattle and pigs, has been correlated with physiological measures of stress (Hemsworth et al., 2011). Frequent, high and constant noise levels may be indicative of handling problems. However, pigs are very vocal animals and it is not uncommon for waves of vocalisation to occur throughout the handling system, often with little clear cause. In handling systems consisting of a single race, levels of vocalisation that exceed 10% of pigs handled are not unusual (author's personal experience). This is likely to be associated with the inherent limitations in handling system design, though can also be influenced by the animal's previous handling experiences (producer), pig type, farming system etc. The analysis of vocalisation has been described as a non-invasive procedure that may be used as a tool for assessing animal welfare. Consequently, it has been adopted by some industry and customer abattoirs standards as an objective measure to demonstrate fulfilment of animal welfare requirements. Vocalisation scoring is best used at specific points in the processing plant, particularly the forcing pen, lead-up race and the stunning box. Equipment has been shown to have an effect on vocalisations, including head restraint devices, sharp turns in raceways and uneven flooring. The OIE Terrestrial Animal Health Code recommends that performance targets are established to evaluate animal handling. In order to fulfill this recommendation, it suggests the use of numerical scoring to measure the percentage of animals moved with an electric instrument and the percentage of animals slipping or falling at a point in the slaughterhouse. It does not specifically mention the use of vocalisation as an objective measure, although it does refer to the use of *'outcome-based measures, such as animal behaviour, to monitor the level of welfare of the animals.'* Recording livestock as either vocalising or not vocalising is the simplest method to use, without counting the number of individual animal vocalisation nor calculating the intensity, as this can be difficult under commercial conditions.

The AMIC Industry Standard refers to the use of vocalisation as an animal welfare indicator (during handling and restraint) for cattle and pigs. During handling the performance target for vocalisation is 3% for cattle and 10% for pigs. Vocalisations due to electric goad use also contribute to vocalisation score. When restraint systems are used, the Industry Standards refer to performance measures for vocalisation in the following sections:

- Section P2.12: No more than 5% of animals (cattle, pigs only) are observed to vocalise while in the restrainer (measure from the time where the restrainer takes hold)
- Section P5.1: Excessive pressure from restraint - No more than 3% cattle and 10% pigs should be observed to vocalize

It was noted in the recent review of the standard that performance indicators refer to both 3% and 5% being acceptable vocalisation scores for cattle during restraint, possibly reflecting the different recommendations provided by Grandin in different scientific papers. It was recommended, by the reviewer, that this performance indicator be amended to a single figure. Grandin (2012) observed that in well managed processing plants, less than 3% of cattle vocalised when they were being moved through the forcing pen lead up race and stunning box. It was observed that excessive electric prodding, slipping on the floor, too much pressure being applied by a restraining device and missed captive bolt stuns were associated with 98.2% of vocalisations, thus these events were regarded as averse to welfare during the handling of cattle at the processing plants examined. It was also shown that 90-95% of cattle could be moved through the processing system without the use of the electric prod and that prodders were the greatest cause of vocalisation in cattle.

Determining vocalization scores in pigs can be quite difficult. The AMI guide (2005) refers to the measurement of vocalisation in pigs during handling and restraint. The most recent version of this document (2012) has acknowledged some of the limitations associated with the use of vocalisation scoring in pigs and includes the description of modified assessment techniques to overcome some of the issues that have been identified. It now requires vocalisation (in pigs) to be scored in/on the restrainer (conveyor type) or whilst being loaded into the gondola (gas systems). The current AMI audit procedure does not require vocalisation to be scored on the approach to the restrainer, stunning pen or gas system. The wording in the audit guide has been revised and states the following:

> *'Because it is impossible to count individual pig squeals when a group of pigs is being handled, vocalisation scoring of individual pigs can only be conducted in the restrainer, stun box or group stunning pen.'*
>
> *'The U.S. Department of Agriculture (USDA) defines a squeal as an extended sound (0.5 - 2.0 sec.) of both high amplitude and high frequency produced with an open mouth, indicative of a high level of excitement, fear, or pain.'*
>
> *'Score only the squeals that can be determined to be provoked by equipment or humans….If there is no way to determine the cause of the vocalisation then it should not be counted.'*

Grandin also referred to the changes in the AMI guidance on her website (http://www.grandin.com/auditing.scoring.poor.practices.html - accessed September 2015), where it is stated:

> *'There have been questions about the 2005 American Meat Institute guideline on vocalisation scoring of pigs in the restrainer….. Each pig is scored using yes/no scoring as either silent or a vocalizer (squealing). It has to be fully in the restrainer to be scored. The reason pigs are not scored like cattle, in all parts of the facility, is because it is difficult to determine which pig is squealing.'*
>
> *'Another simple method for monitoring continuous improvement within a plant is estimating the percentage of time that the entire stunning room is quiet. As each pig is stunned, the person doing the scoring checks off whether or not the room was quiet. …… Because vocalisation scores can vary by auditor, number of pigs and by room acoustics, room vocalisation scores are difficult to compare across plants and should not be measured by third party auditors. This is for internal use only.'*

The emphasis of the AMI recommended handling guidelines (and associated recommendations by Temple Grandin) is on the use of vocalisation for internal assessment and continuous improvement. The guide recommends that it is used as a tool by the auditor to establish the type of factors that may have contributed to the score. It recommends that an assessment of vocalisation need not be performed if all other core criteria are met.

Table 17 and 18 provide a summary of the audit data relating to vocalisation scores and use of electric prods. These particular KPIs are only measure in beef and pig plants. The use of vocalisation as an indicator of stress is not recommended for use in sheep. The use of electric goads to move sheep is not permitted, therefore evidence of use during an audit would result in an automatic audit fail. Overall industry performance (for pigs and cattle) was within the acceptable range for both goad use and vocalisation. However, there were failures at establishment level, against both criteria. Six out of 42 certified cattle abattoirs exceeded the target for vocalisation during handling or restraint and 2 abattoirs were given non-conformities for goad use exceeding 25% of animals assessed. In the pig abattoirs, one facility failed to meet standards relating to vocalisation and electric goad use. In this case, it is likely that high goad use is correlated with increased vocalisation.

VOCALISATION				
			Species	
			Cattle	Pigs
Abattoir (sample)		Count	42 (3235)	8 (690)
	No vocalise	Count	3155	656
		Percentage	97.5%	95.1%
	Vocalise	Count	80	34
		Percentage	2.5%	4.9%

Table 17 KPI measurement for vocalisation in certified cattle and pig abattoirs

ELECTRIC PROD USE				
			Species	
			Cattle	Pigs
Abattoir - audits		Count	42 (3235)	8 (690)
	No goad	Count	3031	634
		Percentage	93.7%	91.8%
	Goad	Count	204	56
		Percentage	6.3%	8.2%

Table 18 KPI measurement for electric prod use in certified cattle and pig abattoir

5.1.3 Efficacy of stunning and slaughter

Established stunning methods induce unique brain states that are incompatible with the persistence of consciousness. These altered brain states are associated with certain behavioural patterns and physical reflexes which are referred to as animal-based indicators. Indicators should be repeatedly checked to detect signs of consciousness through the three key stages of monitoring during the slaughter process: after stunning (between the end of stunning and shackling), during neck cutting and during bleeding.

