final report

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ACC Trace 4

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Executive Summary

This project showed how the GS1 systems (GS1 numbering, bar coding and electronic messaging) incorporating existing regulatory systems (NLIS and NVDs) could be applied along the whole of the beef supply chain from breeding through to retail to improve efficiently and traceability.

The project was conducted with the Australian Country Choice supply chain from breeding properties through to Coles retail outlets utilising 2,000 livestock units.

The analysis of the methods for identification of cattle, mobs, kill lots, carcases, cartons and consignments as well as the time taken to management the identification and related information was conducted. The analysis showed that for 1,000 head slaughtered per day there was an average along the whole supply chain of 25 mob movements/NVDs per day (inductions, property exits and lairage arrivals), 18 kill lots and 9,000 cartons. The labour for all of this identification and information management along the whole supply chain equated to approximately 27,500 hours per year.

The one of the objectives of then project was to lower the hours spent managing identification and information along the whole supply chain. The use of the electronic NVDs to pre-populate the NVD forms, passing the data electronically and the GS1 bar coding for the carton has shown to lower the time by up to 20% per year. These saving were achieved by not needing to enter the same information a number of times along the supply chain. The project also validated the traceability process along the supply chain by use of DNA finger printing technology for statically representative number of cattle.

The investment required by ACC for the project related to on farm software, farm work practice, feedlot software, feedlot work practice, on plant software for kill agendas as well as the existing on plant for GS1 from slaughter through to retail. The collective software required an investment of $160,000.

Based on an averaged labour cost of $25.00 per hour, the pay back period for the project has been calculated to be less than 15 months.

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IMPORTANT NOTICE

1 Trace 4 Project

1.1 Background

Over the last 6 years MLA has worked with Australian Country Choice (ACC) to investigate, develop and implement a tracking and traceability system that could be utilised by industry.

Over the time that this work has been completed the drivers for such a traceability system have increased. Our major export customers, the USA and Japan, are examining their own internal tracking and traceability requirements with Japan having implemented mandatory traceability in its domestic market. It is only a matter of time before these crucial markets demand this of our industry. Traceability will not only be a requirement of our export customers, but will become just as important in the domestic market.

The work that has been completed by ACC has focussed on traceability in the domestic market and the work that has been undertaken in conjunction with Australia Meat Holdings has focussed on the export market into the USA.

To date there has not been a full commercial demonstration of complete through supply chain traceability. The work has been completed in sections:

1. Abattoir to domestic customer, including co-products;
2. Abattoir to export customer; and
3. Feedlot to abattoir in conjunction with the National Livestock Identification Scheme (NLIS).

The NLIS has been demonstrated to capture the live history of the animal effectively; it has been linked with the system used at the abattoir (based on bar coding, electronic data interchange and DNA sampling) and this system has been tested at the domestic level and commercially at the export level. There has not been a full commercial demonstration of the tracking and traceability of live and processed beef products from property of origin to retail.

1.2 Project Concept

To commercially demonstrate the full tracking and traceability of livestock and processed beef products from property of origin to retail.

1.3 Methodology

This trial will include data capture, local processing, transfer and central processing for 2000 livestock units through the breeding, back grounding, lot feeding and slaughter pathway of the ACC supply chain through to the Coles domestic retail chain. The trial will involve the following activities:

- Tagging and reading of individual cattle with NLIS devices at the property of origin.
- Capture of information at each property that requires pass forward along the supply chain.

- Sending GS1 electronic messages to ACC head office of the records of the induction and other supply chain information.
- Sending GS1 electronic messages to ACC head office of the records of consignment of the cattle and associated commercial data.
- Sending GS1 electronic messages to NLIS of the records of consignment of the cattle.
- Reading of NLIS devices at time of slaughter.
- Sending GS1 electronic messages on slaughter to NLIS.
- Sending GS1 electronic messages to Coles regarding despatch.
- Receipt of GS1 message from Coles on receipt of goods.
- Sending GS1 Query messages from Coles to ACC head office.
- Sending GS1 electronic messages on livestock performance (feedback).
- Sending GS1 Query messages to the NLIS for the live history on slaughtered livestock.
- Receiving GS1 Response messages from NLIS on the live history of slaughtered livestock.
- Response to Coles on query.

There are a number of specific GS1 electronic messages that will be used for the commercial demonstration trial these are as follows:

- EANCOM Despatch Advice (DESADV) for consignment information both for NLIS update and between trading partners.
- EANCOM Quality Test Report (QALITY) for attribute information eg market category, meat colour, hip height as well as many other for use between the trading partners (producer feedback).
- EANCOM Product Inquiry (PROINQ) for requesting a query on the NLIS database.
- EANCOM Product Data (PRODAT) for a response from the NLIS database. The EANCOM Product Data (PRODAT) message can also be used to update the NLIS database with records of the date of slaughter.

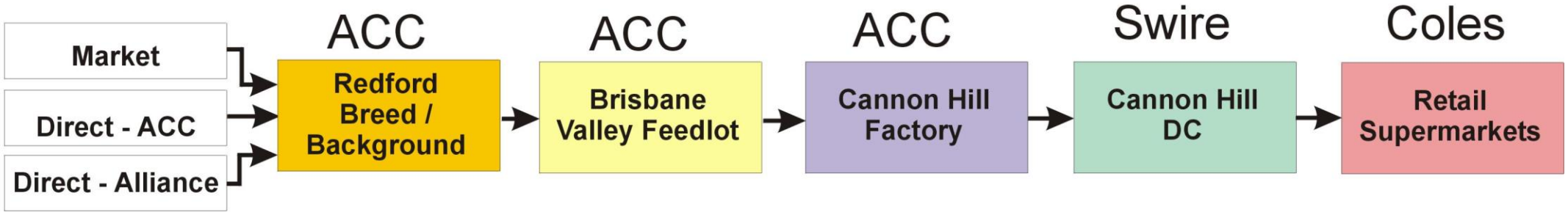
The proposed Pathways are:

Pathway # 1 (Feedlot to Factory)

Market procurement and Breeding / Back Grounding property consignments to supply Brisbane Valley Feedlot.

MARKET – FEEDLOT – FACTORY (4 MONTH CYCLE)

Pathway # 2 (Breeding/ Backgrounding Farm to Feedlot to Factory)



Redford Group Breeding / Backgrounding (Business Unit - Redford) to supply Brisbane Valley Feedlot. BV Feedlot to supply Cannon Hill Slaughter Facility.

BREED – BACKGROUND – FEEDLOT – FACTORY (12-18 MONTH CYCLE)

1.3.1 Outcomes

The Project outcomes are as follows:

- Successful commercial demonstration of electronic and manual/ electronic capture of information on property related to the supply chain - ie induction, commodities, consumables, transport .
- Successful commercial demonstration of electronic messaging of Vendor Declarations (NVD, MSA VD, Waybill, etc) as well as individual animal identification information between a vendor and consignee through the 2 pathways.
- Successful commercial demonstration of traceability for both track forward and trace back by use of mob and individual identification methods and validated by use of DNA methods for 2 pathways.
- Successful commercial demonstration of electronic messaging between commercial / regulatory entities.

1.4 Project Opportunity

1.4.1 Benefits

The benefits to be demonstrated to industry include cost, accuracy and speed of the use of electronic data capture methods linked to electronic messaging, DNA, EANCOM standards for mob/ individual identification through the entire beef supply chain.

1.4.2 Barriers

The barriers to be overcome include:

- Technical barriers related to equipment:
  - Tag readers
  - Data collection equipment
  - On-Farm computer systems
  - Telecommunication infrastructure to service rural locations for electronic messaging
  - Standards for electronic messaging
- Operational barriers due to limited computer skill sets of the on-farm personnel.

2 Milestone 1 - Research/Investigation/Discovery/Identification

The milestone 1 section of the Trace 4 project required completion of the following:

- Investigation and Analysis of the 2 proposed pathways including:
  - Current on-farm electronic technologies
  - Current work practice for mob and individual livestock management
  - Current work practice for information collection (data capture)
  - Current telecommunications infrastructure
  - Information flow between each property with in the pathway
  - Leakage of livestock in and out of the pathways
- Current commercial offering of electronic/ manual data capture systems to industry.
- Gap analysis between existing offering and requirements.

2.1 Investigation and Analysis of the Pathways

The various property links were analysed during the project to determine existing work practices and identification methods.

The cattle from the properties may have been bred on the property, moved from one property to another for growing out before being sent to the feedlot. Individual Ear Tags are attached to identify the cattle and the property where the tag was attached. When cattle arrive at a property the existing ear tag is often removed. This process of removing and replacing ear tags is an expensive and labour intensive process.

There is also the leakage into and out of each property link in the supply chain.

2.2 Leakage In and Out of the Supply Chain

The process of traceability and good inventory management relies upon accuracy in identification and currency in data management. Leakage in and out of the supply chain that is not captured and managed in a timely manner will greatly reduce the effectiveness of the traceability and inventory management processes.

The causes of leakage must be identified and system put in place to manage these occurrences.

The leakage is caused by:

- Births – unplanned.
- Additional outside purchases (this can be to any section of the supply chain. Including direct consignment to slaughter from Saleyards).
- Deaths (known and unknown).
- Unidentified animals that are found. These are cattle that do not have an identification because the ear tag(s) has been lost, been removed by accident and not recorded, have never been recorded before (wandered from another property, have not been musted before, were not tagged/ recorded when arrived).

- Not recorded – These are cattle that have identification (e.g. management and/ or NLIS tags) but are not in the on-farm cattle management database.
- Culls - sale of cattle not suitable for market segments.
- Culls - Breeder cattle and bad performers that are redirected to slaughter.
- Transfer errors – errors created by either human or system errors that effect the information about the individuals that comprise a mob. This can also be caused by "fence jumpers" where cattle have become mixed with incorrect mobs.
- Theft - Cattle that are stolen.

2.3 Breeding Property

On the breeding properties weaning of cattle occurs at nominated times. The cattle are processed and initial market assessment is conducted based on sex and weight. The cattle are tags as per the details below on tagging and relevant information recorded.

At nominated times that cattle at again processed and market direction determine by weight, sex and other attributed. The possible market segments are:

- Sen to backgrounding,
- Sent to the Feedlot,
- Sent directly to sales, or
- Sent directly to Slaughter

Yarded Cattle at the Breeding/ Backgrounding Property

Capture Equipment set-up at the Breeding/ Backgrounding Property

Data being Captured at the Breeding/ Backgrounding Property

Cattle Processing at the Crush at the Breeding/ Backgrounding Property

2.4 Back Grounding Property

Cattle on arrival at the backing grounding property are counted off the truck to ensure the number corresponds with that on the waybill. The store stock coordinator and the General Manager-Agribusiness are notified immediately if numbers are incorrect.

All tail tags are removed if cattle are from the saleyard and the cattle are identified with an individual tag.

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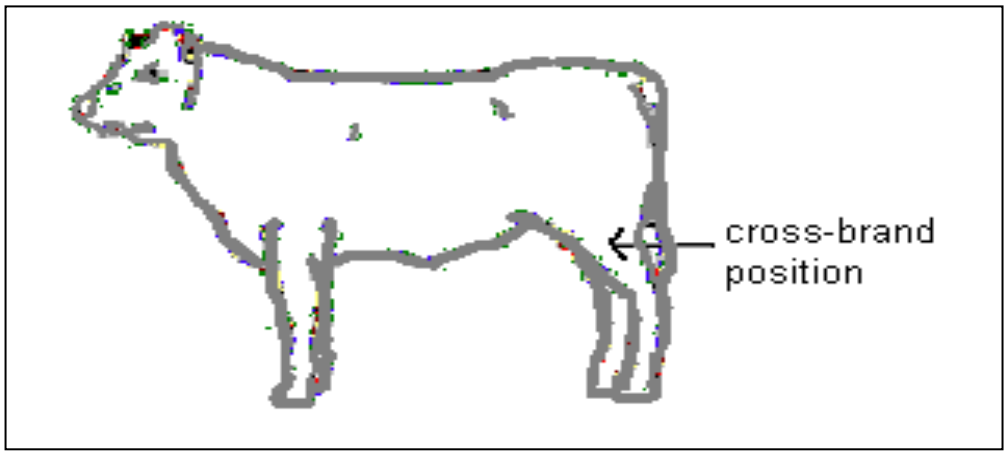
Cattle are to be cross branded on the near side hind leg
Illustration 1: Position of cross-brand



Cattle are then drenched.

All cattle except feeder cattle are implanted with an HGP inserted in the ear. Cattle that have received an HGP are be identified with an identification triangle ear punch in the tip of the off side ear.

All cattle with large horns are dehorned at the head to prevent carcass damage to other cattle.

Cattle mouthed and appropriately identified and store stock co-coordinator and General Manager-Agribusiness notified of any abnormal percentage of 6 & 8 teeth cattle.

Any entire males are castrated.

2.4.1 For Feeder cattle

Cattle that are weighed as feeder cattle receive different treatment to the other mobs. They only receive the following treatment:

Ear tag (refer to ADM 1018 – Cattle Identification)
Cross brand
Tail tag removed (if saleyard cattle)
Entire males are to be castrated

At the end of processing a Daily Cattle Record is completed and signed. If the cattle are from the saleyards a Property Processing Sheet must be completed. A Stock Movement Advice is completed and faxed to, ACC head office Livestock department, receiving property or feedlot and to General Manager Agribusiness. General comments positive or negative on SMA are important in keeping the livestock department in touch with purchases.

2.4.2 Redford Breeding/ Backgrounding Property

The Redford breeding/ Background property will require equipment at the crush for intelligent weight recording, bar code for DNA samples and NLIS tag readers (both wand for induction and panel for general weighing). A hand held wand for scanning after NLIS tags are attached is critical to ensure that any damaged tags are detected before the animal leaves the crush.

