



final report

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Intergrating environmental issues in the deisgn of a participative methodology for implementing integrated management systems suitable for adoption in small domestic and export abbatoirs

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1. BACKGROUND

The meat processing industry, both domestic and export, is highly competitive, with strong emphasis on food safety, quality, health and hygiene.

In order to remain in business, an abattoir needs to be seen as a responsive and responsible corporate citizen, operating in harmony with the environment (human and physical).

In response to this, a comprehensive, integrated management system has been proposed, covering health and hygiene; Occupational Health and Safety; product quality; and the environment. This integrated management system is being developed under MRC Project No M.939 "Designing and testing a participative methodology for implementing integrated management systems suitable for adoption in small domestic and export abattoirs".

It has been recognised that, for this system to work, it must be developed with the active involvement of the workforce, and that its implementation within the workplace must incorporate relevant employee job / duty descriptions and training.

It is believed that this strategy will enable the abattoir organisation to become more accountable, more flexible, more productive and, ultimately, more profitable.

The strategy is presented as an integrated model for change for small domestic and export abattoirs.

2. PROJECT OBJECTIVES

The goal of this Project, as part of Project M.939, is to design and test a participative methodology, suitable for adoption in small domestic and export abattoirs, which will

- * develop a comprehensive integrated management system covering all relevant environmental issues
- * achieve a fully trained workforce, committed to environmental management
- * help create a work environment which enhances job satisfaction, and enables the efficient production of a high quality product
- * establish a methodology for an abattoir workforce to achieve on-going improvements in work processes and management systems, and
- * facilitate improvement networks between abattoirs.

The project has built on previous MRC funded research, and has used a process improvement methodology based on the HACCP (Hazard Analysis of Critical Control Points) system, incorporating a high level of employee involvement.

3. THE PROJECT TEAM

The Project Team was composed of employee representatives from all facets of the abattoir operation, co-ordinated by a specialist environmental consultant.

One of the objectives of the Project Team was to provide key members of the team with facilitating skills, so that more and more of the execution and implementation of the Project can be undertaken by the abattoir employees.

4. PROJECT METHODOLOGY

The Project Team followed the principles used in implementing a HACCP system, using the following steps:-

- | | |
|--------|--|
| Step 1 | Prepare flowcharts of processes |
| Step 2 | Identify and rate hazards and identify measures to prevent the hazards occurring |
| Step 3 | Identify critical control points (CCPs) |
| Step 4 | Establish critical limits on CCPs |
| Step 5 | Establish monitoring procedures for the CCPs |
| Step 6 | Identify prevention and control measures for the CCPs, including work instructions and training programmes |
| Step 7 | Establish audit procedures to monitor and ensure procedures are followed |
| Step 8 | Prepare documentation necessary to maintain work systems |
| Step 9 | Establish a management review process |

5. SUBJECT AREAS

The above methodology was applied to the following subject areas:-

1. Water Quality
2. Water Consumption
3. Waste Handling
4. Waste Water Management (Collection, Treatment and Disposal)
5. Noise
6. Odour
7. Visual Amenity and Revegetation

6. FINDINGS AND OBSERVATIONS

6.1 WATER QUALITY

The popular sentiment amongst most abattoir employees seems to perceive water quality in terms of bacteriological quality only - ie. "a minimum 0.25ppm Chlorine residual and zero Faecal Coliforms", with an almost universal presumption that all other water quality requirements will have already been satisfied by the supply Authority.

Water quality requirements for operators of meat export abattoirs are specified in the (AQIS) Export Meat Orders (EMO's). (Refer Attachment 1)

In particular, EMO 95.1 provides a descriptive outline of water quality criteria, and requires assessment to be made in accordance with the National Health and Medical Research Council and Australian Water Resources Council publication "*Guidelines for Drinking Water Quality in Australia - 1987*".

This Guideline is quite comprehensive in its breadth of water quality criteria - physical, chemical and microbiological - and it should not be assumed that "potable" water supplies conform to it. It should be remembered that Water Supply Authorities are not compelled to achieve the above Guideline "standards" - it is only a guideline, not a statutory requirement for Water Supply Authorities.

Water Supply Authorities are required to provide regular monitoring of the above criteria parameters, and these monitoring results should be obtained by abattoir operators in order to satisfy themselves that their potable water supply complies with EMO's.

Notwithstanding such apparent compliance, it is considered prudent to carry out regular in house checks of the potable water supply to ensure that there has been no localised problem in the supply Authority's reticulation system (such as algae of turbidity - not uncommon, particularly at "dead ends" in a reticulation network), or with the abattoir's reticulation system (such as cross connections, or contamination of break tanks), which may cause the abattoir's potable water to be in breach of EMO requirements.

For this purpose, it is recommended that weekly samples of potable water be taken from within the abattoir, and assessed for colour, clarity, turbidity, sediment, taste and odour. If any of these parameters is evident, further investigation / testing should be undertaken.

The Project Team also identified the importance of having a reference drawing showing the location of all water supply pipework, valves, meters, pumps, etc.

Armed with all this information, the Project Team systematically traversed the whole abattoir operation, identifying potential hazards and controls in regard to water quality.

The following Hazard Analysis Chart shows the various hazards, control points, preventive measures, critical limits, monitoring procedure and frequency, corrective action, etc.

HAZARD ANALYSIS CHART on WATER QUALITY

<u>Operation</u>	<u>Potential Hazards</u>	<u>Control Point</u>	<u>Preventive Measures</u> and person(s) responsible for applying	<u>Critical Limits</u> for Preventive Measures (Specifications)	<u>Monitoring Procedure</u> & Frequency	<u>Corrective Actions</u>	<u>HACCP Records</u> > Where recorded
Potable Water Supply	<ul style="list-style-type: none"> Physical and chemical contamination to edible product 	<ul style="list-style-type: none"> Town Water Supply 	<ul style="list-style-type: none"> Monitoring of Analysis Results Monitor incoming water supply <ul style="list-style-type: none"> ⇒ visual ⇒ smell ⇒ taste 	<ul style="list-style-type: none"> As per EMO 95.1 	<ul style="list-style-type: none"> QA Officer checks that <ul style="list-style-type: none"> ⇒ Preventative measures are being performed ⇒ Critical limits are being achieved 	<ul style="list-style-type: none"> Inform AQIS VOIC of unusual water characteristics 	
Potable Water Supply Disinfection Sterilisers	<ul style="list-style-type: none"> Micro organisms contamination to edible product 	<ul style="list-style-type: none"> Chlorine injection system Sterilisers 	<ul style="list-style-type: none"> Monitoring of the Chlorine injection pump Monitoring of chlorine levels at random locations of potable water outlets <p>Responsibility Environs QA Officer</p>	<ul style="list-style-type: none"> 0.25 ppm residual chlorine level in water 20 minute contact time of chlorine to water Steriliser water to be kept $\geq 82^{\circ}\text{C}$ 	<ul style="list-style-type: none"> QA Checks <ul style="list-style-type: none"> ⇒ Chlorine level every 2 hours ⇒ weekly observation of non-potable town water ⇒ Monthly verification of water quality using Supplier Authoritys Analysis 	<ul style="list-style-type: none"> Stop Production Re-set chlorine injection pump 	<ul style="list-style-type: none"> Chlorine Monitoring Book Monitoring of town water supply

6.2 WATER CONSUMPTION

The subject of water consumption was examined in great detail, once again systematically reviewing all abattoir operations.