The European Food Safety Authority (EFSA, 2013b, EFSA, 2013c) has recommended the use of three 'tool boxes' to monitor stunning and slaughter. Toolbox 1 is for monitoring after stunning and prior to sticking. Toolbox 2 is for monitoring at sticking and Tool box 3 is for monitoring during bleeding. The behavioural signs described in the tool boxes vary depending on stunning method used, stage of the process and species. The indicators of effective stunning used in Tool box 1 are summarized in Tables 1-3 (Appendix 9.1), along with the behavioural signs used to assess stunning effectiveness in other standards and regulations.

Research consistently supports the concept that electrical stunning may mask some of the clinical signs used to assess unconsciousness. For example, during the epileptic fit immediately after electrical stunning rapid eye flicker and nystagmus (vibrating eyeball) may be present, which makes testing eye reflexes difficult. It also questions the validity of this assessment methods when used in this context. Therefore, the use of eye reflexes is more suited to an assessment of brain death on the bleed line, rather than as an indicator of effective electrical stunning prior to slaughter. Rhythmic breathing can be determined by watching for the rise and fall of the chest, with evenly spaced breaths. This should not be confused with random gasping (agonal breathing), a result of spasmodic muscle contractions, which can occur when the brain is dying. During these random contractions, air can also be forced from the lungs, causing the animal to make involuntary noises. It is important to note that the presence of rhythmic breathing or positive eye reflexes alone do not indicate consciousness, but simply indicate that the brain is reorganizing after stunning. Breathing can be present for several minutes in an animal that remains unconscious. Indicators of failed stunning are escape behaviour often with vocalising, absence of the typical tonic or clonic muscle activity, resumption of rhythmic breathing, vocalisation during and after the current application or righting attempts after current application. If the eyeball is able to focus and follow stimuli from the surrounding, the animal is conscious.

In contrast with simple head-only electrical stunning, use of the Jarvis Beef Stunner with the cardiac arrest cycle in place has presented a greater problem in regard to assessment of effective stunning/successful cardiac arrest. Wotton *et al*., (2000) cited by Weaver and Wotton (2008) noted the presence of eye roll and breathing movements animals had received an electrical head stun (causing an increase in brain metabolism and oxygen demand) and had been subject to cardiac arrest as assessed by ECG (thus stopping the flow of oxygenated blood to the brain). These animals were therefore undergoing the death process with associated cerebral anoxia, suggesting a state of consciousness was highly unlikely. They concluded that more research is needed to explore the function of the spinal cord in post-stun/kill responses (when the cardiac arrest and spinal discharge cycles were used) and to suggest quick and accurate assessments that can be used on a high-throughput slaughter line.

EFSA (2013abc) recommends that personnel performing stunning, shackling, hoisting and/or bleeding check all the animals to rule out the presence of consciousness following head-only electrical or carbon dioxide stunning. The person in charge of monitoring the overall animal welfare at slaughter (i.e. animal welfare officer) has to check a certain sample of slaughtered animals for verification purposes. A mathematical model is proposed which can be used to calculate the sample size that he/she needs to check at a given throughput rate (total number of animals slaughtered in the slaughter plant) and tolerance level (number of potential failures—animals that are conscious after electrical or carbon dioxide stunning).

Table 19 is a summary of the effectiveness of different stunning methods (penetrative captive bolt, non-penetrating percussive device and electrical stunning) in facilities certified for the slaughter of cattle. Out of a total of 2437 animals assessed for efficacy of non-penetrating percussive stunning, 88 animals were ineffectively stunned with the first shot (96.4%). In the AMI recommendations (AMI Foundation (2012)), which is the basis of many North American retailer standards (for example, McDonalds), stunning efficacy scores in excess of 95% are deemed acceptable, with 99% referred to as 'excellent'. Using this criteria, the industry score (average for the 42 certified plants) for non-penetrating percussive stunning (96.4%) and penetrative captive bolt (99.6%) and meet the requirement, with the use of penetrative captive bolt being regarded as excellent. In the US, failure rates have been reported to be in the order of 0.6 – 1.2% (Grandin, 1994) with penetrating captive bolt. Table 20 is a summary of the KPI measures for electrical stunning efficacy in sheep and pigs. Only two pig plants used electrical stunning, whilst the other 6 certified pig plants used a modified atmosphere (gas system). The KPI for the efficacy of stunning using gas is a combination of a measure of gondola loading and bleed rail insensibility (see Table 9).

EFFECTIVE STUN						
			Stun type			Total
			PCB	NP	E	
Abattoirs		Count	9	30	3	42
Stun	Effective	Count	670	2349	123	3142
		% within stun type	99.6%	96.4%	98.4%	97.1%
	Ineffective	Count	3	88	2	93
		% within stun type	0.4%	3.6%	1.6%	2.9%
Total		Count	673	2437	125	3235

Table 19 Comparison of stunning efficacy in certified abattoirs (processing cattle) when using different stunning methods

EFFECTIVE STUN			Electrical stun	
			Sheep	Pigs
Abattoirs (sample)		Count	21 (2040)	2 (690)
Stun	Effective	Count	2034	90
		Percentage	99.7%	100%
	Ineffective	Count	6	0
		Percentage	0.3%	0%
Total		Count	2040	90

Table 20 Electrical stunning efficacy in certified pig and sheep abattoirs

Regarding bleed rail insensibility, all cattle, sheep and pigs assessed (n=5965) were insensible on the bleed rail. The external audit does not record information on the following, unless it was specifically noted by the auditor to explain an audit finding.:

- Type of head restraint
- Movement into restraint and box type
- Stunning equipment type and power
- Experience of operator
- Type of animal

5.1.4 Industry survey findings - testing the KPIs

The successful implementation of the identified KPIs was investigated through the use of an industry survey. A simple survey was developed (surveymonkey.com) and approved by AMIC, AMPC and AUS-Meat prior to circulation to AAWCs certified facilities. The aim of the survey was to evaluate the practical implementation of the identified KPIs in an abattoir environment and also establish whether there were any important differences in the way the facilities were collecting, presenting and analyzing KPI data. The survey was circulated to 60 certified facilities and 37 responses were received (62% response rate). Analysis of the survey data showed that the facilities varied in the following:

- Location and throughput
- Species slaughtered - Cattle (calves), Sheep and pigs
- Stunning methods - Penetrative (cartridge driven, pneumatic), non-penetrative (cartridge drive, pneumatic), electrical and gas
- Handing systems - Automated group handling vs. single races for pigs
- Animal welfare assessment and monitoring protocol – for example, sampling methodology, assessment technique and position on processing line
- Preparation of recording documentation
- Alignment of testing period with external audits
- Verification of monitoring process through external audit procedure

- Processing procedures. For example, use of electrical immobilisation after stunning, use and timing of thoracic stick

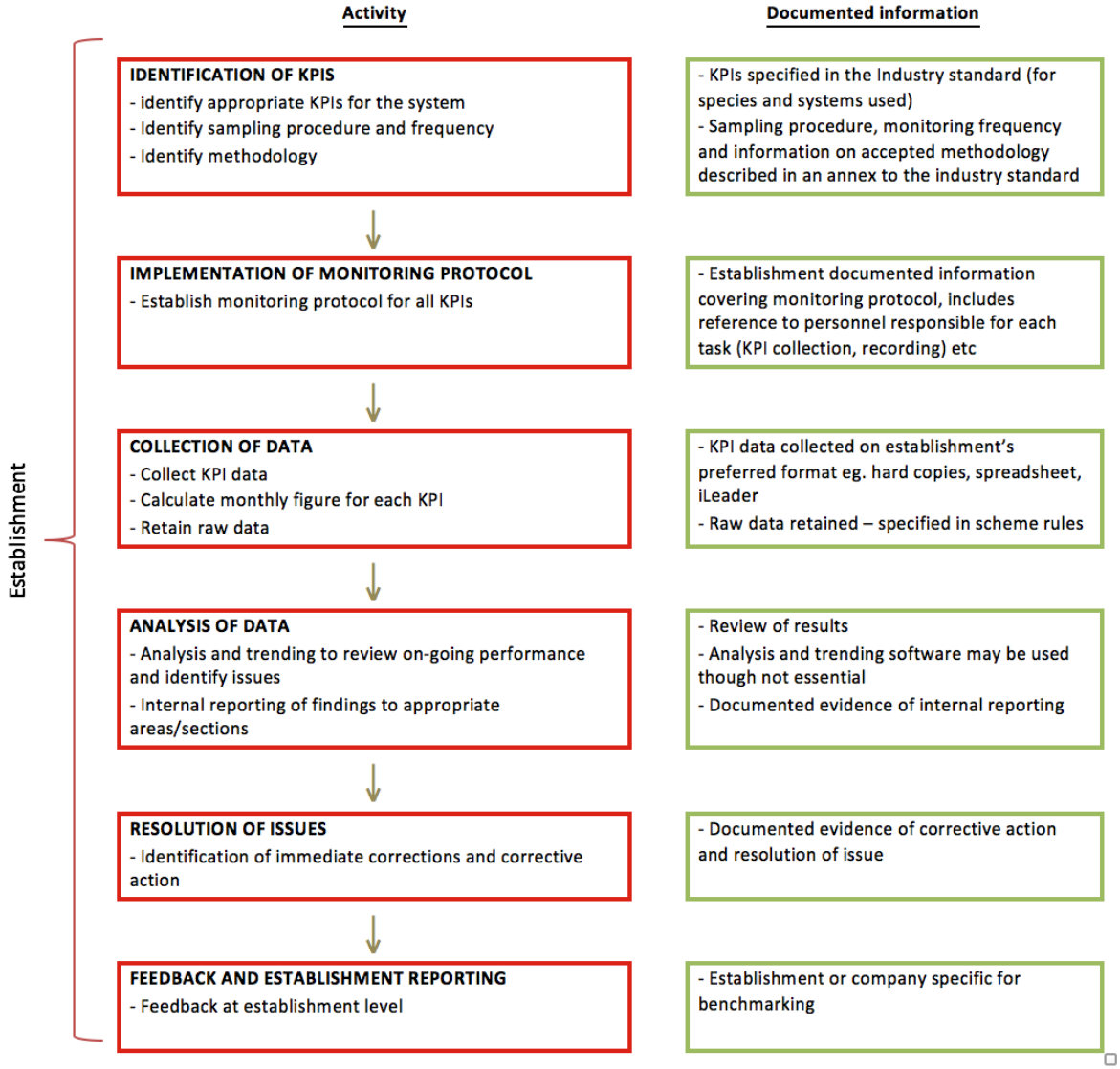
An important finding of the KPI testing and industry survey was the differences in monitoring processes between facilities. It is essential that the implementation of KPIs (to demonstrate compliance) is consistent between facilities and as such allows effective cross comparisons to be made. EFSA, (2013a) have provided an independent view on the indicators and elements for putting in place monitoring procedures, including sampling protocols, at slaughterhouses for different methods of stunning and slaughtering. In order to provide food business operators with an indication on the sample size and frequency of sampling, a mathematical model was developed to calculate the number of animals that need to be checked to fulfil the above mentioned requirements. The model also allows to estimate the potential failure rate given a certain sample size. The model was implemented in a tool with a user friendly interface. This technical report presents this tool and explains its theoretical basis. A user manual is also provided where detailed instructions can be found. This paper presents useful information for both business operators (when implementing monitoring regimes) and audit bodies. Since 2009, there have been developments in equipment designed to monitor equipment-based indicators of effective stunning. Messenger (2012) reported the use of a Stun Assurance Monitor (SAM), an innovative piece of equipment providing 'real time' monitoring of stunning parameters. The software supplied with the monitor allows detailed analysis of operator performance, identification of fatigue and early detection of faults with the electrical stunning equipment. The equipment is used in some plants in the UK to provide assurance to the Muslim authorities that electrical stunning is within certain parameters and animals are stunned, but not killed by the applied electrical current. Butina (manufacturer's of high throughput controlled atmosphere systems for pigs) have also released manufacturer's operational guidance notes that can be used as reference for SOPs. The notes indicate how monitoring systems within the most recent versions of the equipment can be used to fulfill regulatory monitoring requirement.

In the UK and EU, CCTV installation is generally driven by retailer requirements. In 2011, a number of major supermarket chains in the UK introduced a requirement for CCTV systems be fitted in all abattoirs supplying them with meat. Authorities in the UK are still considering the burden a regulatory approach for compulsory CCTV would place on small and medium size businesses, as well as the overall impact that CCTV might have in reducing welfare abuses in slaughterhouses. A detailed survey on CCTV use (with subsequent recommendations) was completed by a Scottish Parliament Cross Party Animal Welfare Group in 2012, however, the published results could not be obtained for review. The Food Standard Agency (FSA) survey (2011-2012) conducted in UK abattoirs, reported that in red meat slaughterhouses, 96 of 253 establishments (38%) were operating CCTV, with 59 of these using CCTV to cover the stunning area, 49 to cover the bleeding area and 85 to cover the lairage and unloading areas. However, they found no significant variation in compliance levels (with UK legislation) between those premises with or without CCTV. The survey also identified that in 134 (53%) of red meat slaughterhouses and 33 (44%) of poultry slaughterhouses it was not possible to observe the practice of slaughterers without the slaughterer being aware they were under observation. Given that there is often limited space in the stunning pen for OVs or Animal Welfare Officers to have a clear view, use of CCTV in these instances may therefore provide a useful monitoring tool.

