Final report

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Traceability in the Red Meat Industry

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Table of Contents

1.0 Introduction

This document summarises the documents and information that has been compiled over a number of years relating to the implementation and operation of traceability systems in the meat industry both by Meat and Livestock Australia and others.

Some of the information in this document will apply in some circumstances and not in others depending on products (red meat, offal etc.) and business profile while other information will be relevant to the particular needs of the supply chain or the position in supply chain that the company operates (producer, wholesaler etc).

There are a number of referenced documents that relate to both the work carried out by MLA and GS1 as well as some general background documents included in this document. While these are linked where appropriate in the text of this document they can also be viewed in the listings of documents. Not all the documents included in the lists are referred in the text of this document and therefore need to be accessed from the document lists.

A complete document of all the pages of this file is included in the links on the left to enable simple printing of the pages. Linked documents are not included in the file and will need to be printed separately.

2.0 Background to the Implementation of Traceability.

Although there are common methodologies and systems there is no single set of instructions that apply to implement traceability for a company's products. In some respects a company will already have a measure of traceability in its operations if only through the use of computerised accounting systems, inventory management and shipping systems. However, this will not be enough to meet the needs of a modern food processing business and these systems will not be providing any benefits to the company that accrue from the tracking of product and using the collected information in running the business. Nevertheless these systems may need to be upgraded to interface and integrate with traceability needs and systems or if the traceability systems will need to be designed to accommodate these existing arrangements.

The key question that needs to be answered when designing or upgrading a traceability system is "what business objectives am I trying to achieve". Typically this relates to "what problem or issue am I trying to resolve" or "what opportunity am I trying to attract or achieve"

The traceability systems, their functionality and requirements will also be different inside the business (and maybe even by department) and outside in both supply and product markets.

To determine the traceability needs of the business managers need to ask a few questions:

- *Who is the primary user of the systems output?*
- *What primary information does this primary user want or need?*
- *Are these requirements explicit or implicit?*
- *How will the traceability information be used in the business to create value?*

3.0 Definitions and Terms

A number of similar terms are used in the supply chain to describe similar actions and functions. the definitions for these terms as described in the GS1, Trace-1 Guidelines. These are as follows:

1. **Traceability** broadly describes the ability of the system (and/or its users) to trace the origins of product and its movements in the supply chain. This is further defined by the terms **trace back** and **trace forward**
2. **Tracking** is the recording of data as product moves through the supply and manufacturing process and provides the information that makes **tracing** of product possible.
3. **Trace back** is the ability of the systems in the supply chain (both internally and externally) to trace a product back from the end user (or source of the query) back to the start of the supply and manufacturing process.
4. **Trace forward** is the ability to trace forward from a point in the supply chain to identify all products from the source. For example, given a problem with product which is identified back to an animal or herd, **trace forward** is the ability to find all the products from those animals – wherever they are in the supply chain.
5. **Tracing** is the ability of the system to use the data from the tracking process and describes following the data back from the end of the supply chain to the source of the product. The collection of **tracking** data does not in itself mean that **tracing** is possible. If collected data is not relevant to purpose or systems interfaces do not match or are ruptured then **tracking** systems may not necessarily allow product **tracing**.
6. **GS1** (Formally EAN International) administers the coding and communications systems and related symbologies such as USCC, company identifiers etc. Membership of the organisation is necessary to be able to use the GS1 systems
7. **EAN.UCC System** is the standard numbering and bar-coding, e-Messaging and related systems jointly developed by EAN International and the the Uniform Code Council to provide a global system of identifying and communicating between organisations in the supply chain.
   These systems have now been combined into the one global system GS1.
8. **UCC** The Uniform Code Council in the USA
9. **GTIN** is the Global Trade Item Number
   An identification number to identify a trade item which may be sold at retail POS (Point of Sale) which appears in a general warehouse (distribution) environment.
10. **SSCC** (Serial Shipping Container Code) is used as the unique identification of logistic units.
11. **Check Digit** The check digit in a bar code is a calculated number that is used to verify a correct read of the bar code when scanning. The number is calculated by the use of an algorithm designed to ensure accuracy. A document outlining how this is calculated can be found here.
12. **Global location number (GLN)**

The Global location number is used to identify a company or organisation as a legal entity. GLNs are also used to identify physical locations, or functional entities within the company. The use of location numbers is a pre-requisite for efficient EDI.