Crush at Redford

The computer system at the homestead is suitable for the necessary cattle management (Stockbook) and eDEC software. The system is a Pentium 3 with 256 mb of ram with UPS and printer. There is a 64Kb/s 2 way satellite broadband connection with dial up back up.

2.5 Feedlots

Cattle on arrival at the Feedlot are held in holding pens until induction.

During induction the cattle are tagged, weighed and have other attributes recorded. The source information eg source PIC and NVD are recorded for the mob of cattle.

Sick or injured cattle are processed and held in the sick pens.

At nominated times the cattle are reweighed and suitable cattle are sent to slaughter.

2.5.1 Brisbane Valley Feedlot

The Brisbane Valley feedlot has had a number of changes completed over the last 12 months. Including a new crush and data capture equipment.

Crush and Data Capture at Brisbane Valley Feedlot

NLIS Panel Reader was installed at the feedlot before the crush and data is que up to 3 cattle before the crush.

NLIS Panel Reader before the Crush at Brisbane Valley Feedlot

The computer system at the feedlot office is suitable for the necessary cattle management (FY3000) and eDEC software. The system is a Pentium 3 with 256 mb of ram with UPS and printer. There is a 400 kb/s 2 way satellite broadband connection with dial up modem back up.

At the crush there is a harsh environment computer running StockaID and connected to the scale indicator and NLIS panel reader.

2.6 Slaughter/ Boning

Cattle when they arrive at the abattoir are unloaded and placed in holding pens. The kill agenda is prepared from the cattle that arrive. The individual NLIS devices can be read at knocking. Traceability through the slaughter floor is maintained by GS1 carcase ticket until entry into the boning. The carcase ticket is scanned on entry to the boning room and the time/ date recorded to provide traceability by time and date windows.

Finished cartons must have GS1 bar code with unique serial numbers to provide traceability and recall.

2.6.1 Cannon Hill Slaughter and Boning Facility

The Cannon Hill slaughter facility is capable of slaughter 1,000 head per day. The systems are in place to record individual NLIS device number at knocking along with lot numbers and management tag numbers. GS1 carcase tickets are in use through the slaughter process to the boning room. DNA samples are collected fro all carcases in the chillers. Boning entry scanning occurs and the record of the carcase entry is maintained.

All carcases are boned. All carton product has an GS1 bar code printed and attached. Cartons are scanned to verify correct GS1 bar code before release. Cartons then enter the tunnel to the distribution centre.

Tunnel to Distribution Facility

The Cannon Hill facility computer system comprise various systems from lairage and slaughter through to transfer of carton data to the distribution centre.

The telecommunication infrastructure includes a 400 kb/s 2 way satellite and 2 x DSL broadband connections with backup systems.

2.7 Distribution Systems

Carton distribution systems must be able to record entry of product by scanning the GS1 bar codes and matching the electronic messages of the intended cartons. Where errors occur

suitable corrective actions can be taken.

Product (carton or case) must be picked by scanning the GS1 bar codes to record product and serial number data that is sent to each retail facility. This provide the critical link for traceability and recall of carton or carcase product.

2.7.1 Cannon Hill Distribution Centre (Swire)

The Cannon Hill distribution facility distributes the carton product to the retail stores.

Distribution Facility with Cross Docking areas in foreground

2.8 Current Identification Methods for Cattle

2.8.1 Tag Colour (ACC bred cattle)

The five colours used for ACC bred cattle are recurring every five years. These colours are shown in Table 1.

Table 1: Tag colour for each financial year

Financial Year	Tag Colour	Financial Year	Tag Colour
1999/2000	Green	2004/2005	Green
2000/2001	Blue	2005/2006	Blue
2001/2002	Black	2006/2007	Purple
2002/2003	White	2007/2008	White
2003/2004	Orange	2008/2009	Orange

Note: The black tag used in 2001/2002 has not recurred and has been replaced with a purple tag due to the difficulty in using white marking pens.

The following acronym has been identified as a method of remembering the order of the tags:

Good	**B**oys	**P**lay	**W**ith	**O**thers
R	**L**	**U**	**H**	**R**
E	**U**	**R**	**I**	**A**
E	**E**	**P**	**T**	**N**
N		**I**	**E**	**G**

Tag Position (ACC bred cattle)
Male Position – Near ear
Female Position – Off ear

Tag Colour (Backgrounding cattle)
Tags will be RED every year

Tag Position (Backgrounding cattle)
Male & Female Position – Off ear

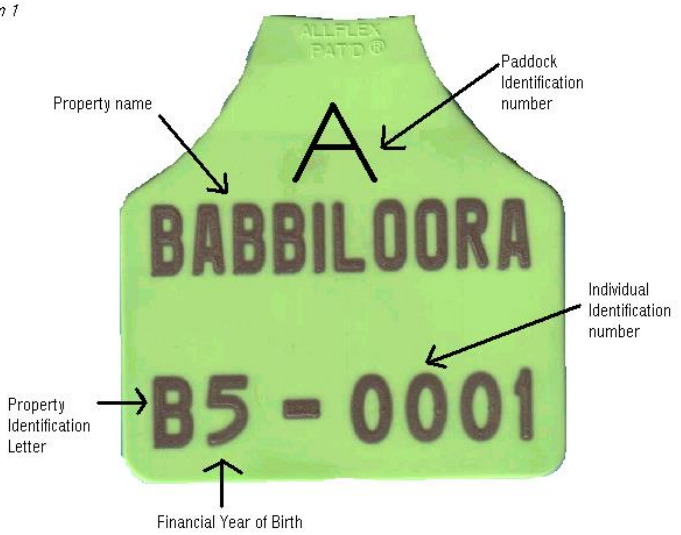
Tag Position (Yellow tags)
Male & Female Position – Off ear
Tag Position (Black tags)
Male & Female Position – Off ear

2.8.2 Ear Tag Identification Definitions

ACC bred cattle

All cattle are to be tagged at branding? Illustration 1 is an example of a breeder tag.

Illustration 1



Tags will be printed with the property name at the top of the tag. Printed on the bottom of the tag will be a property identification letter and financial year identification number. The number letter sequence enables the data base to recognise the property of origin and year of birth of the animal.

The property identification letters are as follows:

B – Babbiloora
R – Redford
W – Wellclose
O – Oakwood
Y – Yo Yo Park
N – Niella

The financial year number will be the last digit of the financial year. eg. 2004/2005 financial year will be 5.

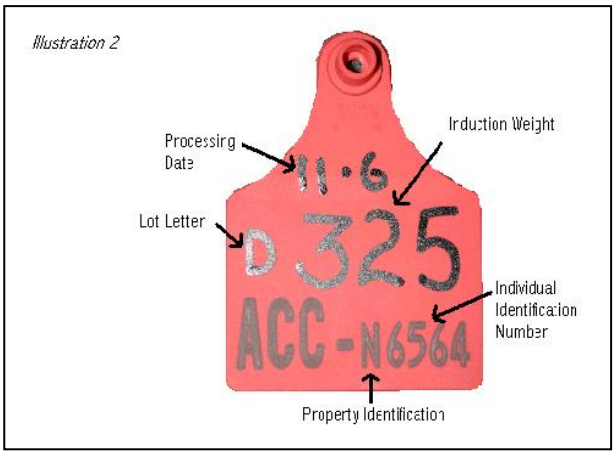
Following the letter and number will be a 4 digit individual identification number unique to each tag.

A paddock or area of origin reference letter must be hand written with permanent tag pen, on the top of the tag. A letter will be specified by each property for each paddock or area of origin. This allows quick visual trace back to the paddock, or area the animal was born.
The relevant tag numbers used must be recorded in the Daily Cattle Record. This allows traceability to the paddock of origin.

Backgrounding cattle – Identification

Cattle are to be processed with tags that have a lot letter, date of processing and induction weight hand written on to the tag with permanent tag pen. Refer to Illustration 2 for an example of a backgrounding cattle tag.

Illustration 2



The date is written at the top of the tag. The lot letter is written on the left hand side of the tag. The weight is written beside the lot letter, on the remainder of the tag and should be large enough to read in the paddock. (Some facilities do not allow the weight to be recorded). The tags are pre-printed on the bottom with ACC, followed by a property identification letter and then an individual identification number. The numbers range from 0 to 99999.

The property identification letters are as follows:

N – Niella
B – Babbiloora
R – Redford
W – Wellclose
Y – Yo Yo
O – Oakwood

It is necessary to note the relevant tag numbers for each lot in the Cattle Handling Record or Property Processing Sheets.

Saleyard Cattle

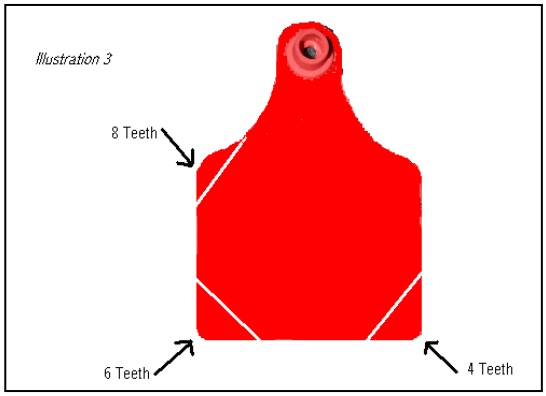
When processing saleyard cattle it is necessary to match each individual tag number with the appropriate tail tag number from that animal. This enables traceability to the property of origin. The tail tag numbers must be noted on the Property Processing Sheets. Both Allflex and Landmark Roma will keep a record of the sequential numbers of the tags previously sent to the properties. This will ensure that the correct sequence of numbers continues when re-ordering tags.

Backgrounding Cattle – Mouthing Identification

As cattle are inducted they must be mouthed to ensure that cattle will not be sold to the feedlot or Cannon Hill with 6 teeth or more.

Milk teeth and 2 teeth cattle are identified by a whole tag.

4 teeth cattle are identified by cutting the bottom right hand corner off the tag.
6 teeth cattle are identified by cutting the bottom left hand corner off the tag. These cattle should be further identified with a black tag.
8 teeth cattle are identified by cutting the top left hand corner off the tag. See Illustration 3. These cattle should be further identified with a black tag.



The Livestock Manager should be notified of all cattle that have been inducted with 4 teeth or more. 4 tooth cattle that are at risk of breaking 6 teeth before turnoff should be isolated to be transferred or sold as directed by the Livestock Manager.

Cattle that are identified with a black tag, as a result of having 6 or 8 teeth should be isolated to be transferred or sold as directed by the Livestock Manager.

During induction these 6 or 8 teeth cattle are not to be treated with an HGP or any product that has a withholding period. They should only be cross-branded and receive an induction tag and black tag.

Yellow tags - Breeding property alert tag

Breeding properties are to use a yellow tag to identify any animal that requires attention. The tag must be written on in permanent tag pen to specify the problem. eg: If one testicle has been missed or smashed during castration the animal will be identified with a yellow tag.

In accordance with the feedlot procedure if any animal receives treatment for illness the animal will be identified with a yellow tag. Hand written on this tag will be the type of treatment, date of treatment and the WHP expiry date.

Compliance with Cattle Care requirements

As a requirement of Cattle Care, ACC has selected the yellow tag as a means of identifying any animal that requires identification of treated or contaminated stock. This may include broken needles that remain in the animal or animals that are treated with Penicillin.

All branding and processing equipment will include yellow tags as a component of the kit.

Yellow tags are never to be removed, unless a problem is rectified, such as a testicle being removed that was previously missed.

Black Tags

Black tags are to be used to identify cull or non conforming animals. Black tags were previously used for the birth year 2001/2002. All non-conforming cattle receiving a black tag should be communicated to the Manager Livestock at Cannon Hill Head Office. Cattle that are to be sold immediately will be isolated and no black tag is to be administered.

2.9 Current Identification Methods for Carcases and Cartons

Carcases and cartons are identified by use of the “GS1 Numbering and Bar Coding Guideline for the Red Meat Industry” requirements. Through slaughter to boning and then to distribution the use of the GS1 bar codes which include product code and serial number information are used for tracking and tracing.

2.10 Issues with Current Systems Used on Properties

On farm information systems have become a vital part of beef cattle production. The introduction of electronic identification tags as well as the need to optimise performance and provide traceability has meant that greater numbers of information systems are being used on farm.

In many industries the introduction of technology has not been without some pain along the way. Beef cattle production is no different. In fact the harsh environment of the farming properties creates difficulties that many other industries have not had to face.

Over the last few years various software and hardware systems has been trialled in beef cattle production environments. This document summarises a number of the findings from audits of properties and discussions with the users of such equipment. The results have been a set of general requirements for on farm information systems. This document does not intend to specify each and every possible use and circumstance of on farm information systems for beef cattle production. The document sets out the features of good systems and identifies those elements of systems that should be avoided.

This section of the project report document has been prepared from a user perspective, not from a technology perspective. This section has focussed on what the user wants and needs, not what technology may or may not be able to deliver. This means that a system being too complex for a user to easily and intuitively perform a task is as bad as a system not being able to do the task at all. The result is the same as far as the user is concerned.

The audits and investigations of the livestock properties identified that there did not appear to be a perfect system that achieved the on farm objectives for information collection, processing and reporting. There was a high level of expectation by users and they felt that the various systems did not deliver the required outcomes. This high level of expectation of the users may never be completely achieved, however there were a considerable number of issues that were seen as not acceptable to the users.