5.2 Objective 02 - Reporting framework

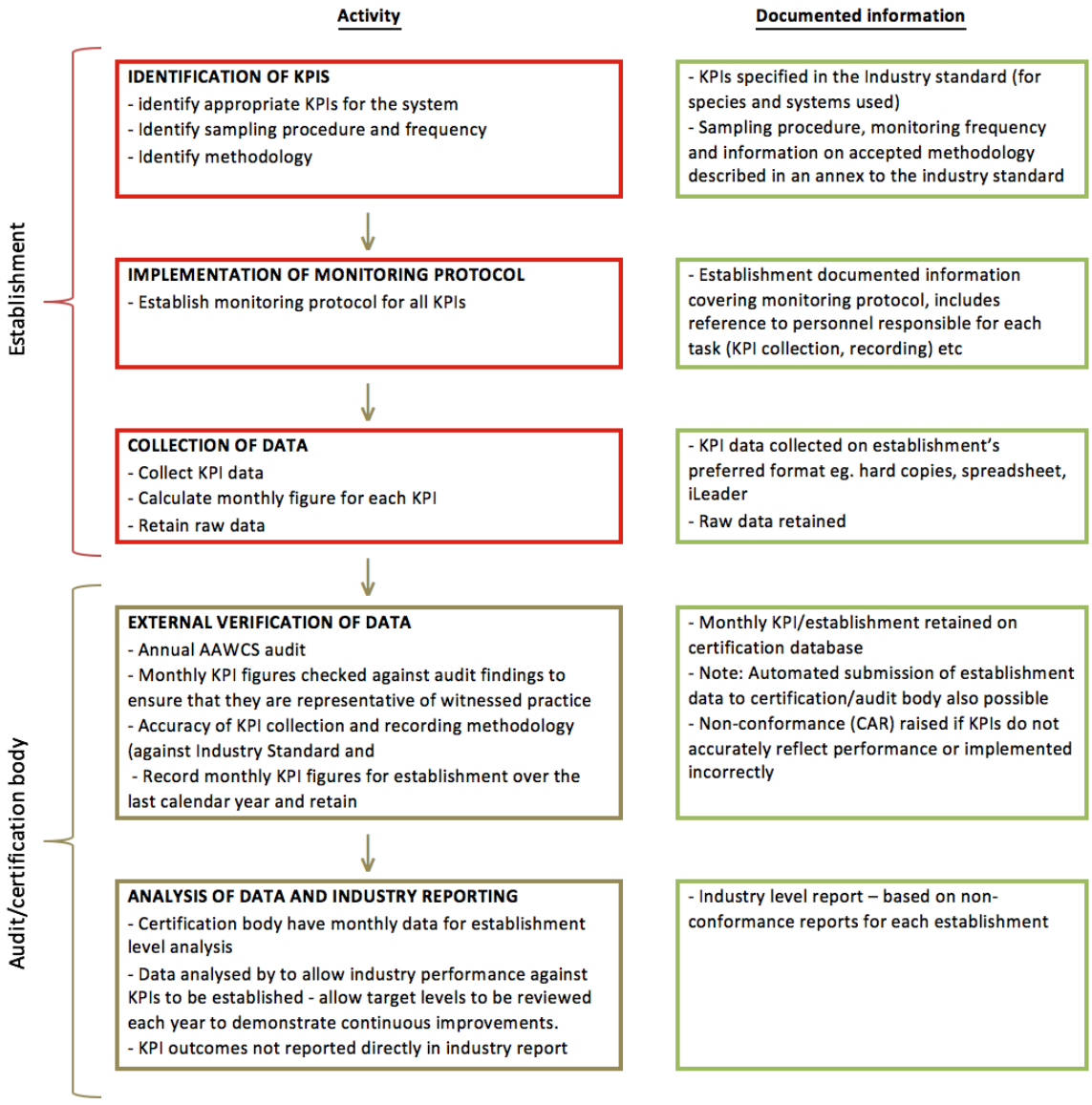
5.2.1 Recommended establishment reporting framework

At an establishment level, it is important that data is not just collected and then remains redundant. Trending and analysis needs to be done to identify existing issues and predict changes in performance. It is essential that KPI data is used to identify those areas where issues exist and allow support and help to be given to eliminate these issues. Where issues are identified it is expected that effective corrections (immediate action) and corrective action (to prevent recurrence) are undertaken. Feedback will need to be given to the relevant areas/sections, to enable continuous improvement.



5.2.2 Recommended industry reporting framework

A proposed framework for the collection and reporting of industry animal welfare outcomes is shown below. A draft pro-forma for industry level reporting is provided in Appendix 9.3 The format and content of which is reviewed in Table 21.



Format and content of industry report	Pros	Cons
Produced annually	- Summarise annual external audits - Coincide with bi-annual revision of industry standards	- Requires yearly analysis of industry data and audit reports
Compliance results for all certified establishments summarised rather than separated by species	- Attention is not drawn to possible species differences.	- Not enough visibility regarding performance of species sectors - The report may be perceived as lacking sufficient detail required to demonstrate adequate welfare outcomes (by species) to consumer
Summary of total non-compliances rather than reference to individual KPIs	- The failure of one establishment to meet the KPI target can influence the total industry figure, therefore using trend analysis of non-conformances presents a more accurate overview of performance and continuous improvement	- The report may be perceived as lacking sufficient detail required to demonstrate adequate welfare outcomes (by species) to consumer
Link to certified establishments	- Transparency – consumers can verify which establishments are certified - Processors who are certified can promote their certification status to their customers	- Transparency – consumers can relate specific industry issues (for example as reported in the media) to establishments that belong to the scheme
Areas for improvement	- Demonstrates ability of scheme to detect issues and the drive for continuous improvement	
Standards review information	- Demonstrates that the standards are under scheduled review and amendment to respond to emerging issues and consumer concerns	