13. **EPC and EPC Network** are Standardised Electronic Product Codes for use with RFID technology and facilitated by GS1 International (formally UCC and EAN International.)
14. .**EPC and EPC Network** are Standardised Electronic Product Codes for use with RFID technology and facilitated by UCC and EAN International.

4.0 Traceability in the Meat Industry

4.1 Introduction

The meat industry has over time tracked product through the supply chain for a number of reasons, from simple payment to the farmer, identifying product loaded for export and regulatory requirements, etc. Over time, as markets have diversified, processes changed and the preparation of product move back up the supply chain the issues relating to traceability and product tracking have become increasingly important and complex.

4.2 Key issues for Product Tracking in the Meat Supply Chain.

Tracking of product and related information in the meat supply chain may be separated into two areas of activity, internal company tracking systems through the manufacturing process and external systems interfaces that allow company product to be traced from the consumer end of the supply chain back to source animal or raw material.

4.2.1 Internal Company Issues.

During the abattoir process the tracking of meat product is relatively secure (correlation of physical and data movement) until the bodies arrive at the boning room. At this point the removal of individual cuts from the bodies disengages the connection of cuts from bodies causing a rupture in the tracking data flow. However the tracking of products removed during the slaughter process (e g red and green offal etc) are less accurately tracked and present a range of issues for the processor.

The tracking of meat meal and tallow is an example of the need to track mixed products. This was examined as part of a project with Australian Country Choice:

An outline of this project can be viewed here

A video of the project can be viewed here.

Once the meat cuts are again in a bar-coded carton the orderly information flow recommences. Therefore, the issue for most meat processing plants is how to provide cost effective systems to manage this (boning room) area: Typically issues that need to be addressed are:

- Tracking the physical movement of the cuts and keep separation between products.
- How to collate the necessary data and connect it to the physical operations/movements
- Determining a method that allows the risk associated with a product and the methods used to track the product to be associated with the risk / financial profile of the product. An example of this can be seen when manufacturing meat (low value) which may be

only able to be traced by a time batch leads to a recall of a large amount of primal cuts even though they have been accurately identified and tracked through the process.

Similar issues relate to the processing of offal and other co products.

To date in boning rooms the solution for larger processors has been to adopt one of three systems:

1. The use of totes or moving cutting boards fitted with RFID transponders.
2. The use of software sectioned belts with controlled drops to separate the cuts on the conveyor belts.
3. The use of solo or team based boning arrangements, where only one body is being processed by a team or individual at any one time.

The use of DNA sampling is also an option to determining the source (animal) of a consumer product and is used by some plants. This system has low capital cost requirements but does have significant operating costs. However without sophisticated systems the process lacks the ability to trace back and then trace forward to find other related products.

Economies of scale help to alleviate the high capital costs of the first two systems and downstream management benefits provide operational savings in the plant through better labour utilisation and yield management.

The use of team and solo boning systems have demonstrated the ability to provide the physical movement and data connectivity but they have also tended to disadvantage operators with lower productivity and the need for higher general skill levels in the room. In many respects the installation at Oakey is a mixture of systems two and three with matched boning and slicing teams with the cuts being managed on the belts to the packing stations.

Figure 3 Overview of the information exchange Beef Labelling (EC) 1760/2000

Other issues of tracking through the plant and the ability to trace back down the chain are the management of materials brought onto the site and the management of the supply chain information by supply companies.

Given a plant large enough to achieve economies of scale to amortize capital costs and drive the operating opportunities the decision on the level of product tracking will be influenced by:

1. The age and efficiency of the existing boning room operation,

2. The degree of accuracy of existing (batch based) systems and the needs of the company to improve discrete identification of product in the supply chain.

External Supply Chain Issues.

Not surprisingly with the number of animal health related events that have occurred in Europe over the last few years means that the systems for managing supply chain tracking and tracing back are well developed in these countries. The use of GS1 codes and communications systems allows product tracing through the supply chain, as long as the company has internal systems that are able to accept upstream queries and respond with the correct data either from its own records or those of its suppliers (where necessary).

The coding system for beef in Europe is shown in figure 3 and demonstrates the use of global codes (for companies) and bar code construction standards for tracking product movements between organisations. Many Australian processors / exporters are already GS1 members and have GTIN numbers allowing their products to be identified, tracked and traced globally.