2.11 On Farm Information Systems General Description

Information usage on farm generally falls into two areas:

1. “Field” – these maybe where cattle are inducted, weighed or under go any other information recording activity. Examples include at the crush, hospital pen or any other area in the paddock. The different types of equipment used for “Field”

information collection and processing include logging weigh scales, data loggers, notebook PCs, electronic tag readers/ loggers and similar equipment.

2. “Office” – this maybe at a homestead, in a vehicle or any other place where detailed computer work takes place. Generally the type of equipment is a desktop or notebook PC, printer, modem and similar equipment.

There are considerably different needs between the “Field” and “Office” types of systems. The “Field” type systems generally need to have the following features:

- Be battery powered with 12 volt (car adaptors) and 240 volt adaptors for charging or operation.
- Are portable and simple to transport.
- Be simple and quick to setup and operate (have few cables and other peripherals to connect, configure and setup).
- Have programs or functions that are quick to collect or display information.
- Be robust and suitable for the environment for which they are being used.
- Be flexible in use (collect weights one day and electronic ID tag numbers the next).
- Store information for later download or other processing.
- Have a method to connect and transfer information to and from “Office” systems.

The “Office” type systems generally need to have the following features:

- Be a desktop or notebook PC.
- Have a back up system for data (CD-ROM writer or similar).
- Have a printer attached for reports and other paper work.
- Have connection to the Internet (Dial-up modem, satellite modem or other method) for email and World Wide Web access.
- Have various software (email, word processing, spread sheet, farm management, financial management, specific programs and custom programs) suitable for operational management of the farm (breeding, backgrounding, feedlot and/or other) business.
- Have a means of storing and archiving historic information for recall when necessary.
- Have a method to connect and transfer information to and from “Field” systems.

The “Field” type systems can be further broken down into three categories, these being:

1. “Record only” systems. These are used to collect information with minimum interaction. Systems such as weigh scales that log, electronic tag reader loggers and similar types of equipment.
2. “Record and Recall” systems. These are used to recall certain information based on entering a specific electronic tag, manual tag or other identification methods. These systems are often used for such purposes as identifying drug treatments, weights or other history information for making management decisions. Examples of systems that “record and recall” are:

- A notebook computer being used crush side that recalls specific information based on a scan of an electronic identification tag, entry of management tag or other method to recall a specific record or group of records.
- A hand held data logger (such as a Pocket PC or Palm Pilot) that can recall and update specific information based on a scan of an electronic identification tag, entry of management tag or other method to recall a specific record or group of records.
- Purpose built equipment such as intelligent scales that record and recall.
- Industrial computers that are designed for harsh environments and have suitable farm software installed and operating.

3. "Record and Limited Recall" systems. These are typically intelligent scales that can recall limited amounts previously recorded information such as weight/ date information, calculate the average daily gain and can display this information. The average daily gain or other previously recorded information can then be used for such purposes as automatic drafting based on a set of defined criteria.

2.12 On Farm Information System Requirements

The on farm system requirements are based on the identified work practice requirements specifically for beef cattle production from breeding through to slaughter. The various work practices have been matched to specific technology to deliver a suitable requirements outline for different types of technology.

The two main areas are "Field" systems and "Office" systems. These are treated differently due to the different operational circumstances where they must operate.

2.12.1 "Field" Systems

The most important aspect of the "Field" systems is the need for portability, reliability, robustness and ease of use. This is balanced against the need to have information available where it is required at crush side or other on farm locations.

The simplest and the most robust solution is to use a single piece of equipment suitable for the environment that can capture the necessary information in one operation. Most activities involve weighing and as such the logical choice is to use a weigh scale indicator that can record the necessary information. Two examples of these are the Ruddweigh 600 and the Tru-Test XR3000.

Intelligent Weight Scales

This type of equipment can have an electronic tag reader attached and record various pieces of information on each animal. The difficulty with this type of equipment is that there is a large amount of flexibility, which means that to make the most of the equipment requires careful initial setup and configuration. This should be a once off requirement. There is a level of information that can be preloaded or stored in such equipment that can be automatically recalled at the time when an individual animal is processed.

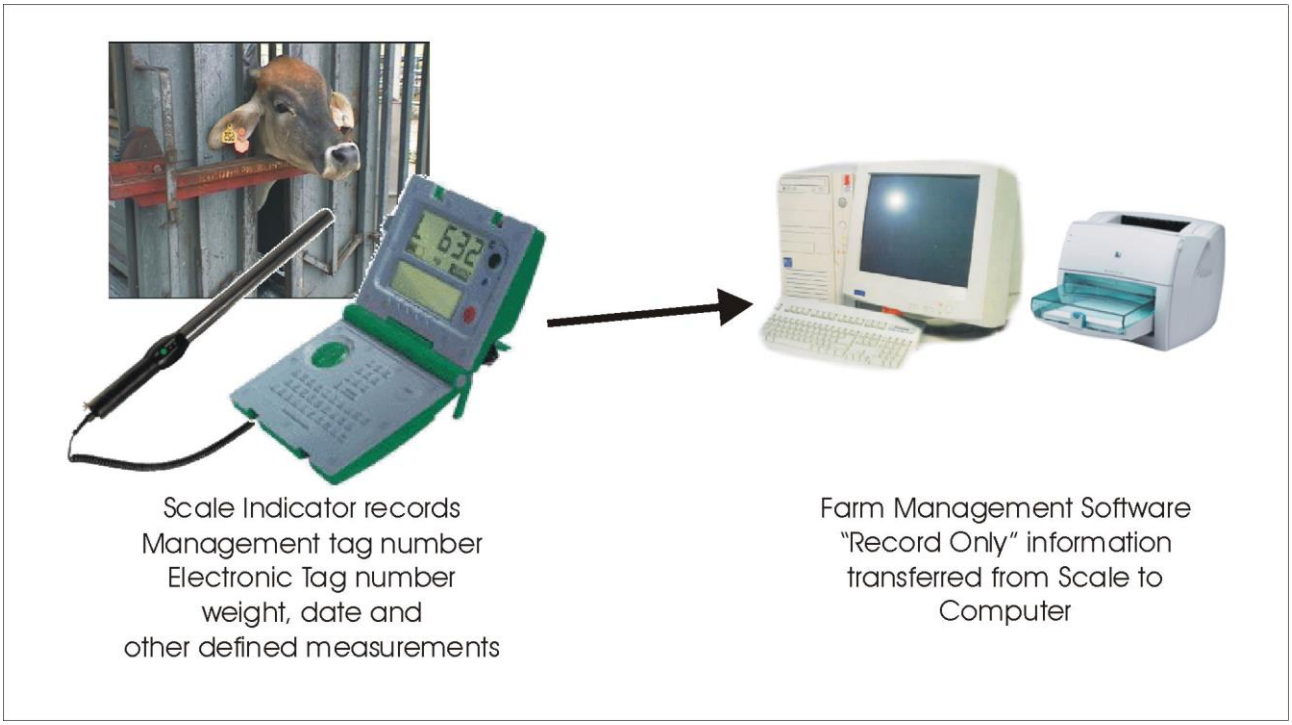
These types of systems are most likely to be used in a "record only" manner to suit the high throughput demands of induction, weighing and other cattle production activities.

Where information needs to be recalled about a single animal such as for calculating an average daily gain, or treatment history it may be more suitable to use a "record and limited recall" type approach.

Where a large amount of information is required or complex searches are necessary, then a "record and recall" approach is required. An example of this may be by use of a notebook computer that is near by (eg in a vehicle) and is used to look up specific animal information and make notes about the individual animal when required. This may occur while other cattle are still going through the crush. Instead of using a notebook computer a pocket PC or Palm Pilot may be more suitable for some applications or users.

The analysis of many on farm production activities has shown that most are of a “record only” or a “recall and limited record” nature and that the need to look up specific information happens on an infrequent basis.

The diagram below shows an example of using the scale indicator to capture “record only” information and then transfer it to the office computer.



Data Capture and Transfer Process

The necessary attributes that have been determined for any “record only” systems and “record and limited recall” systems is as follows:

- Must be battery operated with charging and operation by 12 volt (car adaptors) and 240 volt adaptors. Operate for at least 8 hours on charge batteries.
- Must be suitable for the environment (dust proof, splash proof and shock proof with a Ingress Protection [IP] rating of 565 [see Glossary])
- Minimum connections to operate. An example is an intelligent scale indicator that only needs the load cells and electronic tag reader connected to operate. The more connections that are needed the lower the overall reliability.
- Must support the following data fields:
    - Management tag number (can be set to “must be unique”).
    - Electronic tag number (can be set to “must be unique”).
    - Mob/ lot/ group information (pen, paddock, vendor, supplier PIC/ tail tag, birth year, breed, others as needed).
    - Individual information (weight, date, breed, sex, drugs used, treatments [several fields], dent, condition, muscle score, others as needed).
    - Notes/ comments for each individual or for each mob/ group/ lot.

    - If record and recall functionality is needed the average daily gain should be calculated and able to be used for drafting.
- The fields should be able to be user defined for the field name.
- The fields should have a set of default setup values that can be selected by a single push of a button such as a function key. An example would be having preset sex values for the sex field. There would be different default values set for each field. An external large format keyboard (bash board) could be used for specific keys (numbers, “F” keys, enter, back space).
- There should be a copy last function for each field. This is used when the value is the same for the last animal. Such as sex, breed, dent and other information.
- Mob, lot or group information should only need to be entered at the beginning of a mob, group or lot and automatically recorded for each animal of the mob, group or lot.
- Each field should be able to be turned on or off to suit the specific operation being performed.
- Each field should be able to have data entry checking configured. This is useful to ensure that invalid information cannot be entered. An example would be only allowing a number entry for Dentition and the number must be 0, 2, 4, 7 or 8.
- Connections to external devices must be flexible and configurable.
- Storage of information internally must be robust and not dependent of internal or external power.
- The methods to transfer the information between the “field” systems and the “office” systems must be simple to use, reliable and flexible. Methods to ensure previously transferred information cannot be overwritten are necessary.
- An audio sounder loud enough to be heard in the work environment with tone or pattern changes to indicate specific actions.
- If speech synthesizing systems are used the sound quality must be sufficient for the environment. This is for both volume and clarity in a noisy environment.
- If sperate visual external displays are used they must operate as an independent device and if they fail the main system will still operate.
- There is the requirement for serviceability of the equipment. This means the devices should be modular and able to be exchanged/ replaced easily. For large organisations this would also mean having a limited number of brands and models of equipment to allow for swapping between properties.
- Systems must be compliant with Workplace Heath and Safety requirements for electrical safety, trip and other hazards. There is also the requirement to comply with codes of practice and standards for ergonomics and useability in the work place.
- System documentation, training material and configuration information must be in a suitable format and presentation for the intended users.
- Methods for data integrity must be sufficient to ensure disaster recovery, overcome equipment failure and provide audit trails. Data integrity must apply to both operational information and configuration parameters.

The “record and recall” systems often have a slightly different set of requirements as they are not generally intended to operate at the same speed or throughput as the “record only” or “record and limited recall” systems. “Record and recall” systems may be a notebook computer that is using farm management software the same as the “office” systems. The specific requirements for “record and recall” systems are likely to vary between each user depending on their respective needs. The robustness and reliability of the more complex

"record and recall" systems is not likely to be as high as the simplified equipment more suited to "record only". The "record and recall" systems may include the following:

- Notebook computer running standalone farm management software.
- Notebook computer connected to scales, electronic tag readers and other equipment and running "record only" type software or "record and recall" software.
- Industrial computer (these come in various sizes, shapes and costs) connected or not connected to scales, electronic tag readers and other equipment and running "record only" type software or "record and recall" software.
- Pocket PC products (ranging from low cost consumer products to industrial products with wireless LAN, bar code scanners and electronic tag readers.
- Purpose built specialised equipment. There are various brands and versions of this type of equipment.

The consumer notebook type products or consumer hand held computers (Pocket PC, Palm, etc) are not recommended for use in harsh environments. Industrial type products provide a higher level of reliability and overall performance than consumer quality products when used in the harsh environment.

2.12.2 "Office" Systems

The office systems are most often notebook computer or desktop computer based. The computer needs to be able to run the necessary farm management software or any other required software. There is also the requirement to transfer information to and from "Field" equipment. For the purpose of beef cattle production there have been several vendors of software sighted through audits and reviews. This list is not intended to state that these vendors product meet with the requirements of this document. The list is only presented as a representation of some of the software products seen in the market place.

- Beef One from On-Farm Electronics - www.onfarmelectronics.com.au/
- Cattle Fattening Records from Possum Gully Software - www.possumgully.net/
- CattleLink from HerdLink - www.herdlink.com.au/
- BeefLink from AgInfoLink - www.aginfolink.com.au
- PCFarm - www.pcfarm.net/
- PAM – Fairport Technologies - www.fairport.com.au/
- Stockbook from Practical systems Ltd - www.psystems.com.au/
- StockTracker from Aleis International Pty Ltd - www.aleisinternational.com.au
- Stock Recorder from Saltbush Agricultural Software - saltbush.une.edu.au/

There are many more suppliers of hardware and software systems for beef cattle farm management. For the purpose of feedlot operations there is specialised software specific for the operational requirements for the feedlot.

The important general requirements for the "office" systems includes the following:

- Ability to import and export information in to various formats to suit other applications and products. Including any electronic messaging requirements (eDEC).
- Methods for backup, archiving and restoring of lost information.
- Methods for correction and manipulation of the data to fix issues that are identified after an error has occurred. This is generally required to be done in the office from notes made on paper about errors that occurred crush side or the paddock.
- Audit record methodology – systems that records a log every time something is changed, with the log showing at least the date, time, user, reference to record, original value and new value.