Table 21 Recommended content and format of the industry report

6.0 CONCLUSIONS AND RECOMMENDATIONS

Key Performance Indicators (KPIs) are used to measure the result of a system relative to the aim; or to measure the 'success' of a system. The use of KPIs allows more flexibility in the method of delivering an acceptable welfare outcome and avoids the use of overly prescriptive requirements. A moderate body of research exists regarding the use of objective KPIs to assess the welfare of cattle, sheep and pigs, in the abattoir (Milestone 1). Translation of theory into commercial practice has warranted further development in some areas during the course of the project. It was obvious from the initial analysis of the industry survey data that there was variation between application, measurement and recording of KPIs, between establishments; and between industry and the certification body. It was therefore recommended (Milestone 1) that in-plant monitoring activities be revised to take into account latest scientific research and recommendations, before being incorporated into an establishment or industry level reporting framework. The revised KPIs measures were tested for a range of establishments, to take into account:

- AAWCS and customer monitoring requirements
- Federal and State regulatory requirements
- Species of livestock slaughtered
- Stunning methods used - Penetrative (cartridge driven, pneumatic), non-penetrative (cartridge drive, pneumatic), electrical and gas
- Handing systems used - Automated group handling vs. single races for pigs
- Restraint systems used – Individual, group
- Recording systems and documented information used at establishment level
- Verification of monitoring process through external audit procedure
- System variation between sites, for example:
    - Use of electrical immobilisation after stunning
    - Use and timing of thoracic stick

With these factors in mind, Table 22 provides a summary of the identified KPIs that best reflect animal welfare program compliance and are supported by current scientific understanding. Justification for changes to KPI criteria, refinements to the assessment methodology and reporting requirements (establishment and industry level) are discussed in Section 5.0 and summarised in Table 23. Appendix 2 provides and example of the approach that should be taken during the design of industry level documentation to help eliminate these inequalities and improve consistency in KPI application and collection. For industry level reporting of monitoring and audit outcomes, a sample pro-forma is included in Appendix 3.

Area	KPI	Measurement	Methodology
Animal condition	Fit for transport	- at arrival	- Uses fitness to load criteria - Total number of animals that do not meet criteria recorded as % of total delivered - Continuous recording
	Dead on arrival	- at arrival	- Total number of dead animals at arrival (transport deaths) recorded as a % of total delivered - Continuous recording
	Dead in lairage	- in lairage	- Total number of animals that die (in lairage) prior to processing recorded as % of total delivered - Continuous recording
	Culled in lairage	- in lairage	- Total number of animals that are culled prior to processing recorded as % of total delivered - Continuous recording
Animal handling	Falls	- at unloading - movement to stun	- <1% target - Definition of a fall - Specified sample size and frequency
	Slips	- at unloading - movement to stun	- <3% target - Definition of a slip - Secondary measure – additional internal monitoring/auditor tool - Specified sample size and frequency
	Vocalisation	- during active handling - during restraint	- <3% during active handling - <5% during restraint - Definition of vocalisation - Measured in cattle only - Recommended that not used for pigs. - Specified sample size and frequency
	Electric goad use	- at unloading - entrance to restraint	- Cattle and pigs - Specified sample size and frequency - Goad use prohibited for sheep
Stunning and slaughter	Stunning efficacy	- first shot	- Placement of electrical stunning electrodes - >99% resulting in effective stun - Placement of mechanical stunning device - >95% resulting in effective stun - detection of consciousness (see Appendix - Adequate use of intervention - Specified sample size and frequency
	Unconsciousness	- After stun before bleed - At slaughter - During bleeding	- detection of consciousness - Adequate use of intervention method - Specified sample size and frequency

Table 22 Recommendations for KPI implementation

CONCLUSIONS AND RECOMMENDATIONS		
Finding	**Explanation**	**Reporting**
Industry Standard animal welfare KPIs require some revision to take into account latest scientific research and recommendations	Changes to KPI criteria required to ensure that they: / are aligned with current scientific understanding / follow the recommendations made by EFSA and OIE / meet customer expectations (eg. Incorporate changes in customer standards, such as recent changes to AMI guidance / meet the requirement for valid, objective measures of animal welfare	- Reported in final report - Included in revised Industry Standard – AMIC project AW2 and future revisions of industry standard - Included in revised AUS-MEAT Animal Welfare Certification Program Rules for Livestock Processing Establishments - During update of industry training material - Findings of this project to be incorporated into training and industry extension material - Communicated to minimum standard working group during consultancy period
In-plant animal welfare monitoring activities require some revision to take into account latest scientific research and recommendations	Changes to in-plant animal welfare monitoring protocol required to ensure that they: / are aligned with current scientific understanding / follow the recommendations made by EFSA and OIE / meet customer expectations (eg. Incorporate changes in customer standards, such as recent changes to AMI guidance / are aligned with external audit measures	- Revision of Industry Standard and external audit protocol (where appropriate) - Revised monitoring protocols incorporated into training and industry extension material - Alignment of in-plant monitoring criteria with external audit activities
Alignment of fit to load KPIs with the requirements of the Land Transport Standard and Guidelines is necessary	- There is an information gap between the industry standard and the Land Transport Standards and Guidelines, particularly in the 'fit to load' criteria and associated KPIs	- Industry extension material may be useful to improve communication with producers. - Update of industry training material - Revision of industry standard - Minimum standard stakeholder consultancy period
In-plant monitoring data and external audit data is not regularly collated and analysed to determine and report establishment and industry performance	- Scheduled analysis of establishment data is required to demonstrate compliance and continuous improvement, particularly during the period between external audits	- Implementation of establishment and industry reporting systems - Update of industry training material (Meat Plant Auditor Course)

	- Industry reporting demonstrates change over time and continual improvement in animal welfare standards (including compliance with regulatory requirements).	- Work with AUS-Meat to produce revised audit guidance document (AAWCS.AG) - Circulation of proposed industry report pro-forma to industry representatives
Inconsistencies between internal monitoring activities and external audit processes identified	- Consideration should be given to the production of industry guidance to compliment the existing monitoring training. This will ensure consistency between industry and external auditors regarding verification of non-conformance criteria.	- Update of industry training material - Revision of industry standard - Minimum standard stakeholder consultancy period
As the number of plants certified under AAWCS increases, there is a requirement to ensure that an increased number of auditors still results in a consistent audit process	- Consideration should be given to the production of audit guidance to compliment the existing auditor training. AUS-MEAT have produced a guidance document (AAWCS.AG) that can be refined to fulfill this requirement.	- Update of industry training material (Meat Plant Auditor Course) - Work with AUS-Meat to produce revised audit guidance document (AAWCS.AG)
Investigation into alternative analysis and reporting of KPI monitoring and audit data is required	- Consideration of the implementation of a welfare index, using KPI data - PHI approach	- Industry report pro-forma presented in final report - Further industry discussion required

Table 23 Recommendations for KPI monitoring and reporting (Establishment and industry level)

7.0 BIBLIOGRAPHY

EFSA 2013a. Sample size calculation tool for monitoring at the slaughterhouse. *EFSA supporting publication.*

EFSA 2013b. Scientific Opinion on monitoring procedures at slaughterhouses for pigs. *EFSA Journal,* 11.

