PROPOSED UPGRADING OF EXISTING NORTH DANDALUP ABATTOIR

CLOVER MEATS

Report And Recommendations
of the
Environmental Protection Authority

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i SUMMARY AND RECOMMENDATIONS

Clover Meats Pty Ltd purchased a partly completed abattoir on a 200 ha rural site at North Dandalup in 1983. It proposes to finish construction of the abattoir in the near future and to operate the abattoir initially at a slaughter rate of 200 cattle/day with upgrading to 400 cattle/day at a later stage.

A Public Environmental Report (PER) was submitted by the proponent in May 1988 to the Environmental Protection Authority (EPA) and released for an eight week public review period commencing 14 May 1988 and concluding 11 July 1988. The Authority received 6 submissions.

The Authority has assessed the potential environmental impacts of the proposal utillizing the PER and additional information supplied by the proponent and by Government agencies. The Authority specifically notes the extensive list of commitments that the proponent has made in the PER and in response to issues raised in submissions and questions from EPA.

The major potential environmental impact with this proposal is that it would discharge phosphorus to Peel Harvey catchment area. Given the present phosphorus problem in the estuary, very strict criteria need to be applied to new discharges, including this proposal, so that no further unacceptable impacts occur.

The project would use a high performance air floatation-biological lagooning treatment system and if managed properly should produce a high quality effluent. The treated effluent would be irrigated unto red mud amended pasture where the phosphorus would be stripped by adsorption and partly removed by cropping and extensive tree planting. The project will require strict monitoring of phosphorus export. Tertiary treatment of the effluent prior to irrigation will be considered if monitoring results shows excessive nutrient export offsite.

The Authority considers the project to be environmentally acceptable subject to the commitments given by the proponent in the PER and in responses to subsequent questions, and to the Authority's recommendations in this report.

RECOMMENDATION 1

The Environmental Protection Authority concludes that the proposal, as described in the Public Environmental Report, is environmentally acceptable, and recommends that the proposal could proceed subject to the Authority's recommendations in this report and the commitments made by the proponent which include:

- **the abattoir will be designed to minimise water use;**
- **wastewater treatment and disposal will incorporate the most appropriate technology currently available to meet EPA and the Water Authority of Western Australian requirements for irrigation;**

- mending pond leaks immediately, constructing additional lagoons and correcting mechanical failures as required;
- suitable management of livestock holding facilities;
- a tree planting programme to assist the removal of phosphorus from the groundwater and to improve the amenity of the site;
- minimising odour and noise;
- monitoring;
- red mud amendment of site as required;
- cropping of the irrigated area as required; and
- removal of solid waste to an approved site.

RECOMMENDATION 2

The Environmental Protection Authority recommends that the disposal of treated effluent via irrigation is environmentally acceptable. Should detrimental environmental impacts be detected, the EPA should require, as a condition of licence, that the proponent modify the operation to the satisfaction of EPA.

RECOMMENDATION 3

The Environmental Protection Authority recommends that prior to commissioning the plant, the proponent should prepare and subsequently implement a tree planting programme to the satisfaction of EPA. This programme should be prepared in consultation with the Department of Conservation and Land Management with the objective of assisting with removal of phosphorus from the site.

RECOMMENDATION 4

The Environmental Protection Authority recommends that prior to construction the proponent submit, and subsequently implement a monitoring programme to the satisfaction of EPA.

The monitoring programme is to include:

- initial baseline sampling period to determine whether impacts are presently occurring or likely to occur;
- parameters to be measured;
- sampling sites and times;
- reporting times to EPA, and
- commitment to modify the environmental management programme, if necessary, to reduce the impact of pollution to the satisfaction of the EPA.

RECOMMENDATION 5

The Environmental Protection Authority recommends that earthen stock holding paddocks should be amended by the proponent with sufficient red mud to reduce phosphorus losses to groundwater prior to use to levels acceptable to the EPA and that the area be monitored by the proponent to the satisfaction of EPA.