The Project Team acknowledged the "hazards" of excessive water consumption by considering the following:-

1. Water is a finite resource. There is no new water. The water that we have on earth today is the same water that has been on earth since the time of creation - it just keeps going around and around the water cycle, and this use and reuse inevitably contaminates it in some way.
2. Water of a "potable" standard is becoming less available, and more expensive to obtain. The more of it you use, the more it costs.
3. Using water in an abattoir operation inevitably produces highly contaminated waste water. This waste water requires "treatment" in order to reduce the contaminant load sufficiently to enable its safe return to the water cycle. There is almost always some cost associated with this treatment, and the greater the quantity of wastewater, the greater the cost.

In order to assist quantify water usage in various areas (and the effect of modifying work practices), a total of fifteen water flow meters were installed at key locations throughout the abattoir site.

All these meters are read daily, and this has provided excellent feedback regarding major water use activities, and overall performance, ie. consumption relative to production - past, present and future. This can be compared with "industry averages", although sensible comparison between abattoirs is difficult, due to differences in the design and operation of various abattoirs. Nevertheless, such a comparison can at least provide a "sanity check" on water consumption - preferably measured as kilolitres per tonne (or litres per kilogram) Hot Carcase Weight (HCW).

The MRC funded Manual entitled "*Water and Waste Minimisation*" (Australian Meat Technology Pty Ltd 1995) provides very useful assistance to operators wanting to investigate water usage.

As a result of the focus given by the Project Team to water consumption at the participating abattoir, a sustained 25% reduction in water consumption has been achieved (from between 8 and 9 l/kg HCW; to between 6 and 6.5 l/kg HCW). (Refer Attachment 2)

Further significant potential savings have been identified (eg. dry handling paunch waste), but these require substantial re-design of abattoir buildings and/or equipment.

The following Hazard Analysis Charts have been developed, to cover issues related to water usage.

WATER USAGE

Operation	Potential Hazards	Control Point	Preventative Measures and person(s) responsible for applying	Critical Limits for Preventative Measures (specifications)	Monitoring Procedure & Frequency	Corrective Actions	HACCP Record Where recorded
Cattle Washing	<ul style="list-style-type: none"> Contamination to product and to water Excess water use 	<ul style="list-style-type: none"> Pipe line 'ID' Cross connections (employee to be trained in water conservation) 	<ul style="list-style-type: none"> Ensure no cross-connections of water lines Ensure meters are read daily by Quality Assurance Officer 	<ul style="list-style-type: none"> No joining of non-potable and potable water lines 20,000 litres per day 1,000 litres per body per day 	<ul style="list-style-type: none"> Environs Quality Assurance Officer monitors ⇒ Preventative measures are being performed ⇒ Critical Limits are achieved ⇒ Water consumption monitored daily ⇒ Meter is read daily 	<ul style="list-style-type: none"> Ensure Sectional Supervisor is advised of excessive water use 	<ul style="list-style-type: none"> QA Environs Monitoring Form Monitoring of water meter book
YARDS	<ul style="list-style-type: none"> Wastage of water 	<ul style="list-style-type: none"> Training of operation nozzle pressure cattle troughs 	<ul style="list-style-type: none"> No leave hosing running use correct nozzle selection of pump ballcock protection 	<ul style="list-style-type: none"> litres per body no excessive use of water Pump pressure at 60 psi Nozzle to be 8 mm in diameter All ballcocks to be covered 			
		<ul style="list-style-type: none"> Cattle holding pens 	<ul style="list-style-type: none"> Designed in such a way (with concrete floors) that the pen can be broomed prior to hosing 	<ul style="list-style-type: none"> All concrete pens to be broomed before hosing 			

WATER USAGE

Operation	Potential Hazards	Control Point	Preventative Measures and person(s) responsible for applying	Critical Limits for Preventative Measures (specifications)	Monitoring Procedure & Frequency	Corrective Actions	HACCP Record Where recorded
Slaughter Floor	Cleaning during production	Training	No excessive use of hose	Use broom instead of hosing where possible	Read water meter twice a day by QA Environs Officer	Ensure Sectional Supervisor is advised of excessive water usage	QA Environs Monitoring Form Monitoring of water meter book
	Excessive water use at boot wash	Correct hose nozzle Knee or foot pedal on LSU	Attach hose nozzle to all boot wash hoses	4 mm boot wash hose Nozzle to be 3mm			
	Excessive water usage during sanitation	Correct hose nozzle	All hoses used during sanitation are to be affixed with a nozzle	90,000 litres per day			
	Excess water usage	Employee to be trained in Water Conservation	Ensure water meters are read daily	No water to mix with blood			
	Water mixing with blood	Bleed Area	Broom blood down drain				
Water usage at Dry Landing Area	Excessive use of water	Training	Operator trained and instructed to use water in moderation and only when necessary	Only use water when necessary	QA Officer	Inform Supervisor	QA Officer
Steriliser	Excessive water usage Over sized steriliser	Turn water off at work breaks No oversized sterilisers	Operator to turn steriliser off at work breaks Use adequately sized sterilisers	Steriliser water to be \geq 82°C All sterilisers to be turned off at breaks Only use sterilisers large enough to accomplish task			