EFSA 2013c. Scientific Opinion on monitoring procedures at slaughterhouses for sheep and goats. *EFSA Journal,* 11.

FOUNDATION, A. 2012. Recommended animal handling and audit guidelines: A systematic approach to animal welfare. AMI Foundation.

GRANDIN, T. 1994. Public Veterinary medicine: Food Safety and Handling - Euthanasia and slaughter of livestock. *JAVMA,* 204**,** 1354-1360.

GRANDIN, T. 2012. Auditing animal welfare and making practical improvements in beef-, pork- and sheep-slaughter plants. *Animal Welfare,* 21**,** 29-34.

HEMSWORTH, P. H., RICE, M., KARLEN, M. G., CALLEJA, L., BARNETT, J. L., NASH, J. & COLEMAN, G. J. 2011. Human-animal interactions at abattoirs: Relationships between handling and animal stress in sheep and cattle. *Applied Animal Behaviour Science,* 135**,** 24-33.

WEAVER, A. & WOTTON, S. B. 2008. The jarvis beef stunner: Effects of a prototype chest electrode. *Meat Science,* 81**,** 51-56.

8.0 APPENDICES

8.1 Appendix 1 – EFSA tool box assessment criteria compared with those used in other international standard

Behavioural sign	AMIC	OIE	EC 1099/2009	EFSA	AMI
None listed					
Immediate collapse					
Epileptiform seizure					
Absence of rhythmic breathing					
No spontaneous blinking					
No focus eye/ eyeball rotate					
Fixed eye					
Dilated pupil					
Absence of response to a painful stimulus					
Intermittent gasping					
No vocalisations					
No attempts to stand/righting reflex					

Appendix Table 1 Signs of an effective electrical stun (Cattle, Sheep and Pigs) - as described in the standards and scientific literature

Behavioural sign	AMIC	OIE	EC 1099/2009	EFSA	AMI
None listed					
Immediate collapse					
No attempts to stand/righting reflex					
Tonic phase					
Absence of rhythmic breathing					
Open eye/fixed expression					
No attempt to lift head					
Loose tongue/ears relaxed					
Absence of corneal reflex					
No spontaneous blinking					
Floppy head					
No vocalisations					
No response to a painful stimulus					
Intermittent gasping					
Dilated pupil					

Appendix Table 2 Signs of an effective mechanical stun (Cattle, Sheep and Pigs) - as described in the standards and scientific literature

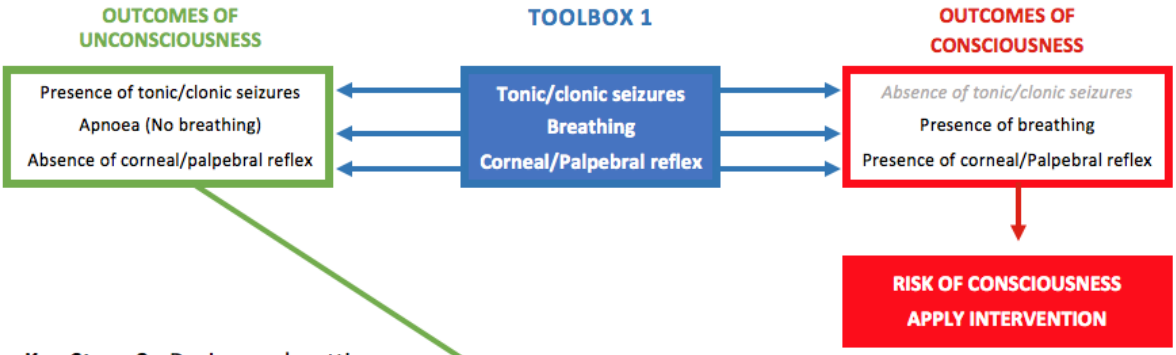
Behavioural sign	AMIC	OIE	EC 1099/2009	EFSA	AMI
None listed					
Loss of posture					
Dilated pupils					
Absence of corneal reflex					
Absence of rhythmic breathing					
No spontaneous blinking					
No response to painful stimulus					
Loose tongue/ears relaxed					
Limp head/neck					
Intermittent gasping					
No vocalisations					
No attempts to stand/righting reflex					

Appendix Table 3 Signs of an effective stun using CO_2 (Pigs) - as described in the standards and scientific literature

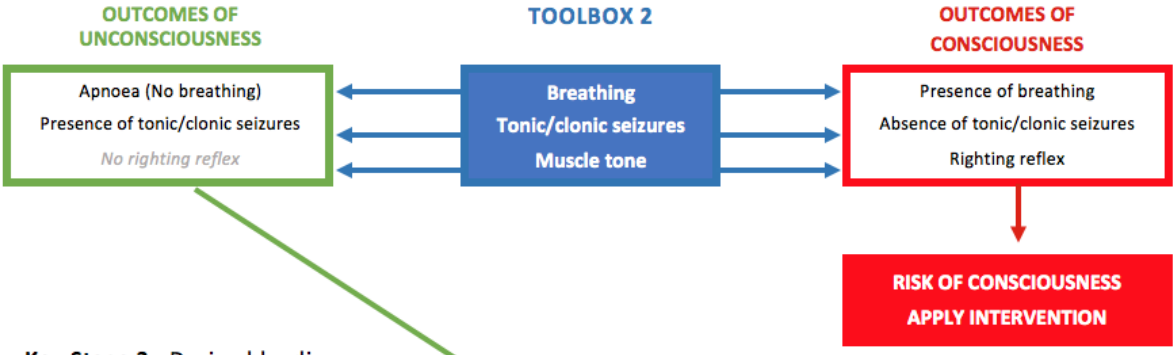
8.2 Appendix 2 – Guidance for KPI measurement during stunning slaughter

Sheep and goat slaughter - Head-only electrical stunning
Check for outcomes of consciousness at each stage

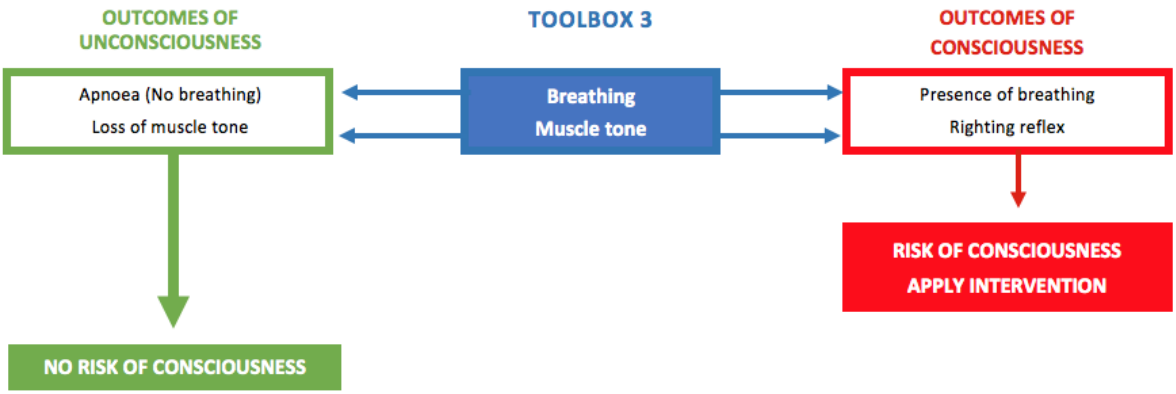
Key Stage 1 - Between end of stunning and shackling