4.2.2 Product Tracking and Recall

All meat processing companies to a greater or lesser extent track meat products through the plant and depending on those systems have an ability to trace back product. Tracing forward in simple systems is not always as straightforward. Consequently the issues relating to the improvement in supply chain management and product tracking are as follows: **(This topic is further discussed in this document.)**

1 The current position of the company needs to be ascertained. While a certain amount of qualitative data is useful quantitative data is essential for a company to properly assess its position, costs and risks. A review of traceability systems will need to determine:

   a Data loss rates between systems (physical and IT). The processes and practices to address the issue

   b Where and what are the rupture points in the internal supply chain.

   c What type of product tracking system is in place and what are the batch sizes associated with that:

   d Can the system trace forward with accuracy and confidence.

   e What is the interoperability of the systems with third parties, Government, suppliers, customers, etc.

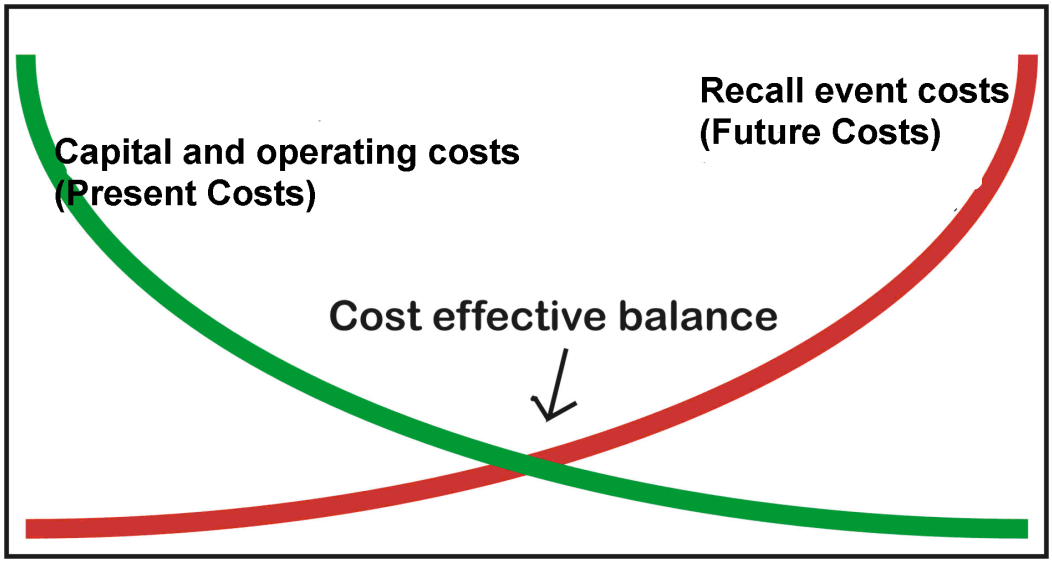
   f. How is lost data managed, how are data errors detected and repaired.

2. What is the batch size(s) used by the company and what should it be? The tracking batch size of product through the company will be different for each individual product and will be determined by the breakpoint of product in the system. For a boning room, for example, this may be when there is a change in orders through the room and one type or mob of cattle is changed to suit the new order with the room being cleaned through (of product) in the process. In the offal room for some small products the batch size (on the same plant) may be as high as a half or full day.

The implications of batch size on recall options and volumes all relate back to this production unit, both in tracing back and tracing forward.

In essence the discrete product tracking systems in place at both ACC and Oakey are all based on a batch size of one (one primal, one batch of manufacturing meat etc) and from the cost of developing those systems at this high level of traceability and knowing the cost of conventional batching systems. From this it is possible to infer the cost of tracking all products in the boning room (including trim) and the loss related to recalled products compared to simpler time based batching systems with significantly lower capital costs but greatly increased costs for recalled and lost product.

Depending on the revenue for the product the markets serviced and the costs of recall etc it is possible for a processor to determine the most cost effective level of traceability for a given processing plant.



The importance of the size of a batch in the system is highlighted by the extreme case of **Hudson Foods in July/August 1997 in Columbus, Nebraska.** Hudson opened a new state of the art facility to produce large volumes of hamburger patties, however it also adopted (naively) the practice of using the last of the product from the previous day to start in the morning. Effectively removing any breaking into batches the production of the plant. Effectively a very large batch size of one. When H157 e coli was found in the finished product not only could the company not identify suppliers of beef they couldn't identify which customers had which product. This led to a recall that escalated from 10,000lbs to 25 million pounds (11,363 tonnes) over a couple of weeks and bankrupted the company.