2.13 Issues Reported by Users of On-Farm Systems

Interviews have been conducted with users of on farm systems across a many properties that have been using “field” and “office” systems. Some of the reported problems are likely to be users not being able to do a specific task or function. This issue of lack of user training or complexity of the software product has the same result as if the software did not do the task. Software that is difficult and not intuitive is not suitable for the on-farm environments. A number of common issues have been reported, these have been summarised below:

- Reliability problems due to power requirements. Various equipment needed external power and this proved to be a problem to ensure availability of power sources and cabling/ connections.
- Inadequate audio feedback both volume and clarity.
- General cabling issues related to reliability and as a trip hazard. Too many cables needed for systems to work and required reading the user manual each time.
- Need the ability to guard against invalid information entry through good data entry validation. Only except the right type of information for a specific field.
- Ability to quickly and easily undo or correct data entry errors.
- Issues with mobs being broken up and moved to different paddocks. Many of the software products did not manage (or the user could not work out how to do it) breaking and reforming mobs in different paddocks and moving the information from a mob to a new mob.
- Automatic prompts for entry of repetitive information. Examples include copy from last record and a limited list to ensure only the correct information is entered and selection can be made with just 1 keystroke.
- Need for self-diagnostics to alert the operator to the failure of an interface or peripheral being unplugged.
- Need for robust hardware – computers, cabling and connectors.
- Issues with reading incorrect electronic tags with readers both hand held and panels. Two cattle in crush at once. Placement of panel readers resulted in next animal being read so wrong information was recorded. Passing the wand over several tags without knowing it had happened and this resulted in the wrong information being recorded against the animal. There was no method to easily determine that the wrong animal had been recorded. The errors were determined at a later time and no correction of the information was possible.
- Speed of processing information. Systems taking too long to process and start the next record.
- Dust causing the keyboard and mouse to fail. Replacements where available but the system had to be closed down and this caused delays in processing cattle. When the

keyboard or mouse starts to fail wrong information is entered due to keys sticking and the mouse not moving to the correct location.
- Problems with importing and exporting information between systems.
- A problem with some of the software systems when an electronic tag is lost and a new one was attached. The software did not let the old electronic tag number be replaced with a new tag number. This may have been possible but the operators were not able to find out how it was done.
- No back up spares or fall back position. If something stopped working then no information was recorded. Identification of and critical spares management.
- NLIS tags being damages on application and the problem only being detected at induction at the next livestock link, at the saleyards or at the abattoir.

The above list shows a number of issues related to implementation and use of “field” and “office” systems. Any system to be used in the on farm environment must ensure that the above issues are all adequately addressed.

The problems raised by the users related to inefficient work practice, poor training or bad workflow as well as poor hardware reliability and poor software functionality. The results in terms of overall on farm software and hardware performance were considered by the various users to be very low. Any system being offered must address these requirements for:

- Work practice to match the technology.
- Suitable training and support on all aspects of the systems.
- Workflow arrangement to match the technology and minimise the cause of errors and difficulties.
- Reliability of the hardware for the environment.
- Suitability of the software to ensure speed, accuracy and simplicity in use.
- Simple installation, configuration and operation.
- Backup and redundancy so the operational speed is maintained even if technology stops.
- Critical spare part management.

2.14 Current Performance Measurements and Proposed Improvement and Benefits

Through each link in the supply chain specific activities are conducted. These activities can be broadly measured in terms of current performance. From the current performance position improvements in performance and defined benefits can be determined.

This project proposes consider changes to the current work practices and the addition of considerable capital and maintenance costs. The performance measurements and likely improvements on a company wide basis need to be sufficient to cover the training, capital and maintenance costs of the operational changes.

2.14.1 Livestock Production

Current livestock performance measures are based on Cost of Production which is defined as:

Kilograms gained and time on property divided by fixed and variable costs.

These calculations are normally reported on a monthly basis.

These calculation are at a macro level and do not look at variability between individual cattle. It is likely that there are high performers and low performers mixed together. Only the average is being measured. Therefore the spread of performance is not being measured. If the low performers can be identified and removed to more suitable market segments (eg sold), then the average can be improved. This process of identification of bad performers being removed early from the backgrounding and feedlot paths is intended to be the commercial cost justification for the organisation wide implementation of individual performance measurement systems.

Within the livestock supply chain the performance measures can be broken down to a cost per kilogram produced live weight.

Live Supply Chain linkage	**Total Actual**	**Current Information Cost Actual**
Breeding	$1.03	$0.06
Backing Grounding	$0.56	$0.09
Feedlot	$1.83	$0.12

The costs areas and values above have been derived from ACC financial reporting to October 2004. The Information costs are based on the labour, equipment and consumables used for information management.

During the project the cattle variability measures will be collected and reported. The measurement will identify the bad performers and the cost of production estimates will be adjustment to show the lower cost of product that could be achieved company wide.

The livestock performance measurements must based on each link in the supply chain:

- Breeding

- Backgrounding
- Feedlot

2.14.2 Slaughter and Distribution

The slaughter through to distribution performance measurements are calculated differently then livestock performance measurements.

The areas for slaughter to distribution cover the following operational areas:

- Slaughter
- Boning
- Distribution

Each of these areas will be analysed as the project continues to identify the current performance measurements and the likely improvements.

It is estimated that there will be minimal operational changes to the existing systems and the there will be only minor performance change issues to be identified and reported as part of the project.

3 Milestone 2 - Design / Development / Construction

The milestone 2 section of the Trace 4 project required completion of the following:

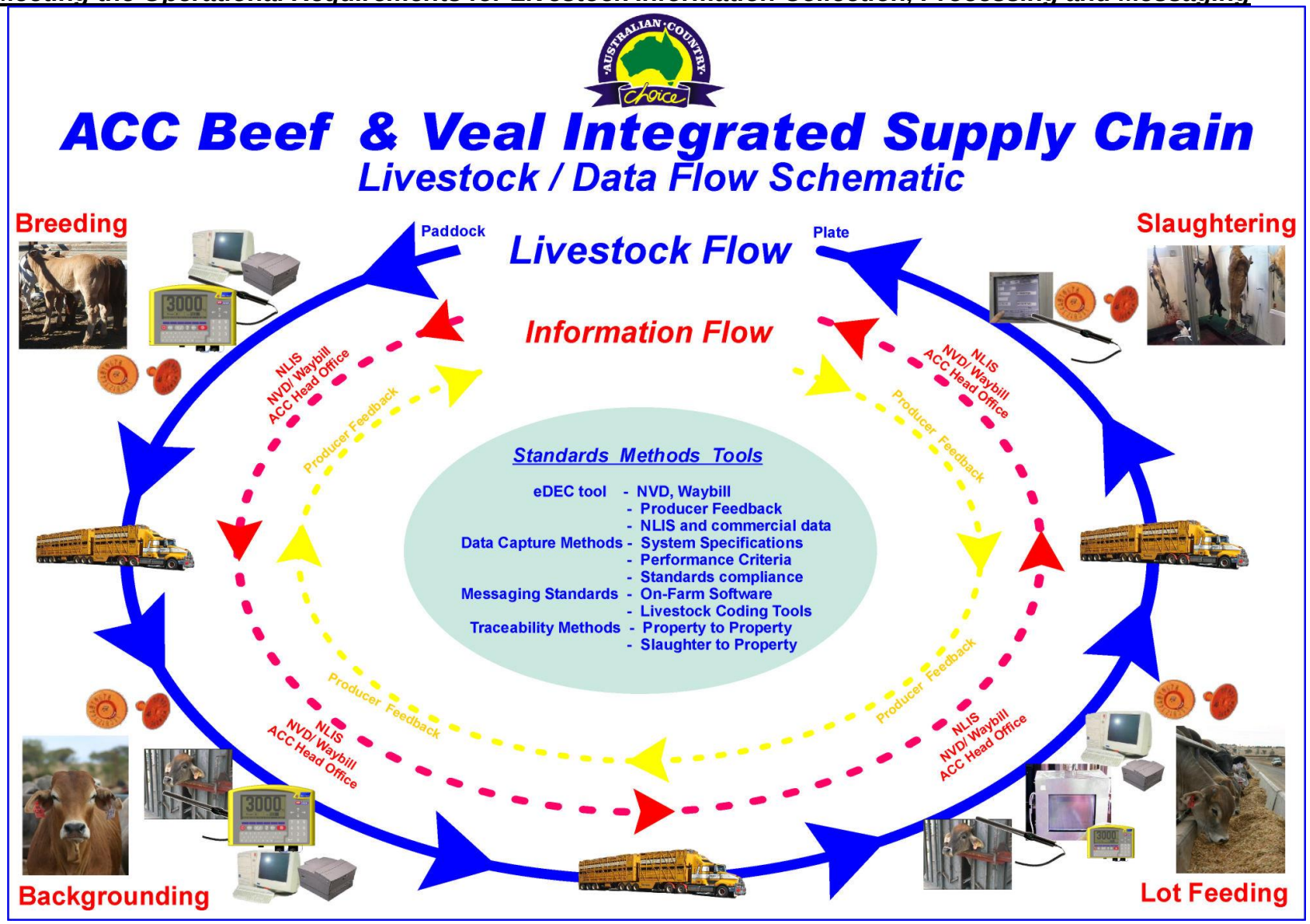
- Development of the demonstration implementation plan for each property within the 2 pathways
- Design and development of data capture models for each property in the 2 pathways.
- Preparation of Message Implementation Guidelines suitable for each link in the pathways to address the identified information needs
- Development of the systems to meet the operational requirements of each of the properties in the pathways for information collection, processing and messaging
- Preparation of details models showing information flows and interconnectivity with regulatory authorities.

3.1 System Design and Development Overview - Livestock

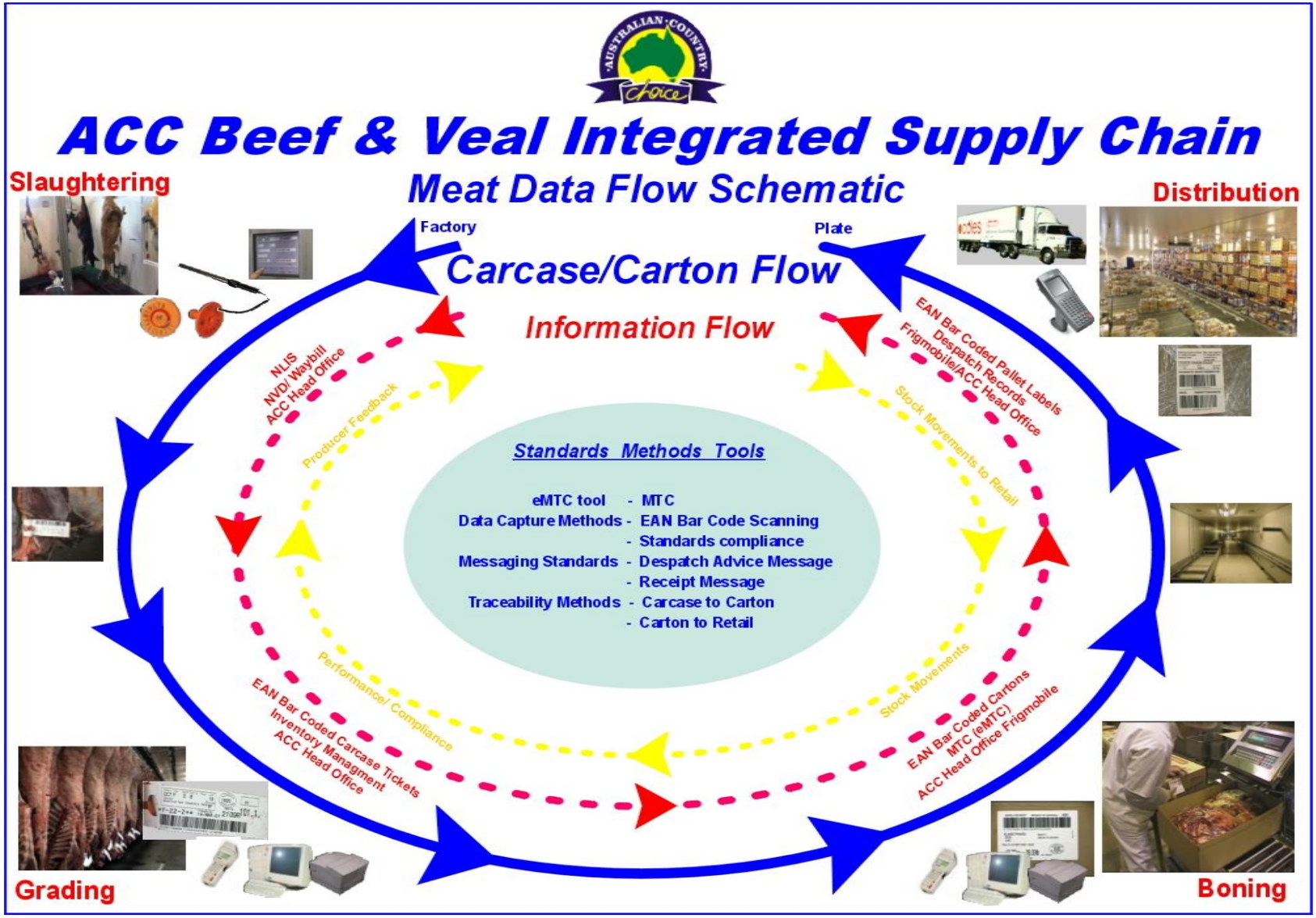
The designed system for operation through the livestock supply chain to slaughter have been developed with consideration of existing and current MLA and AUS-MEAT programs. This has resulted in the designed system being based on the following sub-systems:

1. Identification of livestock by both a management tag and an NLIS tag.
2. Recording of livestock attribute information by use of XR3000 intelligent scale indicators for breeding and backgrounding properties.
3. Recording of livestock attribute information by use of Industrial computer crush side for the feedlots.
4. Use of NLIS tag readers connected to the XR3000 (breeding and backgrounding properties) or Industrial Computer (Feedlot) for reading NLIS tags.
5. Use of DNA hair sample collectors for audit and validation purposes.
6. Use of Stockbook software for recording and managing individual cattle attributes for the breeding and backgrounding properties.
7. Use of FY3000 software for recording and managing individual cattle attributes for the feedlots.
8. Use of ACC PMS (Property Management Software) for property management on the properties.
9. Use of the LPA eDEC system for creation and sending of electronic NVDs for mob livestock information and the individual animal information. This is used for each movement between properties through to slaughter. Additional elements need to be included in the eDEC for detailed individual animal identification and other attributes as well as pure commercial data being sent by the eDEC.
10. Regulatory linkage to the NLIS database as specified by legislation.