Key Stage 2 - During neck cutting



Key Stage 3 - During bleeding

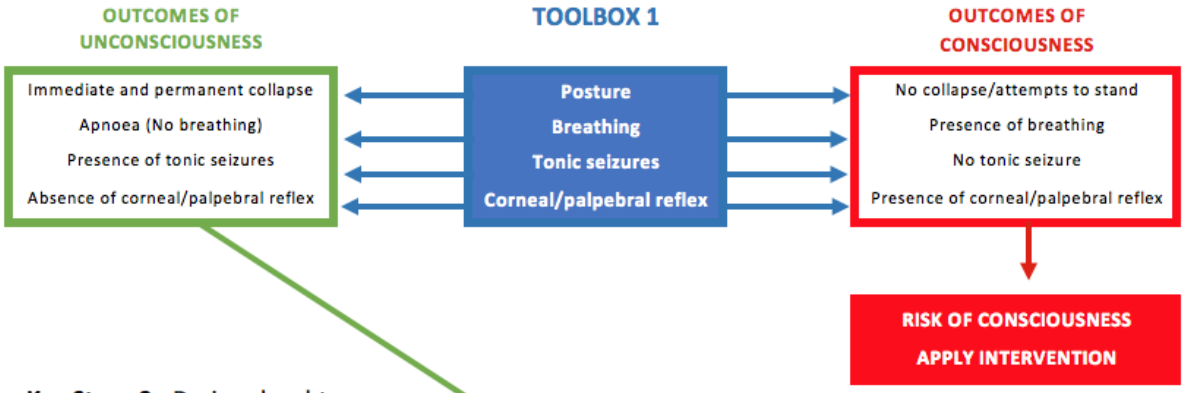


Adapted from EFSA (2013)

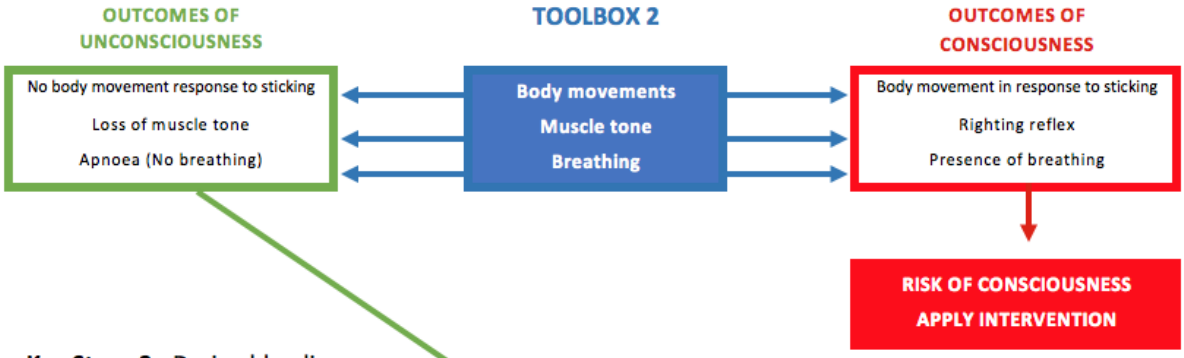
Bovines - Captive bolt stunning

Check for outcomes of consciousness at each stage

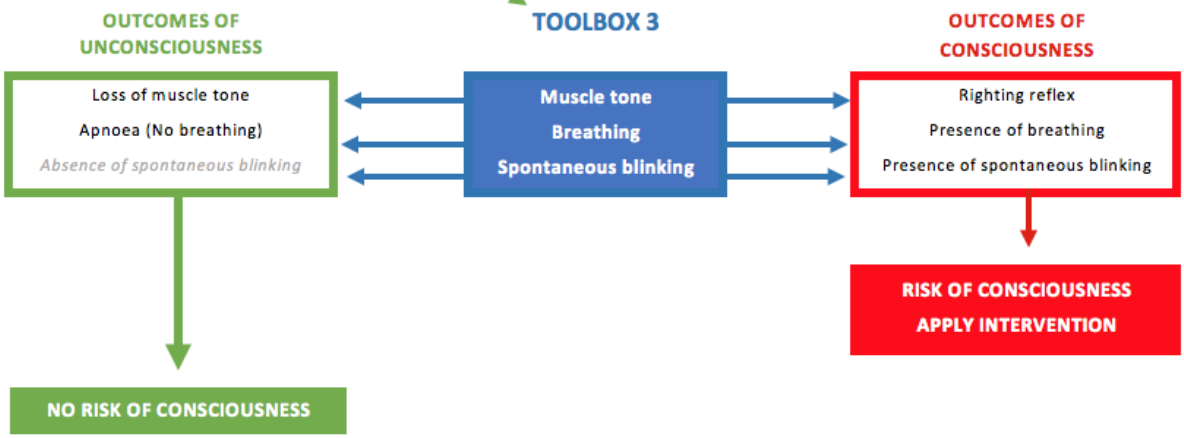
Key Stage 1 - Between end of stunning and shackling



Key Stage 2 - During slaughter



Key Stage 3 - During bleeding



Adapted from EFSA (2013)

8.3 Appendix 3 – Recommendations for industry reporting pro-forma

Key Highlights

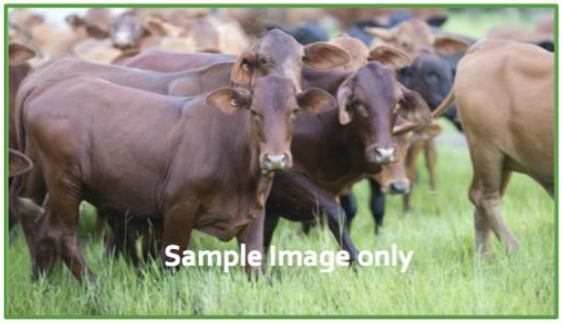
[Key highlights for the year reported]

[Key highlights for the year reported]

Scheme Recognition

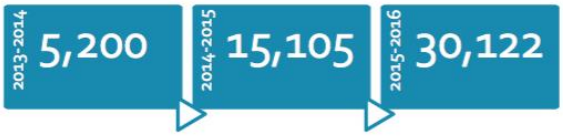
[Number of certified facilities] [Number of audits performed] [Species representation] [Uptake of certification scheme and mark – see example] The AAWCS is an independently audited certification program used by Australian livestock processors to demonstrate compliance with the industry best practice animal welfare standards titled the 'Industry Animal Welfare Standards for Livestock Processing Establishments Preparing Meat for Human Consumption.