WATER USAGE

Operation	Potential Hazards	Control Point	Preventative Measures and person(s) responsible for applying	Critical Limits for Preventative Measures (specifications)	Monitoring Procedure & Frequency	Corrective Actions	HACCP Record Where recorded
Gut Room	Water wastage	Spray bars	Foot pedal driven taps	Spray bars must only be operated when needed		Ensure Sectional Supervisor is advised of excess water usage	QA Environs Monitoring Form All monitoring of Water Meter Book
Gut Table	Waste water	Training of operator	Training of operator No spillage of paunch on floor	All paunch material to remain on gut table			
Gut Room	Excess use of water	Training of operator	Ensure meters are read daily (by QA)	10,000 litres per day	Meter read once a day		
Offal Room	Water waste	Offal wash sprays	Use water saving shower nozzles	Attach water saving shower nozzles to all offal wash outlets	QA Daily		
Chillers & Load Out	Water waste	Chiller Load Out Sanitation	Remove all solids prior to hosing Quick effective hosing	No excessive use of water	QA Daily		
Sanitation Program	Water wastage	Hosing procedure	Training of operator Correct hose nozzles Dry cleaning prior to hosing	Minimal use of water during sanitation	Meter read once a day by Environs QA Officer		
By Products	Water wastage	Cleaning	Training of operator hose nozzles Broom and shovel solids and tallow prior to hosing	Operator not to use excessive water when cleaning All hoses to be affixed with nozzles All solid to be broomed and shovelled prior to hosing		Ensure Sectional Supervisor is advised of excess water usage	QA Environs Monitoring Form All monitoring of Water Meter Book
	Excess water usage	Training of operator	Ensure meter read once a day by QA	30,000 litres per day			

6.3 WASTE HANDLING

The activities associated with waste collection, treatment and disposal, when looked at from an environmental perspective, were seen to involve various forms of hazards, such as excessive water usage; excessive contamination of wastewater; loss of valuable byproduct; odour.

The principle of waste minimisation was covered, along with various re-use options - such as manure and paunch composting / vermiculture; drying of blood; export of tallow.

These considerations led to an emphasis of the need to keep the various waste products segregated, and to regard them as a "resource", rather than a "waste".

Some obvious areas were identified where significant improvement was achievable, particularly the dry handling of yard manure, paunch waste, and blood (saving water, and reducing wastewater contamination).

The ability to optimally handle yard manure is often confounded by the (inappropriate) design of concrete floors, making it very difficult to broom the manure dry (or with water), because of the random (rather than streamlined) pattern of some concrete floor surfaces.

The MRC funded Manual entitled "*Water and Waste Minimisation*" (Australian Meat Technology Pty Ltd 1995) once again proved to be a useful reference, together with a recently developed Waste Management Plan for the participating abattoir.

Odour prevention was also a primary consideration within this topic.

The following Hazard Analysis Chart has been developed, to cover issues related to waste handling.

WASTE HANDLING

<u>Critical Operation</u>	<u>Potential Hazards</u>	<u>Control Point</u>	<u>Preventive Measures and person(s) responsible for applying</u>	<u>Critical Limits for Preventive Measures (Specifications)</u>	<u>Monitoring Procedure & Frequency</u>	<u>Corrective Actions</u>	<u>HACCP Records</u> > Where recorded
<p>Manure</p> <p>Paunch Collection</p> <p>Paunch Screen</p>	<p>High in harmful nutrients</p> <ul style="list-style-type: none"> Excessive water plus nutrients in waste water has harmful effect on tallow and meat meal cooking contaminates to waste water 	<p>Yards</p> <p>Gut Room</p> <p>Paunch Screen</p>	<p>Broom yard where possible</p> <p>Collect Paunch as a solid if possible</p> <p>Competent employee to use minimal use of water</p> <p>Maximum capture of paunch</p>	<p>Minimum water usage</p> <p>Minimum water usage</p> <p>Screen to be checked for effective draining</p>	<p>Management and staff to monitor that preventative measures are being performed and critical limits are being achieved</p> <p>Daily By Products Supervisor</p>	<p>Inform Yard Supervisor if overuse of water</p> <p>Inform Gut Room Leading Hand to use less water.</p> <p>Inform employee and re-check in 20 minutes</p> <p>Inform By Products Supervisor of non conforming Personnel. Supervisor to instruct operator to clean screen</p>	<p>Flow meter log</p> <p>Overseered by Slaughter Floor Supervisor Slaughter Floor Reject and Corrective Action Form</p>
Cooker	<ul style="list-style-type: none"> Harmful nutrients Waste water Excessive water usage Contamination for waste water 	<p>Holding Bin</p> <ul style="list-style-type: none"> Operative Training 	<ul style="list-style-type: none"> Rake hash into bin Clean bin on the ground Ensure operatives are aware of potential hazards 	<ul style="list-style-type: none"> Minimal water in each cook No water into holding bin All employees to be trained in proper waste management 	<p>Management and responsible person to monitor that preventative measures are being performed and critical limits are being achieved</p>	<ul style="list-style-type: none"> Environs QA Officer to inform By Products of defects 60 minute re-check 	
Blood	<ul style="list-style-type: none"> Loss of valuable blood into waste water 	<ul style="list-style-type: none"> Slaughterfloor Blood Pit Blood Storage 	<ul style="list-style-type: none"> Regular dry cleaning Regular pumping to By-Products Keep blood under refrigeration prior to transport 	<ul style="list-style-type: none"> No excessive water in blood 	<ul style="list-style-type: none"> As above 	<ul style="list-style-type: none"> As above 	
Tallow	<ul style="list-style-type: none"> Loss of tallow into waste water Excessive load on ponds 	<p>Decanting Process</p> <ul style="list-style-type: none"> Maintenance of decanter 	<ul style="list-style-type: none"> Trained operator to operate decanter Regular maintenance Regular dry cleaning Regular pumping to By-Products 	<ul style="list-style-type: none"> Only trained operator to perform task No spillage of tallow 	<ul style="list-style-type: none"> By Products Supervisor 	<ul style="list-style-type: none"> As above Retrain 	

6.4 WASTEWATER MANAGEMENT (Collection, Treatment and Disposal)

Wastewater management is obviously a major area of concern environmentally, particularly at an abattoir where treatment and disposal are performed "in-house".

In order to provide a clearer understanding of the subject, the Project Team looked at the various components of contamination of wastewater (Biochemical Oxygen Demand; Suspended Solids; Nitrogen; Phosphorus; Micro-organisms; Salts; Odorous Compounds) - identifying where each originates, and the environmental hazards they represent. Extensive reference was made to a **Waste Management Plan** which had been recently developed for the participating abattoir. This was of tremendous assistance in relating this subject matter to the Project Team's site.

Various treatment options were outlined, which would achieve the relevant "discharge" quality criteria - to irrigation or sewer.

Collection

It became quite apparent that, in many cases, it may be cheaper and easier to prevent contaminants from entering the waste water system than it is to subsequently remove them.