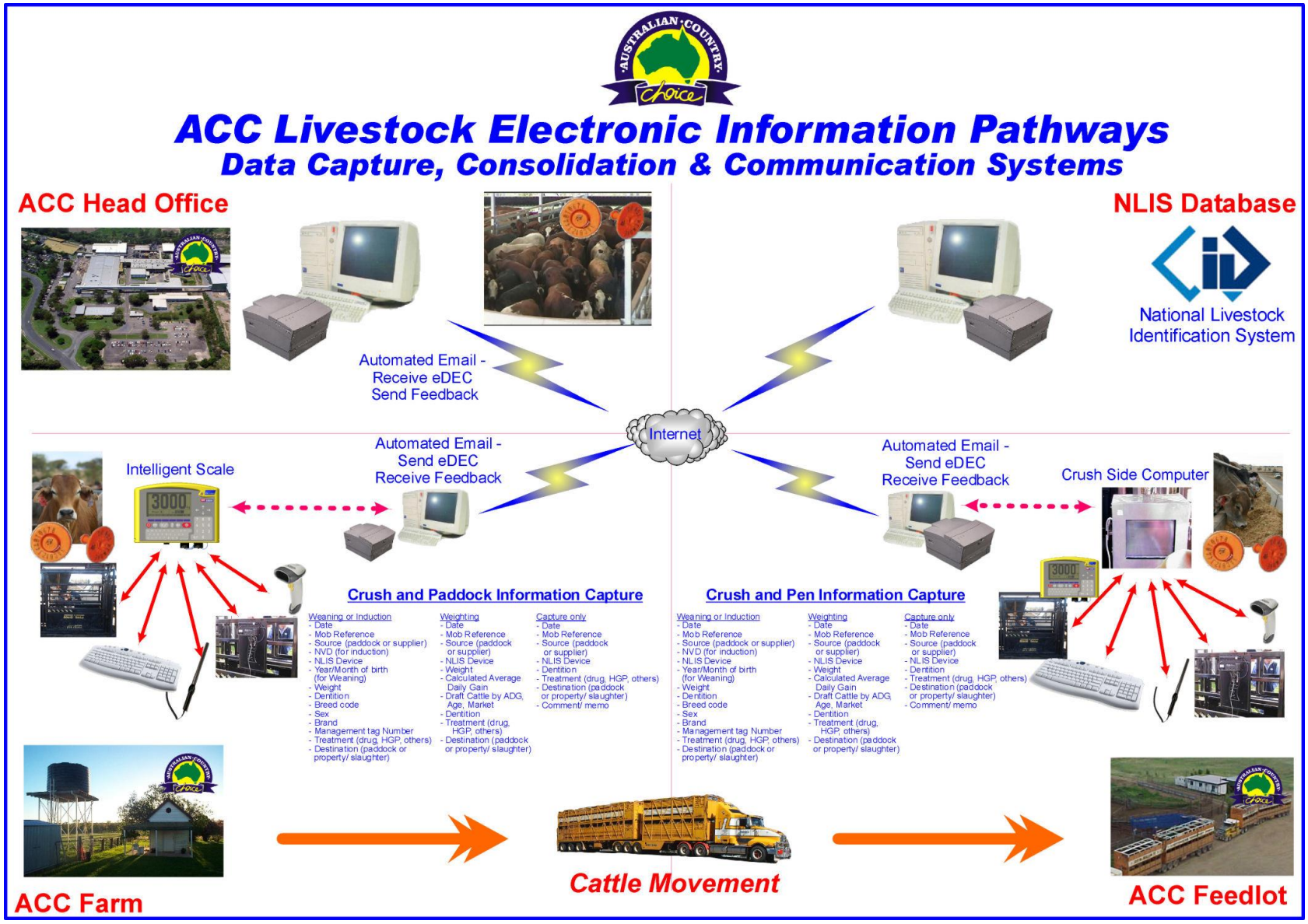
3.2 Systems Meeting the Operational Requirements for Livestock Information Collection, Processing and Messaging



3.3 Systems Meeting the Operational Requirements for Carcase/ Carton Information Collection, Processing and Messaging

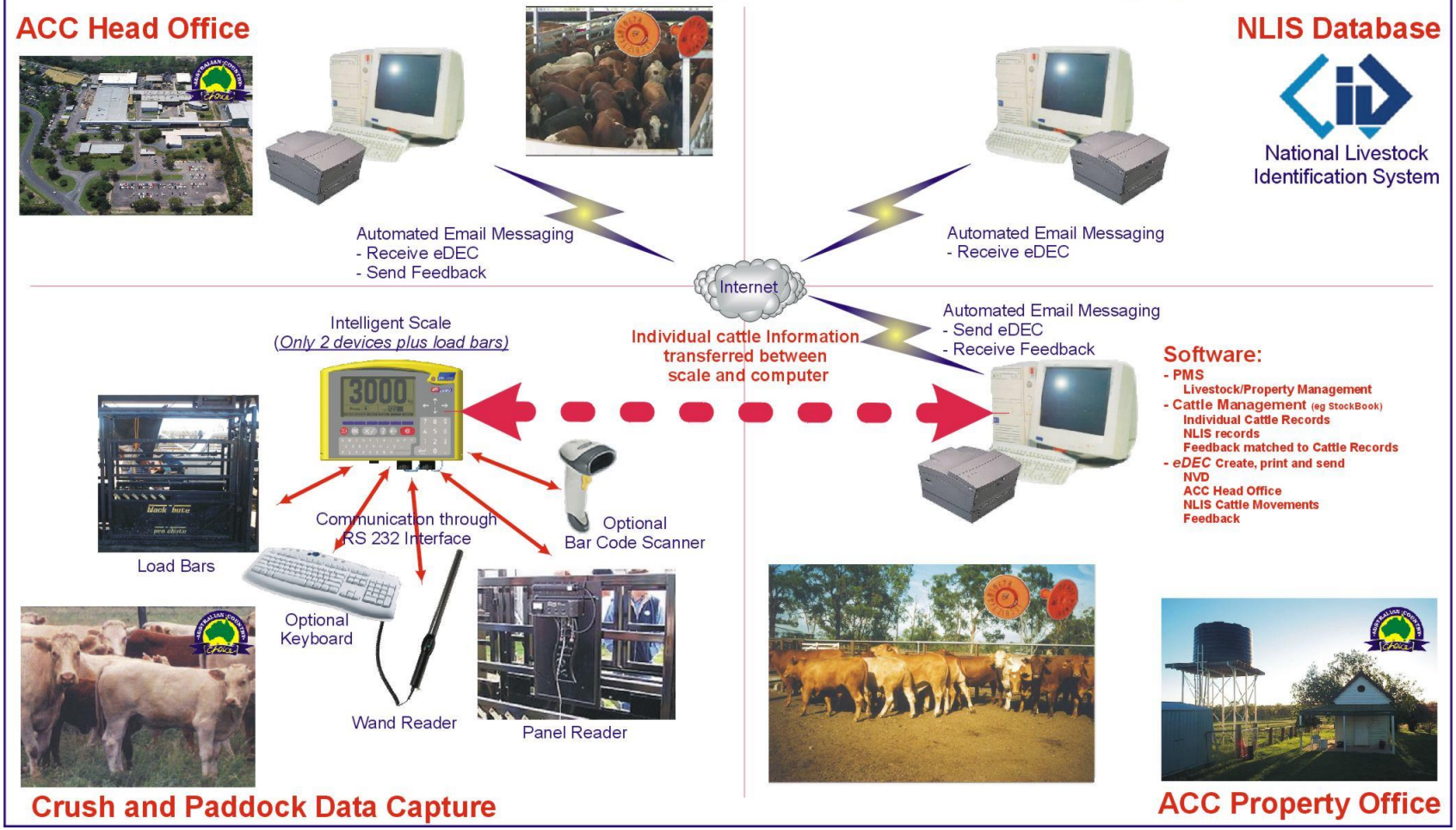

ACC Beef & Veal Integrated Supply Chain
Meat Data Flow Schematic
Slaughtering
Distribution
Factory
Plate
Carcase/Carton Flow
Information Flow
NLIS
NVD/ Waybill
ACC Head Office
Producer Feedback
EAN Bar Coded Pallet Labels
Despatch Records
Frigmobile/ACC Head Office
Stock Movements to Retail
Standards Methods Tools
eMTC tool - MTC
Data Capture Methods - EAN Bar Code Scanning
- Standards compliance
Messaging Standards - Despatch Advice Message
- Receipt Message
Traceability Methods - Carcase to Carton
- Carton to Retail
Performance/ Compliance
EAN Bar Coded Carcase Tickets
Inventory Managment
ACC Head Office
Stock Movements
EAN Bar Coded Cartons
MTC (eMTC)
ACC Head Office Frigmobile
Grading
Boning

3.4 Models Showing Information Flows and Interconnectivity with Regulatory Authorities


ACC Livestock Electronic Information Pathways
Data Capture, Consolidation & Communication Systems
ACC Head Office
NLIS Database
National Livestock Identification System
Automated Email - Receive eDEC Send Feedback
Internet
Automated Email - Send eDEC Receive Feedback
Automated Email - Send eDEC Receive Feedback
Intelligent Scale
Crush Side Computer
Crush and Paddock Information Capture
Crush and Pen Information Capture
Weaning or Induction
- Date
- Mob Reference
- Source (paddock or supplier)
- NVD (for induction)
- NLIS Device
- Year/Month of birth (for Weaning)
- Weight
- Dentition
- Breed code
- Sex
- Brand
- Management tag Number
- Treatment (drug, HGP, others)
- Destination (paddock or property/ slaughter)
Weighting
- Date
- Mob Reference
- Source (paddock or supplier)
- NLIS Device
- Weight
- Calculated Average Daily Gain
- Draft Cattle by ADG, Age, Market
- Dentition
- Treatment (drug, HGP, others)
- Destination (paddock or property/ slaughter)
Capture only
- Date
- Mob Reference
- Source (paddock or supplier)
- NLIS Device
- Dentition
- Treatment (drug, HGP, others)
- Destination (paddock or property/ slaughter)
- Comment/ memo
Cattle Movement
ACC Farm
ACC Feedlot

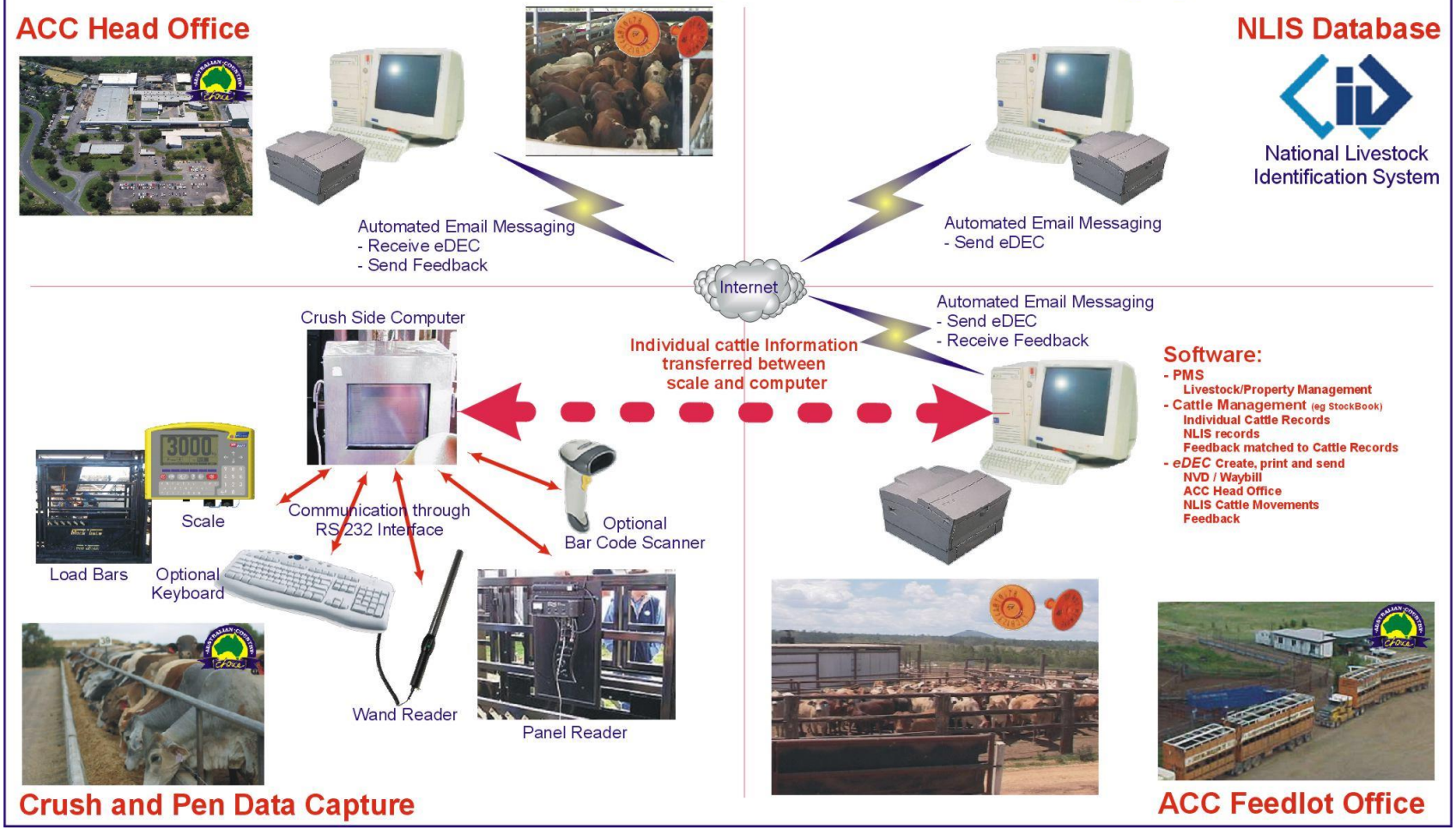
ACC Livestock Tracking and Traceing - Farm Model