5.0 GS1 Australia

GS1 Australia is a not-for-profit organisation that locally administers the global multi-industry system of identification and communication for products, services, assets and locations - the GS1 System.

GS1 Australia was created to help Australian business enterprises become more efficient; the fundamental role is to allocate GS1 numbers and bar codes, maintaining internationally

accepted trading standards. This, in turn, allows Australian organisations to adopt world's best practice supply chain management techniques.

GS1 numbers and bar codes permit organisations of any size to order, track, trace, deliver and pay for goods across the supply chain, anywhere in the world.

The GS1 System was developed by GS1 Global Office. It is recognised by the International Standards Organisation (ISO), the European Standardisation Committee (CEN) and the American National Standards Institute.

A listing of GS1 documents can be found here.

5.1 GS1 Numbering Systems.

There are a number of different bar coding and numbering systems included in the EAN.UCC system each with different purposes and requirements. Each of the systems essentially use three parts to the numbering that combine to form the identifying number and associated bar code. These are the number allocated by GS1 that identifies the company, the number generated by the company that identifies the product and the the check digit that confirms accuracy of barcode reading, this is **calculated using a standard algorithm which can be found here.**

5.2 GS1 Related Links.

1. **A document outlining the basics of bar coding**
2. **A document showing the numbering arrangements of different barcodes structures**
3. **An explanation of carton label coding**
4. **An explanation of carcase label coding,**

6.0 MLA - Supply Chain Management

6.1 Overview

The disassembly process in meat processing (abattoir and follow on processes) pose the most significant challenge in developing product traceability in the supply chain from production through to consumer.

The primary issues related to the processing stages are:

1. Having in place a system that physically separates the products as they are removed from the animal or body.
2. Identifying product in tracking systems and relating data to other inputs and outputs.
3. Determining the level of detail for data collection to provide the output required by the customer and while not overcomplicating systems and adding to cost.
4. Developing methods and procedures to use in the event of a recall or other tracing event.

A number of MLA projects have been carried out with processing companies to address these issues and provide possible methods and solutions for processors.

The tracking of bodies through slaughter floors has been the norm for a long period of time and to a large extent driven by the necessity to allow the payment of farmers on the weight of the carcass. However, the offal and other products removed during the slaughter process need to be considered and projects have been carried out in this area.

During the abattoir process the tracking of meat product is relatively secure (correlation of physical and data movement) until the bodies arrive at the boning room. At this point the removal of individual cuts from the bodies disengages the connection of cuts from bodies causing a rupture in the tracking data flow.

6.2 4 Types of System

1. In many existing boning rooms processors have made use of batch and / or time based systems using data collected from product carton labels or similar markings to identify finished products with carcasses entering the boning rooms.

To provide for systems that allow identification accurately down to primal level it is generally necessary to considerably modify or rebuild a boning room and MLA has worked with a number of larger processors when this work was planned to investigate different solutions. These projects have investigated:

2. The use of totes or moving cutting boards fitted with RFID transponders to control the movement of product in the boning room as well as track it through processing..
3. The use of software sectioned belts with controlled drops product onto the belts to separate the cuts on the conveyor to packaging or further processing.
4. The use of solo or team based boning arrangements, where only one body is being processed by a team or individual at any one time.

The use of team and solo boning systems have demonstrated the ability to provide the physical movement and data connectivity they have also tended to disadvantage operators with lower productivity and the need for higher general skill levels in the room.

6.3 MLA Projects

To date MLA have initiated a number of projects mainly based on the development of new boning rooms using systems from Marel and QED. These projects focus on the installation of each system at a processing plant and how the system integrates into the supply chain..

The **Marel** system uses a system of virtual belt segments on a continuous conveyor belt, controlling the delivery of product to the belt and discharge at selected points to ensure that product is tracked and stays in order through the boning and slicing process. This system was installed at the Oakey plant of Nippon Meat Packers and is summarised **here**.

The **QED system** integrates with a mechanically assisted de-boning system (Proman), with the primal cuts being placed on large moving boards. The boards are fitted with RFID tags to locate and direct the board carrying the cuts through the process.