It was also apparent, with the valuable assistance of two MRC funded publications, "*Abattoir Waste Water & Odour Management*" (CSIRO Meat Research Laboratory); and "*Identification of Nutrient Source Reduction Opportunities and Treatment Options for Australian Abattoir and Rendering Plants*" November 1995 MRC Project M.445 Final Report, where critical control points can be found within the abattoir operation. The principal offenders are very clearly, **blood, fat, manure and paunch waste**. It is important to note that each of these "waste products" has previously (see 6.3 *Waste Handling*) been identified as a re-useable resource.

The importance of separation of rainwater from the wastewater system was also highlighted. This may involve the re-design of the drainage system; roofing of yards, etc.

Treatment and Disposal

Wastewater from the participating abattoir is treated on-site in ponds, prior to irrigation.

The Project Team reviewed the system of wastewater treatment which was employed at their site, including:- screening; saveall; anaerobic/aerobic/facultative/maturation ponds (biological processes).

The environmental hazards identified with the treatment system were dominated by odour, although qualitative limits (relative to EPA Licence and irrigation requirements) were also highlighted.

The important concept of re-use (rather than disposal) was also canvassed, particularly in relation to irrigation, where scheduling; net nutrient export; and sustainable limits take on new meaning.

The following Hazard Analysis Chart has been developed, to cover issues relating to wastewater management.

WASTE WATER MANAGEMENT

<u>Critical Operation</u>	<u>Potential Hazards</u>	<u>Control Point</u>	<u>Preventive Measures</u> and person(s) responsible for applying	<u>Critical Limits</u> for Preventive Measures (Specifications)	<u>Monitoring Procedure & Frequency</u>	<u>Corrective Actions</u>	<u>HACCP Records</u> > Where recorded
Waste Water Treatment System	<ul style="list-style-type: none"> High BOD in effluent Odour Breach of EPA Guidelines 	Waste water Treatment Dams	<ul style="list-style-type: none"> Limit BOD into dams Dose (Anaerobic) dams with biological inoculant Provide adequate aeration 	<ul style="list-style-type: none"> Final effluent BOD \leq 50mg per litre 	Wastewater process samples taken monthly by Environs QA Officer	Ensure waste management and waste water treatment systems are properly managed	Waster water Treatment Records
	<ul style="list-style-type: none"> Odour Discolouration of irrigation water due to high suspended solids 		<ul style="list-style-type: none"> Proper design and management of waste water treatment system 	<ul style="list-style-type: none"> Final effluent SS \leq 100mg per litre 			
	<ul style="list-style-type: none"> Odour Overload of waste water treatment dams due to excessive grease 	<ul style="list-style-type: none"> By Products handling 	<ul style="list-style-type: none"> Avoid tallow spills 	<ul style="list-style-type: none"> Final effluent Grease < 10mg per litre 			
	<ul style="list-style-type: none"> Build up of Nitrogen in soil 	<ul style="list-style-type: none"> Blood handling Aeration in dams 	<ul style="list-style-type: none"> Avoid blood spills Ensure nitrification process in intact 	<ul style="list-style-type: none"> Final effluent Nitrogen < 50 mg per litre 			
	<ul style="list-style-type: none"> Buildup of Phosphorus in soil Breach of EPA Irrigation Guidelines 	<ul style="list-style-type: none"> By Products handling Yards 	<ul style="list-style-type: none"> Waste minimisation 	<ul style="list-style-type: none"> Final effluent Phosphorus < 25mg per litre 			
	<ul style="list-style-type: none"> Spread of disease bacteria Breach of EPA Irrigation Guidelines 	Waste water treatment dams	<ul style="list-style-type: none"> Proper design and management of waste water treatment system 	<ul style="list-style-type: none"> Final effluent E. Coli < 3,000 per 100ml 10 days storage in pond after treatment 			
	<ul style="list-style-type: none"> Build up of sodium in soil 	By Products handling	<ul style="list-style-type: none"> Reduce input of paunch and by products juices 	<ul style="list-style-type: none"> Final effluent Total Salts < 1000mg per litre 			

WASTE WATER MANAGEMENT

<u>Critical Operation</u>	<u>Potential Hazards</u>	<u>Critical Control Point</u>	<u>Preventive Measures</u> and person(s) responsible for applying	<u>Critical Limits</u> for Preventive Measures (Specifications)	<u>Monitoring Procedure & Frequency</u>	<u>Corrective Actions</u>	<u>HACCP Records</u> > Where recorded
Irrigation	<ul style="list-style-type: none"> • Spray drift • Public Health Risk 	Irrigator	<ul style="list-style-type: none"> • Ensure correct pump / nozzle selection • Do not irrigate in adverse wind 	No spray beyond boundary	Daily observations by the Environs QA Officer	Stop or relocate irrigator	Irrigation Log Book
	<ul style="list-style-type: none"> • Runoff • Polluting water ways 	Irrigator	<ul style="list-style-type: none"> • Proper irrigation scheduling • Provide perimeter catch drains 	Nil runoff	Visual observations several times daily by the Environs QA Officer	Stop or relocate irrigator	As above
	Ponding / boggy areas		Proper irrigation scheduling	Nil ponding			
	Attract public attention due to odour / colour in irrigation water	Waster water Treatment Dams	Proper waste management	No colour or odour in irrigation spray		Consult Environment Management Plan	

6.5 NOISE

The subject of noise in an abattoir operation has environmental relevance from 2 points of view:- the "local" environment (ie. noise affecting the workplace); and the "neighbouring" environment (ie. noise affecting the environment outside the workplace).

Both these perspectives are of critical importance to the harmonious operation of an abattoir, and are covered (in NSW) by the Noise Control Act 1975, of NSW, as amended, (administered by the NSW EPA), as well as being a primary Occupational Health and Safety issue.

The abattoir should therefore be designed, operated and maintained so that prescribed noise levels are not exceeded. This impinges on design and selection of equipment; provision of acoustic barriers; setting of curfews, work practices, etc.

The Project Team identified the principal noise generating operations, associated noise levels and noise limits, from a recently commissioned Noise Audit.

The vital importance of continuous in-house monitoring of noise levels was emphasised, and this was found to be particularly relevant to the on-going maintenance task of condition monitoring. (Items such as warn bearings or drive belts or impact resistant padding, can have a major effect on noise in the workplace and neighbourhood environment).

The Project Team discovered that the two most "noticeable" noise sources prevailing at the time of the Project, were the exhausts from some air operated knives, and a noisy belt drive on an exhaust fan.

The following Hazard Analysis Chart has been developed, to cover issues related to noise.