Electronic Identification, Data Capture and Data Processing Systems



ACC Livestock Tracking and Traceing - Feedlot Model

Electronic Identification, Data Capture and Data Processing Systems



3.5 Work Requirements for Each Property Link, Cannon Hill Facility and Distribution

For each of the properties, the Cannon Hill Facility and the distribution system, certain changes and co-ordination of the traceability system must occur. These changes and co-ordination requirements are defined in the following sections:

3.5.1 Redford Breeding/ Background Property Changes

The following changes are required at Redford Property:

- XR3000 Scale indicator must be installed and the personnel trained.
- NLIS Device Panel Reader and Stick Read must be installed and the personnel trained.
- Stockbook software must be installed and the personnel trained.
- NLIS Devices must be supplied and personnel trained in correct attachment of tags.
- DNA samples must be supplied and the personnel trained.
- eDEC with enhancement for individual and commercial data installed and the personnel trained.

Each of these tasks must be completed and tested before the commencement of the project.

3.5.2 Brisbane Valley Feedlot Changes

The following changes are required at the Brisbane Valley Feedlot:

- FY3000 software and StockaID configured to support eDEC to be installed and the personnel trained.
- NLIS Devices must be supplied and personnel trained in correct attachment of tags.
- DNA samples must be supplied and the personnel trained.
- StockaID enhanced to supply induction data (individual NLIS device numbers) back to both the supply property (for updating Stockbook) and to ACC head office to reconciliation and notification to the NLIS database.

The above changes need to be implemented before operational demonstrations can be shown.

3.5.3 Cannon Hill Slaughter Facilities Changes

The following changes are required at the Cannon Hill Slaughter Facility:

- eDEC integration with Thorsys Livestock module to support NVD, individual and commercial data.
- Training of personnel in the use of the eDEC integrated Livestock module.
- Suitable NLIS device reading technology located at the knocking box and linked to the Livestock module. Where possible NLIS devices will be read in the pens to determine which cattle read and don't read.
- Receiving induction data electronically from the properties and the feedlots for reconciliation of livestock transactions and notification of the NLIS database.

The above changes need to be implemented before operational demonstrations can be shown.

3.5.4 Cannon Hill Distribution Centre Changes

The following changes are required at the Cannon Hill Distribution Centre:

- Integration of the traceability linkage for carton product going into distribution. Eg reporting back to ACC the retail store number and date where each carton was sent.

3.6 Leakage Control Methods

The identified leakage processes need to be managed both at an operational and data level.

On each property the process of leakage management is controlled through the following activities:

- For Births on breeding properties – At weaning the cattle are to have a NLIS tag attached and are recorded in the on-farm cattle management software. This creates a record of the individual animal.
- Arrivals on properties that are arranged (e.g. Purchases and transfers) are inducted. If the individual cattle do not have an NLIS (or management) ear tag, one is to be attached and the data recorded in the on-farm cattle management software. If the cattle do have an NLIS ear tag that information is captured into the on-farm cattle management software.
- Known deaths – The NLIS and/ or Management tag is used to update the on-farm cattle management software with the death details.
- Removal from the property by transfer or sale – The individual management tag and/ or NLIS tag details are either recorded on departure and entered into the on-farm cattle management software. Or the on-farm cattle management software is updated with information that is returned from the receiving property after induction.
- Unidentified animals that are found – These must have a management tag and NLIS tag attached and the data recorded into the on-farm cattle management software. The source of the cattle is to be marked as unknown until the origin can be confirmed. Where possible a DNA sample is to be collected and recorded.
- At certain times after completion of musters, weening or other data collection activities a reconciliation of the current animals on property must be completed by use of on-farm cattle management software. The reconciliation is to identify those cattle that have die and not been found, lost tags, stolen cattle and unidentified cattle. The data is to be resolved as best as possible.

3.7 Telecommunication Infrastructure

The telecommunication infrastructure must be sufficient to support the volume of information required to be moved to and from each property to head office. The properties , feedlots and the Cannon Hill Head Office have implemented sophisticated telecommunication infrastructure over the last few years.

The alliance properties and other cattle sources are unlikely to have such sophisticated telecommunication infrastructure. This creates the potential problem that ACC properties, feedlots and Cannon Hill head office can communicate reliably. However this can not be said for the associate supply properties and other cattle sources.

3.7.1 ACC Existing Telecommunication Infrastructure

The telecommunication infrastructure for the properties, feedlot and Cannon Hill Slaughter facility is defined as follows:

Livestock Properties: There is a 64 kb/s 2 way satellite broadband connection with dial up modem back up for each property.

Feedlots: There is a 400 kb/s 2 way satellite broadband connection with dial up modem back up for each property.

Cannon Hill Head Office: There is a 400 kb/s 2 way satellite and 2 x DSL broadband connections backup systems.

3.7.2 Reliability and Redundancy for Telecommunication Infrastructure

The telecommunication infrastructure reliability issues and redundancy is defined as:

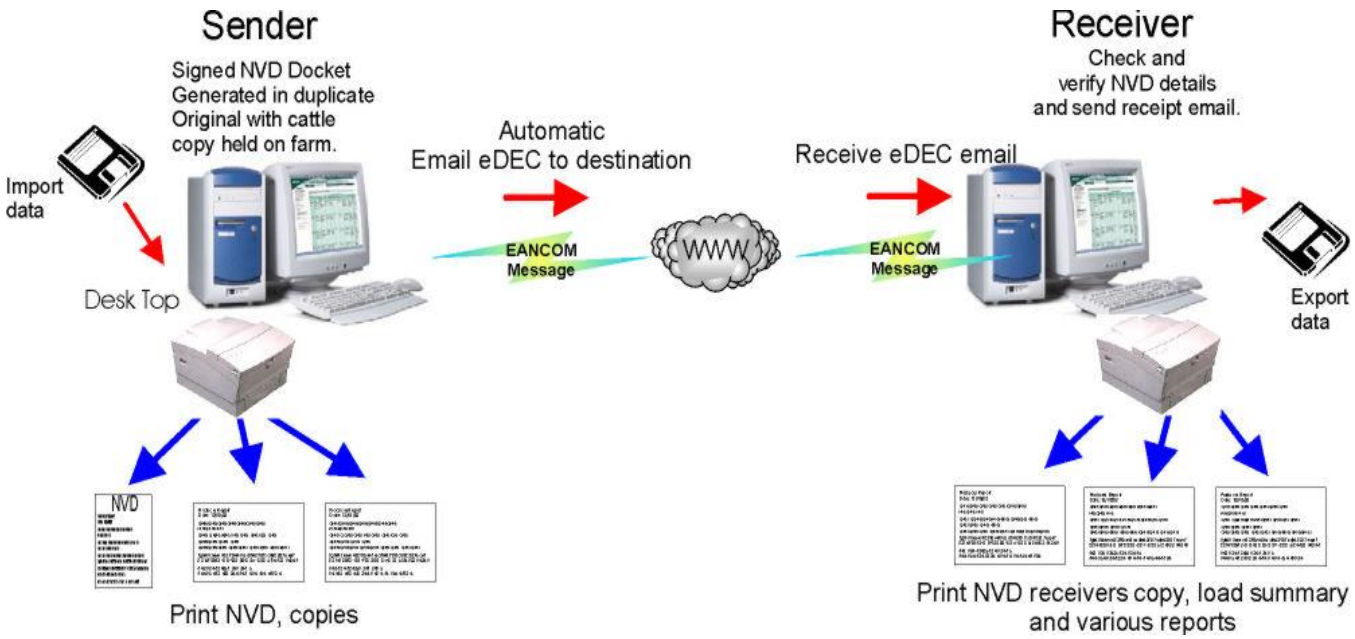
- Availability for critical information movements.
- Consistent bandwidth to satisfy volume demand especially at the feedlot and head office.
- Back-up modems and associated system are in readiness should they be required.

3.8 Proposed Changes To Existing Work Practice and Technology For Supply Chain Information

3.8.1 Livestock General Work Practice Changes

There are a number of identified changes to the current work practices and existing technology at the ACC properties for the project. These changes can be grouped into the following areas:

- The use of the eDEC tool for creating, printing and sending the combined National Vendor Declaration and way bill.
- Attaching of RFID Tags to cattle before leaving the property. These tags would normally be attached at weaning or induction.
- The use of the eDEC tool for reviewing feedback and exporting the feedback for importing into Stockbook.



eDEC information flow diagram

3.8.2 Specific Work Practice Changes for Induction/ Weaning, Weighing and Other Data Collection

There are three primary areas of collection of cattle information identified related to cattle handling. These are:

- Induction or weaning.
- General weighing.
- Capture Only (including moving of cattle, recording of sick or dead cattle and births).

3.8.2.1 Induction or Weaning

The work practice for information collection for induction and weaning are considered to be similar as this is generally the first time the cattle are handled on the property. This means that management and NLIS Tags are attached to the cattle along with various treatments, checks and weight/ other measurements. The cattle are not likely to have an existing record in the intelligent weigh scales. This means that any tag reading equipment must be hand held (with a button for press to read and light/ sounder for a successful read) and located near the head of the cattle so the tag can be read after attachment. This ensures that if the tag is damaged while being attached it can be replaced.

The type of information that is collected at induction or weaning is defined as:

- Date.
- Mob Reference.
- Source (paddock or supplier).
- NVD (for induction).
- Tag Number RFID (NLIS).
- Year/Month of birth (for Weaning).

- Weight.
- Dentition.
- Breed code.
- Sex.
- Brand.
- Body Score/ Condition.
- Frame.
- DNA (if used).
- Sire (if applicable).
- Dam (if applicable).
- Management tag Number.
- Treatment (drug, HGP, others).
- Destination (paddock or property/ slaughter).

3.8.2.2 General Weighing

The work practice for information collection for weighing is often less than for induction/ weaning. The speed of the process is also faster then induction/ weaning.

The cattle may only go over the weigh scale and not be held in the crush. This means that the location of NLIS Tag reading equipment must be near the head of the cattle at the weighing section of the race. The reading equipment must be able to read a long enough distance to suit the various sizes of the cattle and location of the head in the weighing cage. The reader technology must be switchable between automated operation and manual operation. There are times when it is necessary not to read a specific animal. The reader technology must have a light and sounder to indicate that a tag has been read.

The type of information that is collected at weighing is defined as:

- Date.
- Mob Reference.
- Source (paddock or supplier).
- Tag Number RFID.
- Weight.
- Calculated Average Daily Gain.
- Draft Cattle by ADG, Age, Market.
- Dentition.
- Treatment (drug, HGP, others).
- Destination (paddock or property/ slaughter).

3.8.2.3 Capture Only (including moving of cattle, recording of sick or dead cattle and births)

There are other instances when the cattle must have information recorded. This may occur when cattle are moved off the property, if individual or a group of cattle are sick and need treatment, if cattle die as well as births. There may also be the requirement to record cattle that move between paddocks.

The amount of information to be recorded varies to some extent for the different circumstances.

If NLIS Tags are in use then the location and style of reading may vary. The reading equipment will generally either be hand held or a long range reader to suit the circumstance.

The type of information that is collected at “Capture Only” is defined as:

- Date.
- Mob Reference.
- Source (paddock or supplier).
- Tag Number RFID.
- Dentition.
- Treatment (drug, HGP, others).
- Destination (paddock or property/ slaughter).
- Comment/ memo.

3.8.3 Property Technology Requirements

In technology terms the specific changes to systems/ equipment required for the project have been identified as follows:

ACC Properties:

- eDEC Tool (create, print and send NVDs, Waybills, MSA declarations).
- eDEC Tool (review, print and export Feedback).
- Intelligent Scale (True-Test XR3000 or similar) for recording cattle weights, NLIS Tags and other cattle data. This equipment will also be used for just reading individual cattle NLIS Tags when required. Eg for deaths, at induction at the feedlot or other reasons.
- Tag reading equipment
- Upgraded computer system for receiving, processing, printing and resending electronic messages received from each property (eDEC), messages received from the feedlot and abattoir.

3.9 NVD requirements, eDEC, Individual Animal Data and Commercial Data

National Vendor Declarations are completed for each movement of livestock. The project is intended to be based on the MLA eDEC system as the electronic means to send and receive electronic information related to NVDs.

The eDEC as released by MLA is intended predominately to be used for NVD related data only. The Despatch Advice message specifications support additional information but the generic industry eDEC tools only support NVD data.

The project has identified the following requirements must be included:

- NVD data (as per current eDEC tools).
- Individual animal attributes (including NLIS Tag Numbers)
- Commercial data.
- Livestock Coding (as part of the project).