A video of the boning room can be viewed here

Once the meat cuts are again in a bar-coded carton the orderly information flow recommences. Therefore, the issue for most meat processing plants is how to provide cost effective systems to manage this (boning room) area:

1. Tracking the physical movement of the cuts and keep separation between products.
2. How to collate the necessary data and connect it to the physical operations/movements
3. Determining a method that allows the risk associated with a product and the methods used to track the product to be associated with the risk / financial profile of the product.

The use of DNA sampling is also an option to determining the source (animal) of a consumer product and is used by some plants. This system has low ingoing capital cost requirement but incurs costs when used for tracing the origins of product back along the supply chain.

However, without computer and/or records systems the DNA process lacks the ability to trace back and then trace forward to find other related products.

Other issues of tracking through the plant and the ability to trace back down the chain are:

- the management of materials brought onto the site and
- the management of the supply chain information by companies supplying the processors.

Given a plant large enough to achieve economies of scale to amortise capital costs and drive the operating opportunities the decision on the level of product tracking will be influenced by:

1. The age and efficiency of the existing boning room operation,
2. The degree of accuracy of existing (batch based) systems and the needs of the company to improve discrete identification of product in the supply chain.

7.0 MLA Projects

Traceability needs of enterprises in the meat industry are generally defined by:

1. The business of the enterprise and its position in the supply chain.
2. The number of steps the enterprise controls in the supply chain.
3. The interaction between the enterprise and the other entities in the markets and the supply chain.

To identify issues and provide solutions MLA has carried out a number of projects that relate to:

1. Providing systems and equipment to track product through internal company operations.
2. Work to provide communication frameworks to allow organisations to exchange data in a cost effective and timely manner.

Projects carried out by MLA have covered a number of areas of the meat supply chain and may be broken into three broad categories:

1. Company Systems.
2. Communications and
3. Integrated systems.

Many projects cross these boundaries as they relate to different aspects of traceability and may be viewed from a number of different aspects.

A listing of documents relating to MLA projects and Traceability can be **found here**.

7.1 MLA Supply Chain Management Projects

	Domestic Supply Chain Management	Using Standardised Barcodes and eMessaging	Export of Product Using Barcodes and eMTC	Using GS1 Systems for Shipping Product to USA	Barcoding & eCom, By-Products and Co-Products	Using GS1 Systems with DNA Validation	Retail Ready Product Tracking	Supply Chain Systems Integration
Project Number			SCT.006	PRMS.031				
Full Integration - "Story Products"								
All Product Tracking Through Processing								
Track all Meat Product								
Discrete Product Tracking Through Processing								
EDI Communications with Suppliers and Customers								
Standardise Numbering and Coding								
Company Batch Recording Systems								

7.2 Links and Related Documents:

1. **The basics of bar coding**
2. **The implementation levels of traceability**
3. **Explanatory fact sheet on carton labelling**
4. **Explanatory fact sheet on carcass labelling**
5. **Technical details of the Electronic Meat Transfer System.**
6. **The cost benefits of using the GS1 system in the meat supply chain.**
7. **Project Videos**

   Co products and By products tracking

   The use of GS1 barcodes to track a trace product in an export trial of product.

   The tracking of retail ready product through the supply chain with GS1 codes.

   The tacking and tracing of product using conventional batch and sequence systems with DNA sampling to achieve product traceability.

   The use of DNA sampling to track and trace value added products.

   The integration of livestock NLIS systems with GS1 systems in the meat processing and the supply chain.

8.0 The Application of Systems and Technologies at Different Levels of Supply Chain Traceability

	NLIS	GS1 Labelling (Barcode/RFID Identification)	GS1 eCom Implemented (eMessaging)	Process Plant Configured for Tracking	Integrated Company IT & Systems	Company Systems Integrated with GS1 systems	Systems Provide Transparent Traceability to All Users of the Supply Chain
Full Integration - "Story Products" (6)	X	X	X	X	X	X	X
All Product Tracking Through Processing (5)	X	X	X	X	X	X	X
Track all Meat Product (4)	X	X	X	X	X	X	
Discrete Product Tracking Through Processing (3)	X	X	X	X	X		
EDI Communications with Suppliers and Customers	X	X	X				
Standardise Numbering and Coding (2)	X	X					
Company Batch Recording Systems (1)	X						

Notes:

(1) Batch Recording Systems are typically the methods by which many plants track products by dividing production into specific time segments and recording data to allow later tracing of product if necessary. Systems are generally low cost but coarse in their tracing ability and can often be time consuming to use for tracing events. As the base level position these methods meet for traceability for many companies but provide no financial benefit to the company operations.