NOISE

<u>Critical Operation</u>	<u>Potential Hazards</u>	<u>Control Point</u>	<u>Preventive Measures</u> and person(s) responsible for applying	<u>Critical Limits</u> for Preventive Measures (Specifications)	<u>Monitoring Procedure & Frequency</u>	<u>Corrective Actions</u>	<u>HACCP Records</u> > Where recorded
<ul style="list-style-type: none"> Refrigeration motors going on trucks 	<ul style="list-style-type: none"> Noise 	<ul style="list-style-type: none"> Load Out Dock Driveway 	<ul style="list-style-type: none"> Out of hours curfew 10pm to 6am Refrigeration motors not to be running in the curfew hours 	<ul style="list-style-type: none"> Not exceeding established dB levels No unusually load noise 	<ul style="list-style-type: none"> Load Out QA and Supervisor Randomly monitored 	<ul style="list-style-type: none"> Inform drivers and trucking companies 	
<ul style="list-style-type: none"> All nuisance noise 		<ul style="list-style-type: none"> Loading ramp 	<ul style="list-style-type: none"> As above - curfew 	<ul style="list-style-type: none"> As above 	<ul style="list-style-type: none"> Drivers must full in an unloading log book with actual time of arrival and unloading time Book must be signed by the driver Check Head Stockman 	<ul style="list-style-type: none"> Inform drivers and transport companies 	
<ul style="list-style-type: none"> Mob disturbance (cattle) 		<ul style="list-style-type: none"> Yards 	<ul style="list-style-type: none"> Ensuring lights are turned off when not in use Minimal disturbance from employees and vehicles in curfew hours 	<ul style="list-style-type: none"> As above 		<ul style="list-style-type: none"> As above 	
<ul style="list-style-type: none"> Air knives 		<ul style="list-style-type: none"> Operator 	<ul style="list-style-type: none"> Preventative Maintenance 	<ul style="list-style-type: none"> As above 	<ul style="list-style-type: none"> Daily by Slaughter Floor Supervisor 	<ul style="list-style-type: none"> Maintenance informed 	
<ul style="list-style-type: none"> Air operated stands exhaust noise 		<ul style="list-style-type: none"> As above 	<ul style="list-style-type: none"> As above 	<ul style="list-style-type: none"> As above 	<ul style="list-style-type: none"> As above 	<ul style="list-style-type: none"> As above 	
<ul style="list-style-type: none"> Air Compressors 		<ul style="list-style-type: none"> Maintenance 	<ul style="list-style-type: none"> Preventative Maintenance Sound barriers 	<ul style="list-style-type: none"> As above 	<ul style="list-style-type: none"> Maintenance Supervisor 	<ul style="list-style-type: none"> As above 	
<ul style="list-style-type: none"> Hammermill 		<ul style="list-style-type: none"> Hammermill 	<ul style="list-style-type: none"> Curfew for out of hours operations (EPA) Sound barriers 	<ul style="list-style-type: none"> As above 	<ul style="list-style-type: none"> By Products Supervisor 	<ul style="list-style-type: none"> As above 	
<ul style="list-style-type: none"> Forklift Trucks 		<ul style="list-style-type: none"> Regular servicing 	<ul style="list-style-type: none"> Driver Awareness Curfew time awareness 	<ul style="list-style-type: none"> As above 	<ul style="list-style-type: none"> Supervisor monitoring 	<ul style="list-style-type: none"> Employee Training 	

6.6 ODOUR

The history of odour problems associated with abattoirs and rendering plants is well documented.

The Project Team found, however, that the causes and corrective / preventive measures regarding odour management were not all that well understood beyond the practice of good housekeeping.

The two principal contributors to odour problems were identified to be byproducts handling / rendering, and the wastewater treatment ponds.

Biofilter

At the participating abattoir, a biofilter has been recently installed, to treat foul air from the byproducts / rendering plant.

Although this is relatively new (and trouble-free) technology, there appears to be a shortage of information available (and understandable) to operators, regarding the operational and maintenance requirements of biofilters.

This Project has therefore provided a welcome opportunity to relate some of the essential operation and maintenance parameters to the people responsible for the management of the biofilter.

The MRC funded publication entitled "*Abattoir Waste Water & Odour Management*", CSIRO Meat Research Laboratory, is a useful operator's reference.

Wastewater Treatment Ponds

Wastewater treatment ponds (which are often undersized and overloaded) are capable of producing offensive odour as a result of biological process upsets (usually caused by hydraulic or biological shock loading).

The sustained odour free operation of wastewater treatment ponds should, however, be assured if the waste management principles and practices referred to in this Report are followed.

The use of specialised biological inoculants can also be very effective in enhancing pond performance, particularly in regard to odour prevention.

The following Hazard Analysis Chart has been developed, to cover issues related to odour.

ODOUR

<u>Critical Operation</u>	<u>Potential Hazards</u>	<u>Control Point</u>	<u>Preventive Measures and person(s) responsible for applying</u>	<u>Critical Limits for Preventive Measures (Specifications)</u>	<u>Monitoring Procedure & Frequency</u>	<u>Corrective Actions</u>	<u>HACCP Records</u> > Where recorded
Cookers	<ul style="list-style-type: none"> • Odour 	<ul style="list-style-type: none"> • Feed conveyor 	<ul style="list-style-type: none"> • Make sure feed conveyor is empty at completion of shift 	Nil Odour	By Products Supervisor	Inform operator of defect and re-check operative performance every 60 minutes	Reoccurrence of incidents are recorded on a Non Conformance
By Products	Bones	<ul style="list-style-type: none"> • Storage of bones awaiting cooking 	<ul style="list-style-type: none"> • Store bones under refrigeration 	Nil Odour	By Products Supervisor	Inform operator of defect and re-check operative performance every 60 minutes	Reoccurrence of incidents are recorded on a Non Conformance
	Blood	<ul style="list-style-type: none"> • Proper storage • Clean blood tanks 	<ul style="list-style-type: none"> • Store blood tanks in refrigerated container prior to transportation • Effective cleaning of blood tank 	Nil Odour	By Products Supervisor	Inform operator of defect and re-check operative performance every 60 minutes	Reoccurrence of incidents are recorded on a Non Conformance
Rendering Area	Odour	<ul style="list-style-type: none"> • Blood pit on river bank 	<ul style="list-style-type: none"> • Proper cleaning of pit at the completion of the shift 	Nil Odour	By Products Supervisor		
		<ul style="list-style-type: none"> • Contrashear • Save-all • Paunch screen 	<ul style="list-style-type: none"> • Clean down every night 				
Bio-filter	Over heating bed	<ul style="list-style-type: none"> • Overheating of cookers • Coolboys 	<ul style="list-style-type: none"> • Correct water flow 	40°C Maximum temperature of Bio Mass	EQA checks bed temperature probe every day	Inform Maintenance	
	Bed moisture -too dry -too wet	<ul style="list-style-type: none"> • Sprinkler system 	<ul style="list-style-type: none"> • Correct operation of sprinkler system 	Bed must remain moist	As above	As above	
Manometer U/Tube	Back Pressure	<ul style="list-style-type: none"> • Filter bed • Bed decomposition 	<ul style="list-style-type: none"> • Ensure bed is healthy 	Manometer reaching 20mm	As above		
Waste Water Treatment Ponds	<ul style="list-style-type: none"> • Odour 	<ul style="list-style-type: none"> • Refer to the waste management plan for further reference 	<ul style="list-style-type: none"> • Avoid spills • Avoid overload • Use biological inoculant 	<ul style="list-style-type: none"> • Nil odour at abattoir boundary 			

6.7 VISUAL AMENITY and REVEGETATION

The importance of visual amenity, vegetation and landscaping at abattoir sites is often neglected.