[Key highlights for the year reported]



Communication

Content: *[Circulation of annual report] [Social media coverage – Facebook and Twitter followers – if appropriate see example on right] [Website]*



Facebook followers

Scheme Update

The Standards

[Aim of standards] [Scope] [Latest edition] [Overview of content]

Standard Review

[How standards are reviewed – see example]

The Industry standards must stay up to date and relevant for all who use the scheme. It is important that the requirements of the standard respond to changes in the legislation, underpinning science and emerging issues. The standard is reviewed on a 2-year cycle.

Compliance audits and performance monitoring

[Approved certification bodies] [Auditor training] [Monitoring requirements]

[Info on scheme update or standards]

New for 2016

[Changes to the standards] [Changes to scheme implementation/verification] [Changes to customer requirements] [Changes in regulatory requirements]

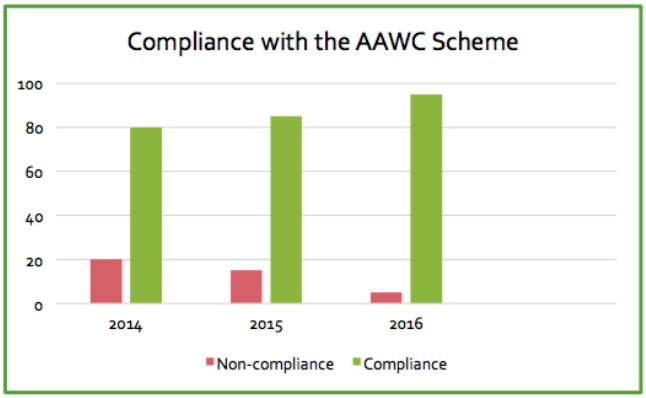
Industry Performance

Welfare outcomes

[Improvements in compliance with scheme over time – linked to KPI submissions and audit outcomes]

Improved compliance with requirements relating to:

- Animal management
- Animal handling
- Stunning and slaughter



What's good

[Overview of industry compliance – see example]

Generally, there is excellent compliance with animal handling requirements and management of livestock during stunning and slaughter.

Improvements required

[Areas that could be improved – see example]

Most members comply but a minority could improve on the following points:

- Implementation of standard operating procedures
- Maintenance of facilities
- Completion of monitoring records

Focus for 2016 – 2017

[Areas of non-compliance that require attention] [R&D research] [Future revision of requirements] [Emerging issues and customer focus]

Connect with us

Certification Rules

Information relating to the certification program and certified establishments can be downloaded from the AUS-MEAT website by clicking here. To contact the AUS-MEAT Animal Welfare Certification Program Manager email ausmeat@ausmeat.com.au or phone (07) 3361 9200.

Industry Standards

To download AMIC's 'Industry Animal Welfare Standards for Livestock processing Establishments Preparing Meat for Human Consumption' (The Standards) click here.

Guidance material

[Link to useful monitoring/auditing tools and templates] [Reference documents and guidance material]

Training

[Link to recognised training - Auditor, animal handling etc]

Contact us

[General contact details] [Social media presence]

[Facebook link – as appropriate]

[Twitter link – as appropriate]

8.4 Appendix 4 – Industry survey

Meat processing industry survey

1. Which livestock species do you slaughter?

- ◯ Single species - Cattle
- ◯ Single species - Sheep
- ◯ Single species - Pigs
- ◯ Multi-species - Cattle and sheep
- ◯ Other (please specify)

2. What is your total weekly throughput? - Total number of animals slaughtered

3. How many animals do you slaughter per hour?

4. Livestock must be 'fit' for the journey to the abattoir. How is this verified on-arrival?

5. How is journey time and total time off feed and water verified at the abattoir?

6. Where and how do you monitor slips and falls? Please outline method used and monitoring position, for example, during unloading -This should indicate the total number of animals assessed .

7. Do you monitor vocalisation of livestock during animal handling?

- ◯ Yes
- ◯ No

If no, please state why not

1

8. Are electric goads ever used during handing of livestock?

- ◯ **No** (If No, please go to question 11)
- ◯ **Yes**
- ◯ If yes, where and when are electric goads used?

9. How is electric goad used monitored? Please outline method and criteria used - This should indicate the total number of animals assessed .

10. Where is electric goad use monitored? Please describe position on the line, for example, entry to stun box.

11. What type of restraint system do you use for cattle?

- ◯ Knocking box (no head restraint)
- ◯ Knocking box (with shelf for animal's head)
- ◯ Knocking box (with head capture no chin lift)
- ◯ Knocking box (with head capture and chin lift)
- ◯ Double rail
- ◯ Cattle not processed
- ◯ Other (please specify)

12. What type of restraint system do you use for sheep?

- ◯ V-Restrainer
- ◯ Pen with manual restraint
- ◯ Squeeze pen
- ◯ Sheep not processed
- ◯ Other (please specify)

13. What type of restraint system do you use for pigs?

- ○ V-Restrainer
- ○ Pen with manual restraint
- ○ Gas system - gondolas
- ○ Squeeze pen
- ○ Pigs not processed
- ○ Other (please specify)

14. Do you monitor vocalisation of livestock during restraint?

- ○ Yes
- ○ No

If no, please state why not (then move to question 13)

15. What stunning system do you use?

- ☐ Non-penetrating percussive stunner
- ☐ Penetrating captive bolt pistol
- ☐ Free bullet
- ☐ Electrical - Manual application
- ☐ Gas system
- ☐ Electrical - Automatic
- ☐ Other (please specify)

16. What is the make and model of your stunning equipment?

17. How do you monitor stunning effectiveness? Please describe method and criteria used - This should indicate the total number of animals assessed .

18. Where do you monitor stunning effectiveness? Please briefly describe position on the processing line.

19. How do you monitor bleed-line insensibility? Please describe method and criteria used - This should indicate the total number of animals assessed .

20. Where do you monitor bleed-line insensibility? Please describe the position on the line.

21. Please indicate any other welfare assessment criteria used in your abattoir (Please tick any that apply)

- [ ] Animals dead on arrival (or dead in pen)
- [ ] Lame animals
- [ ] Sickness
- [ ] Reluctance to move or turning back (signs of fear during handling)
- [ ] Thermoregulation behaviours (shivering, huddling or panting)
- [ ] Skin lesions (pigs)
- [ ] Other (please specify)