(2) Adopting GS1 coding standards ensures that product barcodes can be read and interpreted in almost all global markets.

(3) Discrete product tracking refers to the ability to track single product items (such as primal meat cuts) through the process and when combined with GS1 systems through the downstream markets for these products.

(4 The tracking of all meat products (from the boning room) takes product tracking and traceback a step further by putting in place equipment and processes to track manufacturing meat products through the system so as to provide the framework to be able to traceback bulk pack cartons to supply source.

(5) All Product Tracking refers to the ability of the processor to track all products through the process and in combination with GS1 systems provide the ability to track and trace these products along the supply chains. Products in this category are generally those that are by the manner of processing or packing combined or mixed. These category includes offal, hides, meat and blood meal, etc. Manufacturing meat also falls into this category when it can be tracked and traced by the individual carton rather than by its batch (1).

(6) A fully integrated supply chain that provides for story products has the ability to provide the end user be it the store and/or consumer the ability to view all the data and heritage of the product on display. to achieve this requires a company to go a step further the company tracking and GS1 systems to a level that integrates IT systems to provide transparent access to company systems (in defined and controlled areas) to allow the inspection of all product related information back to farm level.

9.0 Integrated Traceability Systems

While a meat processing company may put in place a traceability system for tracking product through the processing plant the maximum benefit is derived when the system is fully integrated from the breeding of the livestock through to the consumer purchase.

This may be achieved in a number of ways:

- Through owning the production and processing facilities along the whole of the supply chain.
- By controlling the production and processing facilities along the supply chain
- By having systems and arrangements along the supply chain that allow transparency for all the participants in the route to market.

While it is possible to employ a range of systems to suit particular needs within organisations along the supply chain the closer the product comes to market the more universal the systems need to become and on this basis the greater the use of GS1 systems.

However for a fully integrated system the mechanics of the operation and the methods of product identification are only part of the solution and to gain full tracking and tracing outcomes and access the benefits to the company IT systems needs to be integrated within the company and use effective communications systems in dealing with supply chain partners.

MLA sponsored projects that have addressed issues of supply chain integration have included

- **The PIP project carried out by Nippon Meat Packers at Oakey** where the construction of a new boning room facility allowed the company to track product physically through the process and then integrate the whole of the supply chain through the company owned feedlots through to the consumer in Japan. In many respects this is a framework that is not available to other Australian Meat Processors as the ownership of facilities from cattle raising through to consumer is unusual, particularly in an overseas market.
- The project with Australian Country Choice is very similar to the Nippon project except that ACC do not control the product through to retail in the same manner. Although by means of contracts and partnerships Coles Supermarkets do effectively control this supply chain from breeding though to retail sale (beef and lamb) although without ownership of the facilities.
- Several projects were carried out reviewing the methods and procedures to implement supply chain links at different points in the supply chain. These projects were part of the Qe Meats program with the linkages between meat processor and distribution using GS1 methods and standards being implemented by Nolan Meats.
  The project at **Nolan Meats** is in two parts:
  - **EAN Barcodes Implementation**
    The first stage of the project was to investigate, within all the activities of the company, where it would be possible to improve the operations of the company with EAN compliant technology. Areas identified for potential improvement included EAN.UCC coding on carcasses and cartons. This required changes to carton weigh software, slaughter floor software and carton load out software as well as the redesign of labels and the training of staff.
  - **EANCOM Messaging Implementation**
    This project (as part of the Qe Meat program) required the implementation of more reliable data management methods across all business units and trading partners of which Nolan Meats is a major partner. For the project to be a success as a whole it will require the integration of EAN compliant systems throughout all the point within the supply chain.

10.0 Qe-Meat Projects:

These projects are a series of linked projects undertaken as a joint initiative between MLA and the Queensland Department of State Development. These projects were aimed at endorsing the use of open standards in the meat industry and endorse the uptake of GS1 (EAN.UCC) data coding standards. Collectively these projects cover the range of cattle production, meat processing, transport, secondary processing, domestic and export distribution.

While some of the larger meat companies operate in an integrated manner along the length of the supply chain the majority of the companies operate in parts of the chain and need to interact on a detail level with other companies. With different companies using different systems and software communication between the companies is often difficult with significant amounts of data being entered manually (often more than once).