The purpose of vegetation / revegetation and landscaping may be :-

- * to enhance the workplace environment / amenity (for the benefit of the workforce as well as the general public). Workplace environment can have a major effect on employee attitudes and behaviour, which can dramatically impact on performance and profitability.
- * to prevent or arrest erosion
- * to improve pasture
- * to prevent or arrest the formation of boggy areas
- * to provide wind breaks
- * to help prevent irrigation spray drift crossing the property boundaries.
- * to help provide habitat, food and shelter for wildlife, and to provide wildlife corridors
- * to help reduce the impact of flooding, by reducing the floodwater flow velocity

At the participating abattoir, a full site survey had been undertaken, identifying locations where screening and revegetation should be provided.

A tree screening and revegetation plan, involving the planting of approximately 2,400 specially selected trees and shrubs, was developed with the assistance of various "expert" Authorities, including the (then) Department of Water Resources, and the Department of Conservation and Land Management.

This plan, which includes the provision of boundary and building screens, as well as pasture and river bank revegetation, is able to be progressively implemented.

The following Hazard Analysis Chart has been developed, to cover issues related to visual amenity and revegetation.

VISUAL AMENITY - Vegetation and Landscaping

<u>Critical Operation</u>	<u>Potential Hazards</u>	<u>Control Point</u>	<u>Preventive Measures</u> and person(s) responsible for applying	<u>Critical Limits</u> for Preventive Measures (Specifications)	<u>Monitoring Procedure & Frequency</u>	<u>Corrective Actions</u>	<u>HACCP Records</u> > Where recorded
Irrigation	<ul style="list-style-type: none"> spray drift 	<ul style="list-style-type: none"> spray nozzle 	<ul style="list-style-type: none"> Irrigation - location Wind breaks (trees) 	<ul style="list-style-type: none"> EPA Guidelines 	<ul style="list-style-type: none"> EQA Officer Gardener 	<ul style="list-style-type: none"> Relocation of irrigator Turn irrigator off 	
River Bank Revegetation Program	<ul style="list-style-type: none"> Soil Erosion 	<ul style="list-style-type: none"> River bank 	<ul style="list-style-type: none"> Revegetation of river bank 	<ul style="list-style-type: none"> To complete River Bank Revegetation Program 	<ul style="list-style-type: none"> After flooding visual inspection by EQA 	<ul style="list-style-type: none"> Review damage by flooding 	
Holding cattle	<ul style="list-style-type: none"> Soil Erosion 	<ul style="list-style-type: none"> paddocks 	<ul style="list-style-type: none"> Ensure adequate ground coverage Minimise excessive water pressure on uncovered ground Do not overstock 	<ul style="list-style-type: none"> Council requires all paddocks to have 100% vegetation 	<ul style="list-style-type: none"> As above 	<ul style="list-style-type: none"> Rehabilitation of paddocks 	
Beautification Program	<ul style="list-style-type: none"> Loss of visual amenity 	<ul style="list-style-type: none"> Site plan 	<ul style="list-style-type: none"> Tree lines and gardens Maintain Pastoral and planting program 	<ul style="list-style-type: none"> EPA and Council Requirements 	<ul style="list-style-type: none"> As above 	<ul style="list-style-type: none"> New planting if necessary 	

7. CONCLUSIONS

The process of integrating environmental issues into the day-to-day management ethos of an abattoir workforce has resulted in a significant change of perspective and performance at the participating abattoir - in relation to environmental management.

It has led, in the first instance, to the creation of a new management position entitled *Environmental Quality Assurance Officer*, who is responsible for co-ordinating and overseeing all environment related activities associated with the abattoir, and for ensuring that all environment related standards are adhered to.

We found that the (environment related) subject matter was generally new to (and therefore not fully understood or appreciated by) the industry workforce.

The exercise of developing an environmental management framework has therefore been extremely valuable, and has led to immediate benefits being achieved (environmental and economic).

In particular, significant (of the order of 25%) savings in terms of water consumption, treatment and disposal costs appear to be achievable. Dry handling of manure and paunch waste, and waste minimisation were also found to be highly desirable from an environmental (as well as an economic) point of view.

Implementation of integrated environmental management practices at abattoirs will undoubtedly ensure a more harmonious operating history within the local environment (human and physical).

The Project Team frequently discovered opportunities for achieving significant improvements or savings as a result of adopting an environmental perspective. However, these opportunities were often not able to be actioned due to the design of the existing operation.

There is therefore a strong message to designers of meat processing plants, that environment based criteria should be incorporated into the foundation of the design process.

A major legacy of the Project is that the workforce at the participating abattoir are very much more aware of environmental issues at their workplace, and they now have a tool which empowers them to review, improve and audit their environmental performance on an on-going basis.

8. RECOMMENDATIONS

It is therefore strongly recommended that the design of abattoir work places, practices and policies should facilitate environmental requirements.

It is also recommended that all abattoir workers be given training and instruction in the relevance and purpose of environment-related practices within the meat processing industry.

This training and instructional material can be conveniently incorporated into a *Systems Quality Manual*, which would include all information relevant to the day to day management of a meat processing plant, including job descriptions / responsibilities; procedural information; and Hazard Analysis Charts, and can be taylored to reflect the characteristics and to meet the needs of each particular workplace.

This could be done expeditiously and cheaply, utilising this Project Report (and References) as a resource, with the active participation of the workforce, thereby promoting a sense of relevance and ownership of the various issues that affect the profitable operation of a meat processing plant.

9. ACKNOWLEDGEMENTS

We would like to express our grateful thanks to the Management and Staff of the BINDAREE BEEF ABATTOIR (Lismore, NSW), without whose generous, enthusiastic support and commitment, this Project would not have proceeded.