RECOMMENDATION 6

The Environmental Protection Authority recommends that the proponent should ensure the quality of the effluent from the water treatment system conform to the requirements of the Health Department of Western Australia, the Water Authority of Western Australia and EPA.

RECOMMENDATION 7

The Environmental Protection Authority recommends that odours and dust be controlled by the proponent at all times to the satisfaction of EPA, the Health Department of Western Australia and the Shire of Murray.

RECOMMENDATION 8

The Environmental Protection Authority recommends that the treatment pond system be monitored by the proponent for leakage to the satisfaction of EPA. If leakage occurs at any time it should be rectified immediately by the proponent to the satisfaction of EPA.

RECOMMENDATION 9

The Environmental Protection Authority recommends that the proponent ensure that the wastewater treatment facility has excess capacity to hold up to one month's irrigation water production in the event of soil water logging.

RECOMMENDATION 10

The Environmental Protection Authority recommends that prior to commissioning the plant, the proponent should obtain the approval of the Shire of Murray, the Health Department of Western Australia and EPA for the method and location of solid waste disposal.

1. INTRODUCTION

Clover Meats, the proponent, is a Western Australian company and is part of Wynne Export Pty Ltd of W.A. Clover Meats purchased the partially completed abattoir in 1983. The proponent proposes to upgrade the existing works, which is used presently as a rendering plant, to an abattoir.

The proposed abattoir is located on a 200 ha site in a rural area approximately 10 km east of Mandurah. Much of the immediate surrounding land is uncleared. The site is in the catchment of the Peel Harvey Estuary and within 500m of the Nambeelup Brook.

A Public Environmental Report (PER) was submitted by the proponent in May 1988 to the Environmental Protection Authority (EPA) and released for an 8 weeks public review period commencing 14 May 1988 and concluding 11 July 1988. The Authority received 6 submissions. The Shire of Murray conditionally supported the project.

2. DESCRIPTION OF PROPOSAL

2.1 OUTLINE OF OPERATION

An abattoir was partially constructed on Lot 222, Lakes Road, North Dandalup in 1979 (Fig.1). Construction was stopped for financial reasons. The proponent purchased the abattoir in 1983 and has been operating it intermittently as a rendering plant since that time. Clover Meats proposes to complete and upgrade the abattoir so that it will have a capacity of 400 cattle per day. It is proposed to operate the abattoir initially with a slaughter rate of 200 cattle per day. Providing demand is sufficient, this would be expected to increase in the short-term to a slaughter rate of 400 cattle per day during the summer six month period and 200 cattle per day during the winter six month period. The abattoir is expected to operate for 260 days per year.

Water will be used in the process for animal watering, boilers, dressing, and offal cleaning. Much of this water will enter the wastewater stream with liquid wastes from the abattoir operations. Clover Meats intends to treat its wastewater by screening, dissolved air floatation, chemical additions if necessary, anaerobic, facultative and passive aerobic ponding prior to irrigation on its property. Soils on the irrigation site will be amended with red muds, to reduce phosphorus leaching.

2.2. SITE SELECTION

The proponent operates an abattoir at Waroona and boning works at Fremantle and North Perth. For economic and modernisation reasons, the proponent wishes to combine the operations. Several sites were considered including Linley Valley and North Dandalup. The Linley Valley site proved unsatisfactory due to poor access and low supply of labour. The North Dandalup site was selected because of good location for transport, labour and existing plant. In addition, the abattoir already has licences and approvals for operations and is owned by Clover Meats.