GS1 standards provide for reliable, unique and globally consistent product identification which supports best practice for the supply chain, reduces supply chain costs and improves traceability.

Five documents that relate to the Qe-Meat project are attached to this document:

- e-Commerce Business Models
  This 2001 Document provides a number of models to pass information forward and backward throughout he supply chain using GS1 (EANCOM) messaging standards.
- Generic Implementation Plan Issues
  This document sets out a process for a pilot implementation project based on the GS1 (EAN.UCC) system for livestock and the meat supply chain. the objective of the

implementation project is to demonstrate the commercial value in the adoption of a standards based approach to livestock codification and electronic messaging.

- Analysis of Information Flows and Implementation of an e-Business Solution for Killarney Abattoir
  This project looks at the issues related to the processing of animals on the kill floor and the two way flow of information between the cattle producer and the abattoir.
- Analysis of Information Flows and Implementation of an e-Business Solution for Brady's Butchery
- Unique Consignment Reference Number - A EAN.UCC Case Study
  This EAN (GS1) document reviews the use of GS1 methodology and symbology in the Qe-Meat project and summarises the procedures and outcomes.

11.0 MLA Documents

The following is a listing of the MLA documents that have reference or are relevant to traceability and / or have been used in compiling this summary document.

11.1 MLA Projects

1. **Commercial trial of bar coding and electronic data interchange (EDI) for the Australian export meat industry, Final Report, March 2003**

- *The trial was designed to demonstrate how bar coding combined with internet based electronic messaging could form the basis of a fully integrated supply chain management tool and deliver substantial benefits to the meat industry. The trial also demonstrated that certain regulatory documents and information could be included within the system using the same standards. (PRMS.031)*
- *A summary of this report can be **found here**.*

2. **Export product using Electronic Meat Transfer Certificates (eMTCs)**

- *The eMTC was developed by industry to provide a non-proprietary system based on international standards for the creation, printing, and electronically sending and receiving of Meat Transfer Certificates. The eMTC has been developed by MLA with the assistance of AQIS, GS1 Australia, industry participants and export customers. This new system can be used free of charge by industry as it is non-proprietary and based on open standards. (SCT.006)*

4. **Oakey Supply Chain Integration, Summary.**

- *This project set out to establish systems and processes to integrate the end-to-end process management of new high volume production technology, to improve people, process and product outcomes while linking together the currently disparate areas of feed-lot, slaughtering, boning and packing, storage, shipping and customer contact and support, and so provide a means for customers to view the history of the product they were buying. The primary aim was to strengthen consumer confidence in the product and so protect market share. The project was successful in being able to give the customer the required access to product history. In addition, significant benefits were gained in product yield, product quality and labour productivity. (PIP.091)*

5. **EAN Integration At Nolan Meats, Summary.**

- *The "EAN Integration at Nolan Meats" provides the solutions by:*
- *Applying Standardised Barcodes: Standardised barcodes will allow all members throughout the supply chain to scan and recognise every establishment's barcodes. Using these*

standardised barcodes, even customers overseas can scan the barcodes because they are a globally unique barcode.

- *Utilising Standardised Electronic Messaging: After the implementation of EAN barcodes, consignments can utilise standardised electronic messaging for information flow between supply chain members. The electronic messages have even been adapted for live animal transfers, allowing for full paddock to plate electronic traceability. (PIP.103)*

11.2 Traceability Documents

1. **Review of Traceability in the Meat Industry.**

- *An overview document that provides an summary and review of projects carried out to test boning room tracking systems.*

2. **National Livestock Identification Scheme (NLIS)**

- *Brochure on the application of NLIS in the production sector*

11.3 Project Videos on CD

1. **Co products and By products tracking**
2. **The use of GS1 barcodes to track a trace product in an export trial of product.**
3. **The tracking of retail ready product through the supply chain with GS1 codes.**
4. **Tracking product through the boning room at ACC**
5. **The tacking and tracing of product using conventional batch and sequence systems with DNA sampling to achieve product traceability.**
6. **The use of DNA sampling to track and trace value added products.**
7. **The integration of livestock NLIS systems with GS1 systems in the meat processing and the supply chain.**

12.0 GS1 Documents

There are a number of reference documents published by GS1 (and others) relating to the implementation of traceability systems and the use of EAN Barcodes, EAN COM (communications) and other standards that form the backbone of the systems and methods of tracking products outside the organisation. The documents that are referred to, or are relevant to implementing and maintaining traceability systems are listed below.