10. RECOMMENDED REFERENCES AND FURTHER READING

The Australian Meat Processors Environmental Legislative Review Meat Research Corporation

Water and Waste Minimisation Australian Meat Technology Pty Ltd 1995 (MRC)

Abattoir Waste Water and Odour Management CSIRO Meat Research Laboratory, University of Queensland (MRC)

Effluent Treatment in the Australian Meat Industry - Present Status and Future Requirements Mirinz Meat Research, July 1991 (MRC)

Identification of Nutrient Source Reduction Opportunities and Treatment Options for Australian Abattoirs and Rendering Plants Rust PPK Pty Ltd, Taylor Consulting (Aust.) Pty Ltd, November 1995 (MRC)

Developments in Waste Treatment in the Meat Processing Industry - A Review of literature - 1979 - 1993 Dr Mike Johns, Department of Chemical Engineering, the University of Queensland (MRC)

Effluent Irrigation Manual for Meat Processing Plants Lyall & Macoun Consulting Engineers 1995 (MRC)

Biofiltration. A Clean Solution for the Australian Rendering Industry 1996 (MRC)

Biofilters for Control of Rendering Odours ProAnd Associates (MRC)

Solid Anaerobic Digestion Technology Review December 1996 MRC

Meat Packaging and the Environment December 1996 MRC

14 steps to implement a HACCP system AUS-MEAT Monitoring Services 1996

Export Meat Orders Division IX - Water Supplies AQIS

Guidelines for Drinking Water Quality in Australia 1987 National Health and Medical Research Council / Australian Water Resources Council (Australian Government Publishing Service).

Attachment 1

Export Meat Orders, Division IX - Water Supplies (AQIS)

Division IX—Water supplies

Use of potable water

91. Except as provided for in order 94, all water used at a registered establishment shall be potable and shall comply with the standards specified in order 95.

Information to accompany application for registration

92. The application for the registration of new premises as a registered establishment shall be accompanied by—

- (a) details relating to the source of the proposed potable water supply; and
- (b) in the case of town water—a letter from the appropriate water reticulation authority confirming that an adequate supply of water will be available and showing the date of issue.

Underground water supply

93. Where water, other than town water, is being obtained from an underground source and is being used for potable purposes, the equipment that is used to extract the water shall be—

- (a) under the control of the occupier of the registered establishment in which the water is being used; and
- (b) protected from contamination.

Export Meat Orders as amended

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Use of non-potable water

94.1 Subject to sub-order 94.2, the use of the non-potable water on a registered establishment shall be restricted to --

- (a) ammonia condensers;
- (b) vapour lines serving cookers used for rendering material not fit for human consumption;
- (c) cleaning of condemned material or material that is not fit for human consumption;
- (d) stockyard washing; or
- (e) moving of solid material in sewer lines.

94.2 Where potable water is used for the final wash, the use of non-potable water may be permitted for initial washing of live animals.

94.3 There shall be no connection (including a control valve) between the non-potable water supply and the potable water supply.

*Penal provision***Standards for potable water**

95.1 Potable water shall --

- (a) not contain any --
 - (i) substances; or
 - (ii) micro-organisms,
 in amounts that are hazardous to human health;
- (b) be assessed in accordance with the property standards specified in Schedules 2, 3 4 and 5 to the National Health & Medical Research Council and Australian Water Resources Council Publication 'Guidelines for Drinking Water Quality in Australia - 1987', published by the Australian Government Publishing Service;
- (c) subject to sub-order 95.2, be assessed in accordance with the following table:

TABLE

Coliforms/100mL	<i>E.coli</i> type 1 per 100 mL	Rating
0 to 2	0	Satisfactory
3 to 10	0	Suspicious
Greater than 10	0	Unsatisfactory
Irrespective of number	1 or more	Unsatisfactory

Note on order 95: paragraph 95.1 (b) amended by 4191.

Export Meat Orders as amended

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95.2 Where an in-plant chlorination system is installed, the potable water shall be free from all types of coliform organisms at all times.

Monitoring of chlorinated potable water supply

96. Where an in-plant chlorination system is installed, the potable water supply shall be monitored for free residual chlorine in accordance with the procedures specified in the Export Meat Manual.

Record of monitoring results

97. A record of the results obtained from the monitoring specified in order 96 shall be --

- (a) complied in writing;
- (b) held for a period of not less than 3 years; and
- (c) made available to an authorized officer on request.

Non-compliance of potable water supply

98. Potable water shall not have --

- (a) any sample rated as unsatisfactory due to the detection of *E. coli*;
- (b) successive samples, other than the samples referred to in paragraph 99.1 (b), rated as suspicious; or
- (c) in the case of samples containing coliform organisms, more than --
 - (i) 2 unsatisfactory samples that are confirmed on retesting; or
 - (ii) 10% of samples that have not been treated unsatisfactory but which contain coliform organisms,whichever is the greater, in any 12 month period.

Note on order 98: amended by 4191.

Procedure where samples do not comply

99.1 Where an approved analyst has analysed samples taken from the potable water system of a registered establishment and those samples do not comply with the satisfactory standards specified for potable water in these Orders, the authorized officer in charge at the registered establishment shall --

- (a) notify the occupier of the registered establishment in writing;
- (b) arrange for further samples to be drawn from the source that did not comply and for the analysis of these samples; and
- (c) where the samples drawn under paragraph (b) fail to comply with the satisfactory standards specified for potable water in these Orders, notify the occupier of the registered establishment in writing to suspend the slaughter, boning or production of prescribed goods, where such operations are likely to place those goods at risk, until the authorized officer is satisfied that the water has been treated to return it to a potable state.

99.2 Where the occupier of a registered establishment has been advised in accordance with paragraph 99.1(c), the occupier shall --

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- (a) cease any export operations that, in the opinion of the authorized officer in charge at the registered establishment, are likely to place prescribed goods at risk, until such time as the analysis of samples confirms that the potable water has been restored to a satisfactory standard;
- (b) install approved water treatment equipment to rectify the problem where this equipment is not already installed; and
- (c) maintain the potable water supply system in a condition that ensures that the potable water supply is unlikely to be placed at future risk.

In-plant chlorination system

100. Where an in-plant chlorination system is installed, it shall --
- (a) be of a continuous type;
 - (b) be fitted with an automatic alarm to monitor the treatment process so as to ensure that all water entering the system is continuously and correctly treated;
 - (c) ensure a contact period of not less than 20 minutes between chlorination and use;
 - (d) ensure that the free residual chlorine --
 - (i) in the case of water used as an ingredient in meat products, complies with sub-order 398.4 or sub-order 398.5, as appropriate; or
 - (ii) in all other cases, is not less than 0.25 ppm after the contact period; and
 - (e) be maintained in a fully operational state at all times that the registered establishment is operating.