The standard eDEC is intended to be used for electronically creating NVDs and sending them via email to intended recipients. The scope of the project includes sending individual information as well as commercial data. This requirement means that the standard eDEC industry tools can not be used for the project and Stock Book/ FY3000 must include an element for creation, storage, processing and sending LPA compliant eDECs including the individual animal ID, NLIS Tag ID, livestock codes, attribute information and commercial data.

The lairage and livestock systems (On plant at ACC Cannon Hill slaughter facility) will require importing methods for eDEC messages (EANCOM Despatch Advice). This imported information will form the basis for kill agendas and residue testing. The current system is a Thorsys System and will need to be upgraded to import, process and store eDEC information including individual animal identification data. Ideally cattle will be read at unloading at Cannon Hill to determine which read and don't read. The non–readers will be identified and processed separately.

3.9.1 Livestock Coding

A livestock coding system and support tools have been prepared as part of the project. The livestock coding tools are intended to provide a means to universally describe cattle by encoding the attributes into a livestock code.

Go to:

http://www.initmedia.com.au/livestock/livestockcodeweb.html

to view the livestock coding tool.

The livestock encoding and decoding system has been developed with AUS-MEAT.

The livestock coding system will be used to create codes that can be compared and form the basis to manage inventories of cattle and kill agendas (to ensure like cattle).

3.9.2 ACC Head Office NLIS Transaction Reconciliation and NLIS database Reporting

The ACC group of properties and feedlots move a considerable number of head of cattle around over a period of time. There are the additional supply of cattle in to the systems from external properties and saleyards. The collective number of transactions at the individual animal level are quite immense.

In terms of simple volume calculations, there are 250,000 head of cattle slaughtered per year. If there are three movement transactions per head per year (including the tagging on

breeding properties, feedlot induction and slaughter) there would be 750,000 individual animal identification numbers that must be managed from a source of 21 farms, 2 feedlots, 20 alliances and saleyards, as well as the slaughter facility.

This level of data management is not insignificant.

To provide a high level of accuracy and confidence in the data going to the NLIS database, all NLIS data will be sent to ACC Head Office for reconciliation and validation before being sent to the NLIS database.

The ACC Head Office data management will require a specialised system that currently does not exist. This project analysis has identified the issue of the need for centralised NLIS data management and single point notification to the NLIS database. The resource requirements to create and manage this NLIS information management system will need to be allocated and the work commenced with a high priority if the NLIS timetable is to be achieved.

It has been recognised within the project that the time frame to fully implement the centralised NLIS number management system will take a considerable time. Initially each property will be responsible for their own reporting to the NLIS database. Over time this reporting will become centralised.

3.10 Cattle Volumes, Transaction Quantities and Data Volumes

The number of head of cattle and the number of movements will effect the number of data transactions and the overall volume of data.

The current livestock volumes are estimated as:

- 250,000 head of cattle slaughtered per year.
- If there are three movement transactions per head per year (including the tagging on breeding properties, feedlot induction and slaughter) the would be 750,000 individual animal identification numbers per year.
- The information must be managed from a source of 21 farms, 2 feedlots, 20 alliances and saleyard sources, as well as the slaughter facility.

The amount of information recorded, processed and stored for livestock has not been fully determined. This will be measured as the project is implemented.

3.11 Possible Cost implications of Proposed Changes To Existing Work Practice and Technology For Supply Chain Information

Implementation of the proposed changes to existing work practices will have a financial impact. This is even more likely when going from not using electronic systems to capture information to going to a sophisticated, processing and reporting system. The cost impacts relate to initial capital costs, training costs and ongoing maintenance costs.

3.11.1 Capital Costs

If all the ACC property groups implement electronic capture, processing and reporting systems there will be a capital cost of the systems. These costs relate to the following areas:

- Homestead Computer hard.
- Homestead Individual Cattle management software.
- Crush side data capture system (intelligent scale, NLIS device reader, Power suppliers and various hardware options).
- Installation Costs (metal work changes, cabling, mounting brackets, etc).

3.11.2 Training Costs

Properties - If all the ACC property groups implement electronic capture, processing and reporting systems there will be a considerable training cost. These costs relate to the following areas:

- 2 operational personnel from each property group need to be trained for scale, NLIS reading equipment, individual cattle software and reporting systems.
- ACC IT department will need to be trained on operational as well as technical requirements for scales, NLIS reading equipment and interface equipment
- ACC head office personnel will need to be trained for operational requirements for reporting and phone support.

Cannon Hill Slaughter Facility – Training will need to undertaken for lairage, livestock and slaughter personnel for eDEC and NLIS Tag data management. There is also the requirement for the centralised NLIS data management system. Collectively this will require the following:

- All operational personnel from lairage, livestock and slaughter (Knocking Box) for eDEC/ NLIS.
- ACC IT department will need to be trained on operational as well as technical requirements for eDEC, NLIS reading equipment and interface equipment/ modules
- ACC IT department and livestock personnel will need to be trained for operational requirements for NLIS data receiving, processing, error reporting and correction as well as communication with the NLIS database. .

3.11.3 Maintenance Costs

Properties - If all the ACC property groups implement electronic capture, processing and reporting systems there will be ongoing maintenance costs. These costs relate to the following areas:

- PC hardware at the homesteads.
- Scale heads and load bars.
- NLIS Reading equipment.

The normal rate for maintenance/ replacement budget for such equipment in use in this type of environment is 20% per year of the capital cost.

Cannon Hill Slaughter Facility – There is an existing maintenance team at ACC Cannon Hill slaughter facility. This team is likely to be able to provide the additional maintenance without significant cost impact.

Cannon Hill Distribution Centre – This is handled by Frigmobile and is outside of the scope of the project.

3.12 Possible Cost and Performance Measurements for the Project and Impacts for Whole of Operations

Through each link in the supply chain specific activities are conducted. These activities can be broadly measured in terms of current performance. From the current performance position improvements in performance and defined benefits can be determined.

3.12.1 Measures yet to be Defined

The issues of leakage through out the supply chain and the lack of detailed electronic records of all livestock through the supply chain is perceived to be a considerable issue.

As there are currently no detailed electronic records of such data it is not possible to quantify the benefits of the implementation of the proposed systems.

As each system is implemented and methods for measurements are determined, suitable cost and performance reporting measures will be implemented.

3.12.2 Possible Cost per Kilogram with and without Implementation for Livestock Production

If all the ACC property groups implement electronic capture, processing and reporting systems there is likely to be significant costs, these costs are defined as:

- Consumable costs - approx $4.00 per head (NLIS tag and DNA)
- Initial Training costs – approx average of 5% of capital cost
- Capital cost - approx $10,000 per property/ $20,000 per feedlot
- Annual Maintenance Costs – approx 25% of capital cost.

Based on 21 properties, 2 feedlots and 250,000 head slaughtered per year the total implementation costs (capital plus training) would be approximately $262,500. The on going operational costs would be approximately $1,060,000 (tags, DNA and maintenance costs).

If the capital is amortised over 4 year the yearly cost then becomes approximately $1,125,625 per year. When this is converted to a cost per kilogram of carton meat, the cost would be an additional $0.026177 per kilogram of boxed meat.

The above figures are based on the following data:

- 250,000 head slaughtered
- 58,000 tonnes (carcase) to produce 43,000 tonnes (boned)
- 20,000 bred cattle
- 105,000 purchased cattle (back grounding/ feed lot)
- 125,000 internal supply (breed and purchased)
- 100,000 (40% of 150,000) from alliance properties
- 25,000 sale yard direct to slaughter
- 40,000 ACC herd – 20,000 from breeding
- 2,000 sold cattle – leakage – culled
- Total individual 21 farms, 2 feedlots

3.12.3 Performance Improvements and Bench Marks

The market perceived value of complete traceability and supply chain transparency is a driver for the project. This market perceived value is largely unable to be quantified in terms of increase demand and thus market share.

The primary area of long term performance improvement is considered to be based on the increasing level of compliance to specification per kilogram cost of production. These areas are not clearly documented currently. The variance per individual animal will start to become apparent as the systems are implemented on each property.

As each property implements the various systems, specific performance reporting will be generated by the on-farm cattle management software.

4 Milestone 3 - Implementation / Installation

Implementation of the various aspects of the demonstration project must occur across the whole supply chain. These implementation activities have been grouped into the various properties and facilities tasks.

4.1 Redford Implementation/ Installation Processes

Implementation of the proposed solution was undertaken at Redford station during March 2005. Major updated have been completed during June 2006.

4.1.1 Homestead Systems - Individual Cattle Management Software/ eDEC

An initial Stock-book was installed on the computer at Redford Station during October 2005.

Issue with the ACC network for sending eDEC message were identified in October 2005, these issues were resolved during June 2006. Major updates to the systems where completed in June 2006. This included the implementation of the Stock Book, Cattle Plus version with the individual eDEC functionality. This system allows for the NVD and individual information to be sent to ACC head office as well as the feedlot.

4.1.2 Crush Side Installation

The systems installed at Redford station included:

- XR3000 Weigh Scale Intelligent Indicator.
- Harsh Environment keyboard.
- Bar code scanner for DNA samples.
- NLIS hand held reader for induction.
- NLIS panel reader for general weighing.
- Battery power back up system.

Weighing, Bar Code scanning, Industrial Keyboard and NLIS reading equipment at Redford

4.1.3 Commissioning and Training

Systems were set up at Redford over a series of site visits. The process began with the XR3000 installation for weighing. Additional equipment was added as the install proceeded. During the installation process the Allfex Panel reader stopped working and a replaced was sourced.

Training was conducted on the use for the XR3000, Stockbook and the correct application of NLIS tags.

NLIS Tag Attachment Training

The use of NLIS tags in all cattle has been in place since October 2005. All cattle that leave the property now have NLIS devices attached.

4.2 Brisbane Valley Feedlot Implementation/ Installation Processes

Implementation of the proposed solution at the Brisbane Valley feedlot required less work than at the Redford property because many of the systems were already in place. The majority of the work was completed during the 2005 to 2006 financial year.

4.2.1 Office Systems – Feedlot software/ eDEC

Updates to FY3000 and StockaID was installed at the feedlot during 2006. The eDEC system was initialled installed at the feedlot during April 2005. The eDEC system has been trial at Brisbane Valley since December 2005. A number of issues related to communications within the ACC network have hinder correct utilization. These issues were resolved in June 2006. The system is now operational and sending eDEC messages to ACC head office.

4.2.2 Crush Side Installation

The systems installed at feedlot included:

- XR3000 Weigh Scale Intelligent Indicator.
- Harsh Environment computer.
- Alfex NLIS panel reader

4.2.3 Commissioning and Training

The commissioning of the systems at feedlot included training on the use of the eDEC. This training has been completed during June 2006.

All cattle that arrive at the feedlot either already have a NLIS tag attached or if not, have a tag attached at induction. The individual data is recorded in to the feedlot systems.

4.3 Cannon Hill Slaughter Facility Implementation/ Installation Processes

Implementation of the proposed changes at the Cannon Hill slaughter facility require three distinct sub-projects as follows.

4.3.1 Livestock Module for eDEC

The livestock module of the Thorsys system requires the ability to receive and process eDEC messaging include the individual identification data (if supplied) individual attribute data and commercial data. This data can then be used to create kill agendas with relevant supplier data. The operation of the eDEC to Throsys system is scheduled to go live in July 2006. The completion date for the Thorsys system for livestock arrival was June 2008.

The function of the eDEC module at Cannon Hill does following:

- The ‘Thorsys eDec service’ runs on the THORSYS2003 server and sleeps for 100 seconds at a time,
- After the 100 seconds, the service logs into the specified mail server with recorded credentials,
- In our case that is the eDEC user
- If there is a message present it will be read and interrogated for a correctly formatted eDEC message,
- If the message is in the correct format it is processed an inserted into the Thorsys database,
- The final step is to have this information available in kill agenda maintenance, confirming that the whole process was successful

4.3.2 Knocking Box Installation

There is a live id station implemented at the knock box area. As each animal is knocked the NLIS device is scanned and linked to the slaughter body number. This system has been in place since January 2006. The body database within ACC has the individual animal id linked to the body number.

4.3.3 Centralised NLIS Data Management System

The centralised NLIS data management system must be designed, developed and implemented with consideration of the existing ACC systems and the necessary compatibility with regulatory systems as well as the various ACC systems.

The centralised NLIS data management system must be automated to accept the various messages being received as a result of inductions at the feedlots (or properties) as well as weaning data from the breeding properties. External data from Saleyards and alliance properties must also be accepted by the system. There is also the original source data from the manufactures for NLIS tags that are purchased by ACC. This data is all processed and stored. Slaughter data then finalises a specific animal life history. When data has been processed, checked for gross errors and reconciled to eDECs, and other historic data the results are sent to the NLIS database as a message reporting a movement of a number of head of cattle from one PIC to another PIC or slaughter.

The scheduled implementation timeframe for the total integrated centralised Data Management System is October 2006.

4.3.4 Slaughter Systems - Existing

The current slaughter system record the NLIS tag at knocking and track the carcase through then slaughter chain. A GS1 carcase Ticket is applied before leave the slaughter floor. This has been in operation of several years and is operating correctly.

4.3.5 Boning Room Systems - Existing

The current boning room systems scan the carcase on entry to record the time and date of boning. A GS1 carton label is printed and applied to each carton. The bar codes are scanned before exit of the boning room to verify the bar code.

Linkage between carcase entry and carton output varies depending of the specific products being produced.

Trim product has the largest windows and specialised product may for 1 to 1 traceability stored in the database through the new boning room.