Note: Files listed below may change over time and the GS1 website should be checked for current versions.

12.1 Brochures	12.2 Guides
Traceability Management Tools for Agriculture, Food and Beverage Products. This GS1 International Document provides an overview of the application and use of the GS! identification systems.	Traceability of Beef - Application of EAN.UCC Standards. A guide to meeting the EC Regulation 1760/2000 and the implementation of GS1 (EAN.UCC) Standards
Complete brochure on GS1 (EAN-UCC) bar codes, shipping units, logistics and communications.	Explanation of the calculation of the bar code check digit.
The GS1 Traceability Standard - What You need to know. - A complete 35 page document on using the GS1 System for traceability.	Australian Grocery Industry Guidelines (2001) - a documents that covers the use of EAN UCC numbering, barcodes and systems for items that are **NOT** sold at a retail point of sale.
EANnet Brochure - a document that describes the operation and benefits of belonging to EANnet providing for the interchange of data between trading partners.	Australian Meat Industry Guidelines for the Numbering and Bar Coding of **NON** Retail Trade Items - This document should be read in conjunction with EAN Australia User Manuals
EAN Corporate Brochure - A short brochure outlining how EAN Australia can assist companies.	Despatch Advice Guidelines - Message implementation guide for using EDI. The guidelines are part of the Australian Meat Industry project and references export trials.
An Introduction to EAN International - an outline of the international organisation.	GS1 Australia User Manual for EAN UCC Numbering and Bar Coding. Provides all the necessary information in regards to systems and implementation.
A Guide to Becoming an EAN Certified Company	GS1 Australia User Manual - Symbology and Printing.
EANCOM an international standard for EDI communication.	Guide to ISO Verification - The ISO method looks at the barcode the way the scanner sees it.
RSS and composite symbology - a description of the reduced bar code symbology and use	How to Work Out Magnification of GS! (EAN UCC) barcodes.
12.3 Forms	UCC/EAN-128 Specification for **NON** retail Trade Items
Application for GS1 License Agreement.	Introduction to EDI - This document provides a framework on the various areas of study applicable t the implementation of an EDI

	project within an organisation.
GLN (Global Location Number) application.	Introduction to EANCOM in Trade and Transport - Introduces the message available for use in the trade and transport sectors.
Notification of Termination	Product Data Message - for specific application to the NLIS database.
	EANnet v2.0 Pilot Report - The outcomes of the Australian retail grocery industry "proof of concept" trial and rollout of EANnet v2.0.

13.0 General Traceability Documents

The following documents relate to the traceability of meat and systems in general. They are not necessary to implement traceability in a company but they do provide a perspective on traceability in different situations and comment on different systems and methods.

- **Animal Identification and Meat Traceability, Congressional Research Service (USA), July 2006.**
  A short background paper that outlines the progress and actions being taken in the USA to improve meat traceability and in particular animal ID programs and options.

- **Traceability in the US Food Supply - Economic Theory and Industry Studies, USDA, March 2004.**
  This report describes the results of an investigation into the amount, type and adequacy of traceability systems in the United States, focusing particularly on the fresh produce sector and the cattle/beef sector. The results stem from research into the market studies literature and interviews with plant managers, experts and other participants, in some cases site visits were conducted.
  Comment of the varying efficiency of systems is commented on here.
  The beef / cattle industry section of the market sector reviews is covered here.

- **Meat Traceability and Consumer Assurance in Japan, Midwest Agribusiness Trade Research and Information Center, Iowa State University, September 2003.**
  This document reviews traceability legislation and introduction of "story meats" where details of the meat are available on in store computer screens (or on the internet at home) detailing and tracing the product back to the producer (including photos of owners).

- **Traceability in the Canadian Red Meat Sector, Agriculture and Agri-Food Canada, 2003**
  This report examines the economic incentives for implementing traceability systems in the meat and livestock sector, distinguishing between *ex post* trace back systems and *ex ante* quality verification systems. Examples of voluntary private sector and public sector traceability programs are discussed.

- **John Deere FoodOrigins Articles** (web link)
  This website has a number of short articles Relating to product traceability and its integration into business and the operations of a company. A couple of articles are included here, for other articles follow the link to the website above.
  - **How do you measure traceability performance?**
  - **Full Product Traceability** - intelligent tracking is the key to supply chain integrity