Note on order 100: amended by 10/85 and paragraph 100 (d) amended by 4/91.

In-plant storage tanks for potable water

101.1 All in-plant potable water storage tanks shall be covered to prevent the entry of insects and extraneous matter.

101.2 Tanks shall be drained and cleaned as often as necessary.

Quantity and pressure of water

102. Water shall be delivered at the point of use in sufficient quantity and at a pressure that is suitable for the intended use.

Water for hand washing and sterilisation

103.1 An adequate supply of water shall be provided for hand washing and sterilising purposes, and the system shall be capable of delivering water at the outlet at a temperature of --

- (a) 35°C to 45°C for hand washing; or
 - (b) not less than 82°C for sterilisation,
- and in the case of water used for sterilisation by immersion, the water shall be maintained at a temperature of not less than 82°C.

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103.2 Where ring main systems are used for water sterilisation, a dial-faced thermometer that is readily visible to an authorized officer shall be located on the return line as it leaves the area.

103.3 Where water for sterilisation is produced at the point of use by steam injection, a thermometer shall be located at the point of use.

Potable water reticulation

104.1 A reticulation system for potable water shall prevent the back siphonage of used or contaminated water.

104.2 In warm processing areas, overhead cold water lines shall, where necessary, be insulated.

Reuse of potable water

105.1 Subject to Part 26 of these Orders, water may be reused only for the same potable purpose as first used in the following circumstances:

- (a) vapour lines leading from deodorisers used in the preparation of prescribed goods;
- (c) subject to sub-order 105.2, where before further dressing the carcasses subsequently pass through a bank of sprays that use potable water that has not previously been used, spray units in pig scalding equipment or dehairing machines.

105.2 Where water is to be reused for the purposes of paragraph 105.1(c), it shall be filtered before it is reused.

105.3 Lines supplying reused potable water shall be separate from other water supply lines and prevent back siphonage.

105.4 The equipment employed shall be drained and cleaned at frequent intervals.

Note on order 105: suborder 105.1 amended and paragraph (b) deleted. Suborder 105.2 amended by 4/91.

Division X - Steam and Ice

Steam

106. Steam that comes into direct or indirect contact with prescribed goods shall be free from hazardous additives.

Ice

107. Where ice --

- (a) comes into direct or indirect contact with prescribed goods; or
 - (b) is used as an ingredient in the preparation of a meat product,
- the ice shall comply with the standards for potable water specified in order 95.

Note on Order 107: amended by 4/91.

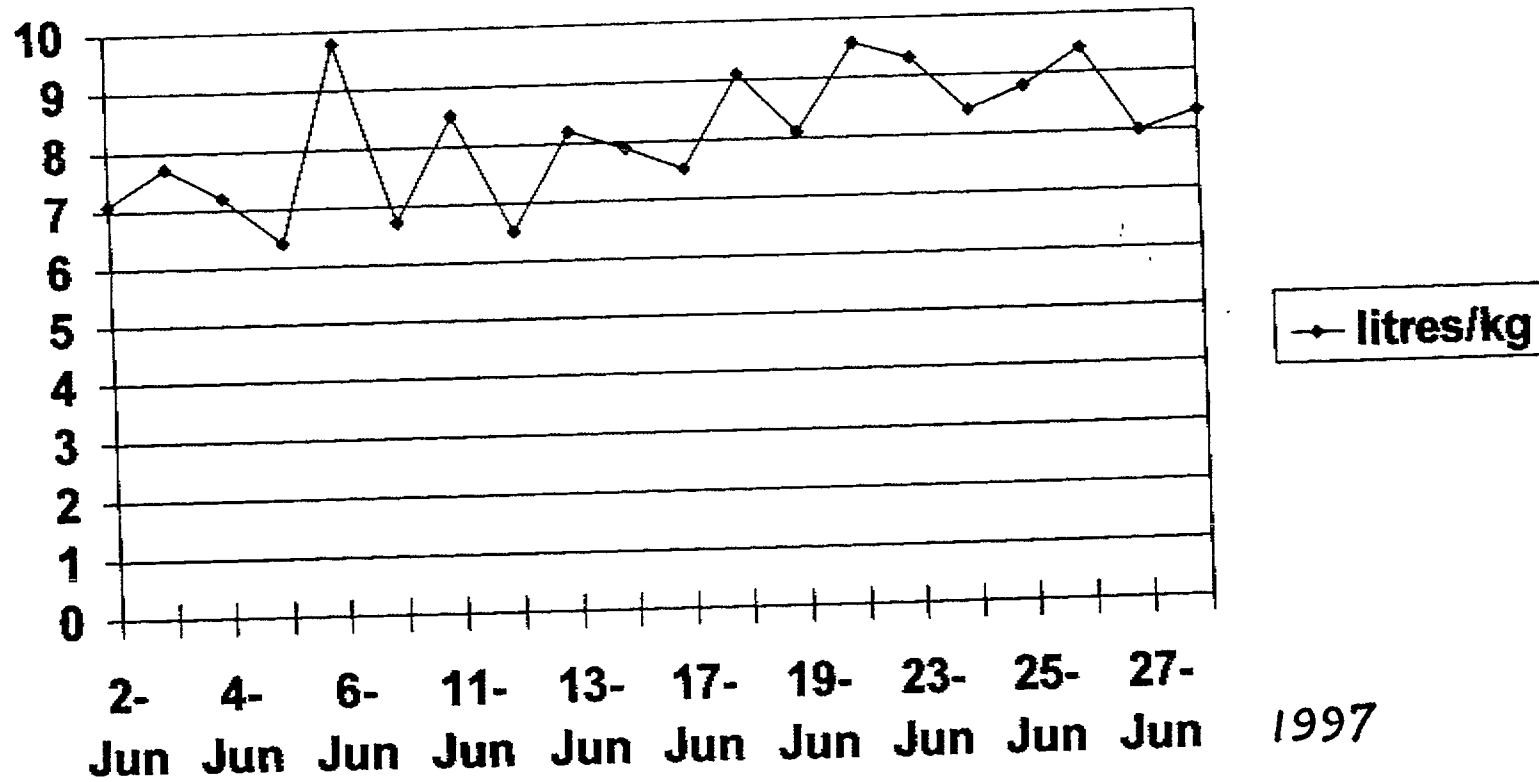
Attachment 2

Graphs Showing Rates of Water Consumption

BINDAREE BEEF

LITRES OF WATER PER KG

JUNE



BINDAREE BEEF LITRES OF WATER PER KG