4.3.6 Commissioning and Training - Existing

Any additional training to operators will be conducted during the implementation processes. This training has been conducted for personnel within the slaughter and boning room areas.

4.4 Cannon Hill Distribution Centre Implementation/ Installation Processes

The distribution systems are part of the Frigmobile systems. Information is sent between ACC head Office and Frigmobile about carton movements.

The individual cartons are scanned at time of leaving the ACC system and on arrival at Frigmoble. This scanning is used to reconcile the individual cartons.

The carton produced for specific store ordered (retail ready product) has individual store details included in the bar codes. This information provide a one to one linkage between the slaughter/ boning records and the individual stores where the product as sent.

The use of the eMTC for distribution will be implemented once the eMTC is released to for use.

4.4.1 Back Office Systems - Existing

The back office systems are Frigmobile managed and are based of scanning carton and using EANCOM messages currently. These messages will be upgraded to eMTC once the eMTC is released.

4.4.2 Order picking and Load Out Systems - Existing

The order picking systems are Coles based and provide picking data to Frigmobile. Cartons are scanned for load out and the information recorded.

4.4.3 Commissioning and Training

Any additional training to operators will be conducted during the implementation processes.

4.4.4 Electronic Communications with Coles

The carton products are distributed through to the Coles Supermarkets. The electronic messaging system once the cartons leave ACC is part of the Coles communication network. The electronic messages used internal within the Coles system is not part of this project as they are internal Coles systems.

5 Milestone 4 - Evaluation / Validation

The evaluation of the traceability and commercial data demonstration project covers at 2,000 head of cattle going through 2 different supply chains. The process of tagging at weaning and the subsequent growing before eventual slaughter and distribution takes approximately 18 months. For the total project to be fully evaluated and validated has taken approximately two years.

Analysis of various aspects of identification methods and information collection and storage has been conducted. This section of the project report summaries the results of the analysis of the 2,000 head of cattle and general operational activities.

Since October 2005 all cattle through the supply chain have included NLIS tag. All cattle that have entered the feedlots and slaughter from November 2005 have had their NLIS devices recorded and maintained in the slaughter database.

5.1 Time/ Task Analysis Along the supply chain

Analysis was conducted on the time taken for the various operational actives that occur on the live supply chain. These times are summarised below:

Tasks	Time	Time	Time
Property			
Recording entry information - NVD	4min/mob		
Recording entry information - Induction	1min/hd		
Recording entry information - NLIS DB	5min/mob		
Recording progressive management information	1min/hd		
Property Recording exit information - NVD, waybill	3min/mob		
Feedlot			
Recording entry information - NVD		4min/mob	
Recording entry information - Induction		1min/hd	
Recording entry information - NLIS DB		7min/mob	
Recording progressive management information		1min/hd	
Recording exit information - NVD, waybill		4min/mob	
Processing Plant			
Recording cattle arrival /lairage details			8min/mob
Preparing cattle kill agenda details			10min/shift

The above table indicates that along the supply chain there is approximately 4 minutes spent per head and 35 minutes per mob/ movement lot/ NVD.

Based on 1,000 head slaughtered per day there must be the equivalent 1,000 head of cattle moved from breeding/ back grounding to finishing (feedlots). These cattle must be ACC breed/ back grounded, alliance breed/ back grounded or externally supplied.

The collected information indicated that the average mob size is 56 head per movement/ NVD. This equates based on the 1,000 head per day slaughter to 17 movements/NVDs per day. Across the three links of the supply chain this would indicate that up to 51 movements/

NVDs per day are generated. Not all of these generated movement/ NVDs would be within the ACC owned supply chain or alliance properties. Many of the movements/ NVDs would relate to external supply chains, including saleyards.

For the purpose of calculating indicative annual time summaries only 50% of the movements will be considered related to the ACC supply chains. This figure of 50% would be approximately 25 movements/ NVDs per day or for a year of 48 working weeks 6,000 per year.

This same 48 weeks a year would equate to 240,000 head slaughtered. Across the 3 links of the supply chain would indicate 720,000 individual movements per year. If 50% of these movements are related to the ACC supply chain, the figure would be 360,000 individual movements per year.

Based on the records of time required for identification and information management along the supply chain the annual time would be in the order of 6,000 mob movements x 35 minutes plus 360,000 individual movements x 4 minutes. This equates to 210,000 minutes for mobs plus 1,440,000 minutes for individuals which is a total 27,500 hours per year.

5.2 Labour cost estimated for livestock through to the slaughter

A labour cost of $25.00 per hour can be assigned to the identification and information collection activities. Based on the 27,500 hours per year this cost of labour would be approximately $687,500 per year from breeding through to slaughter.

5.3 Cost benefit analysis for the livestock chain

The investment required by ACC for the project related to on farm software, farm work practice, feedlot software, feedlot work practice, on plant software for kill agendas as well as the existing on plant for GS1 from slaughter through to retail. The collective software required an investment of $160,000.

If a 20% reduction in the annual labour cost of $687,500 for identification and information management along the livestock supply chain, the saving would be in the order of $137,500 per year.

The return of investment would be achieved less than 15 months.

The project was able to demonstrate greater than 20% labour reduction is certain areas, these included:

- Cattle induction by having the livestock information available before induction,
- NVD preparation by use of the eDEC,
- Lairage information management by having the cattle information available before the cattle arrived,
- Kill agenda preparation.

The secondary benefit which could not be cost quantified was the improved traceability data and lowered data error rates by removing manual entry errors.

5.4 Redford Cattle Tagging and Data Collection at Weaning

The operational component of the project commenced with the attached of NLIS devices to 1000 head of cattle at Redford breeding/ backgrounding property in 29th of April 2003. These 1000 head comprised approximately 600 carves and 400 weaners. An electronic file of these cattle were collected at the time of induction.

No DNA samples were collected for the 1000 head of cattle.

The process for recording the NLIS devices was by passing the NLIS devices over the tag reader before attachment. This process allowed tags that were broken during induction to appear as valid tags even though they can not be read.

Cattle Processing at the Crush at the Redford Breeding/ Backgrounding Property

The NLIS device list was imported into Stockbook in March 2005 to create the individual records in the system.

A number of these cattle where selected at the end of March 2005 for shipment to the feedlot.

A 128 head of cattle left the property at Redford in early April 2005 and arrived at the Brisbane Valley feedlot.

No eDEC was created for these cattle that were despatched to Brisbane Valley Feedlot.

5.5 Tagged cattle arriving at the Brisbane Valley Feedlot

On arrival at Brisbane Valley feedlot the cattle trial where inducted. Of the 128 head inducted the following information was recorded (see attached Appendix of Induction Scanning Data)

- 128 head of cattle were received from Redford.
- 44 head were over 360kg.

- Weight range was 271 to 419kg.
- 1 was 4 tooth, 1 was 6 tooth.
- 9 tags beeped at the reader but weren't able to be read.
- 8 animals had no tags (Tags had been lost) On the induction data these animals can be seen buy having the same animal and visual ID, and the animals with a breeder tag number had no tag.
- Approximately 10 instances where the animal had to be pushed back to read the tag (we may look at bringing the tag reader forward slightly to combat this).

Since October 2005 all cattle have had NLIS devices either attached before arrival at the feedlot or during induction.

5.6 Animals Tagged at Brisbane Valley Feedlot

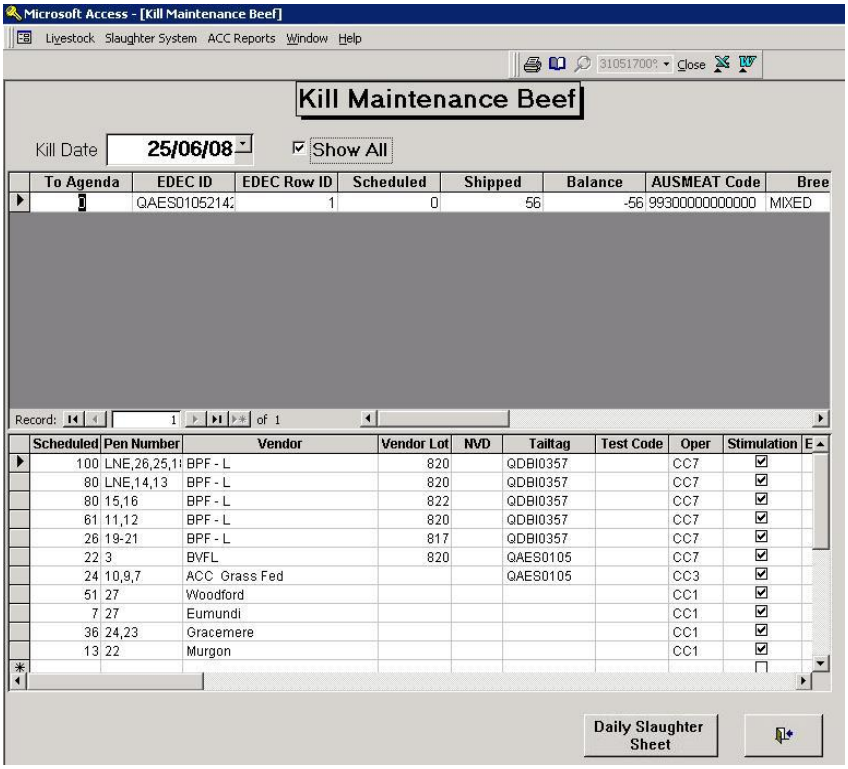
For the initial trial Brisbane Valley Feedlot received 1,000 tags. These tags were applied to cattle during the trial period. From July 2005 all cattle that did not arrive with NLIS tags attached had tag attached.

All cattle since October 2005 have had there NLIS devices read at induction. This tag data is recorded and held in the Induction system database.

For specific lots of cattle that left the Brisbane Valley feedlot eDEC NVDs were created. (See appendix for an example).

5.7 Arrival of Cattle at ACC Cannon Hill and Kill Agenda preparations

eDEC messages are received at ACC Cannon Hill from the Brisbane Valley Feedlot. The information was automatically processed to present the cattle in the kill agenda for scheduling, see the image below.



5.8 DNA analysis of selected demonstration cattle

A group of 300 steers from Redford Station property were nominated to take part in the traceability trial aimed at proving the integrity of the electronic systems. DNA testing was used to match hair samples taken from this group of steers at Redford, with tissue samples taken from animals with the corresponding RFID recorded at slaughter.

A large portion of the 300 steers with hair samples taken at Redford were transported to the Brisbane Valley feedlot, placed on feed, and finally transported to Australian Country Choice at Cannon Hill for processing where 163 samples from the original group were killed. Hair samples were sent to Catapult Genetics in December 2006 and tissue samples were processed in July 2007, and sent to Catapult Genetics in August 2007.

To randomly test the electronic ID system, the tissue samples were arranged in ascending barcode order and roughly every 10th sample was DNA tested against the animal ID which corresponded.

Animal IDs were linked through the following process:

- A spreadsheet supplied by Redford listed RFID and Animal ID on the hair sample supplied,
- Animal ID on hair samples was recorded against hair sample barcode by Catapult Genetics,
- Kill data created at slaughter at Cannon Hill listed the SureTRAK™ tissue sample barcode and the scanned RFID of each animal,
- Hair samples and tissue samples linked through data to the same RFID were DNA profiled and results of hair and tissue samples compared against each other.

The following table provides the details of hair and tissue samples tested. Seventeen reference samples were each compared to one nominated test sample from job CJ100691 (representing 10% of the lot of steers at slaughter).

Matches were found between each reference sample and the nominated test sample as detailed in the table below. All 19 markers tested were identical between the test and reference samples.

Reference Sample	**Matching Test Samples**
1 (barcode 982 000017058483)	982 000039706867 (barcode 10088799)
38 (barcode 982 000017058550)	982 000057061805 (barcode 10088720)
40 (barcode 982 000017055946)	982 000039707197 (barcode 10088820)
57 (barcode 982 000017058769)	982 000038679515 (barcode 10088781)
64 (barcode 982 000017056992)	982 000039713530 (barcode 10088875)
99 (barcode 982 000017056956)	982 000039713295 (barcode 10088765)
130 (barcode 982 000017056343)	982 000057830681 (barcode 10088731)
131 (barcode 982 000017058167)	982 000039706888 (barcode 10088853)
171 (barcode 982 000017056883)	982 000039706819 (barcode 10088865)
179 (barcode 982 000017058974)	982 000039713375 (barcode 10088708)
205 (barcode 982 000017058508)	982 000054600865 (barcode 10088843)
210 (barcode 982 000017058368)	982 000039713319 (barcode 10088808)
213 (barcode 982 000017058571)	982 000057831096 (barcode 10088833)
214 (barcode 982 000017056881)	982 000039707491 (barcode 10088775)
222 (barcode 982 000017059669)	982 000038954604 (barcode 10088741)
239 (barcode 982 000017056660)	982 000039706971 (barcode 10088790)
253 (barcode 982 000017058577)	982 000039713465 (barcode 10088752)

6 Milestone 5 - Final Report / Publication / Dissemination

The project was commenced in 2003 and was completed as at the 28th June 2008.

This final project report comprises the initial project objectives through to the details on completion of the project.

Due the time frame of the project certain details that may have been revenant and current at the commencement of the project have changed.

7 Amendment Register

Version	Amendments	Issue date
1	Initial Draft	21st September 2004
2	Draft for MLA Review	22nd December 2004
3	Update for Milestone 3 and feedback from MLA.	11th April 2005
4	Update for typos, and additional data	11th May 2005
5	Update to show the work completed for the eDEC and livestock through to slaughter.	20th June 2006
6	Finalisation of report – 2007	11th July 2007
7	Finalisation of report - 2008.	28th June 2008

8 Appendices