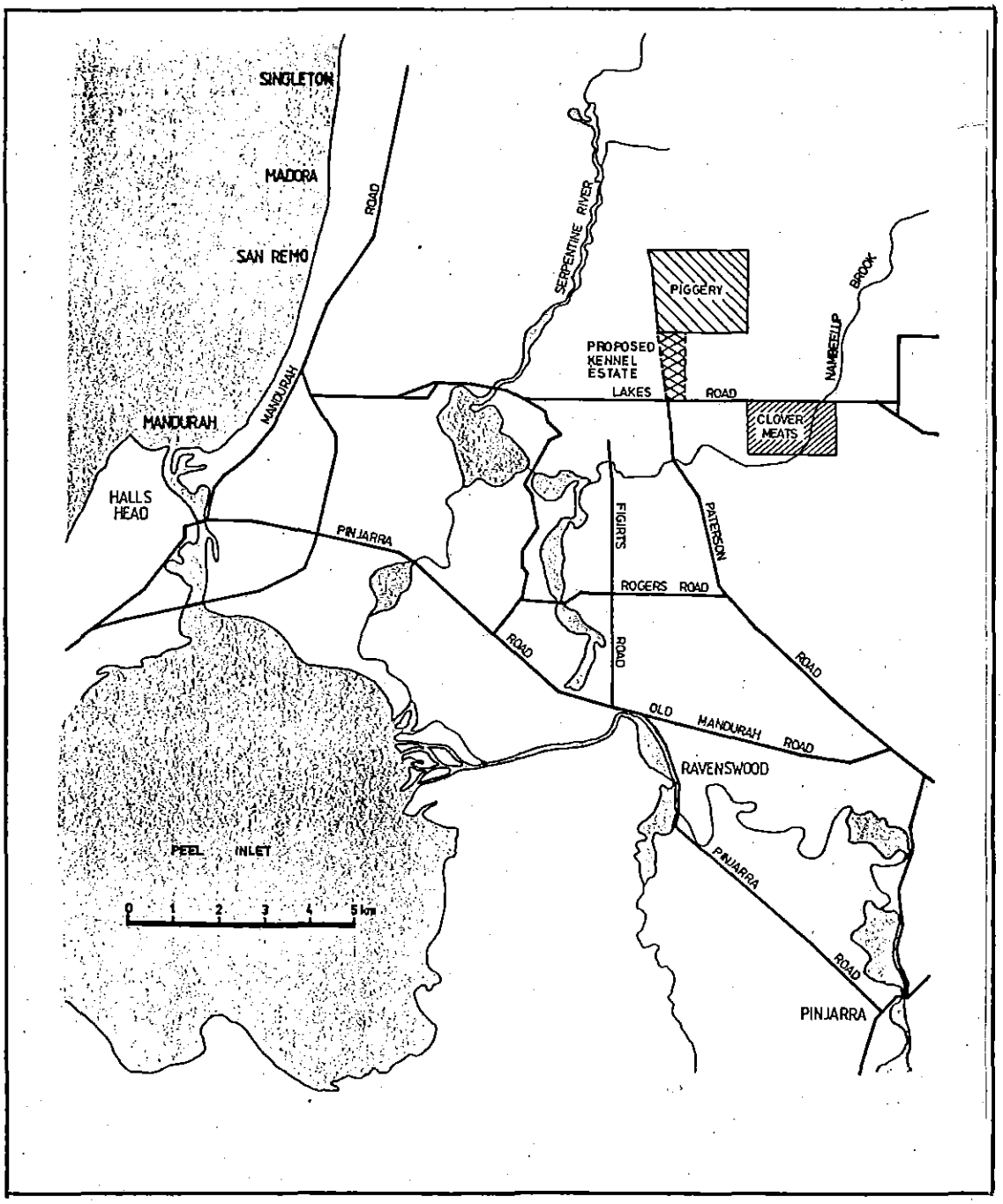

Figure 1a. Regional Location of proposed abattoir

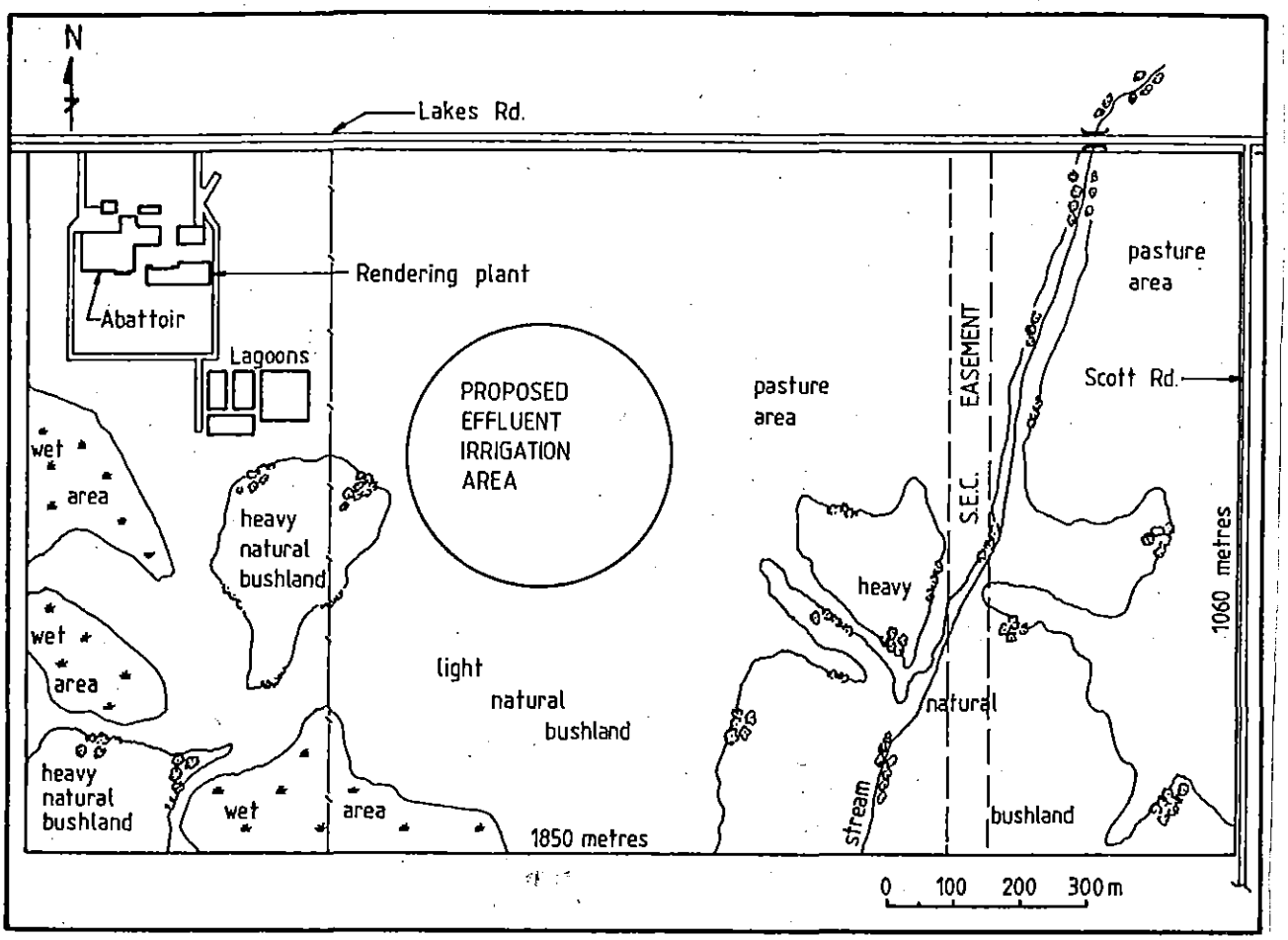

Figure 1b. Site Plan of Proposed Abattoir (after PER submitted by Proponent)

2.3. POTENTIAL ENVIRONMENTAL IMPACTS IDENTIFIED IN PER

The PER identified the following potential impacts from the project:

(a) ODOURS

In the immediate surroundings, there will be abattoir odours. In addition, there is potential for odours from stockyards, the rendering plant and the anaerobic lagoon. The rendering plant has been operating since 1983 without complaint to EPA. The anaerobic lagoon is presently servicing the rendering plant and has only a partly established crust. As a result, any lagoon odour should be at a maximum now.

(b) NOISE

All machinery with a potential to cause nuisance noise will be contained within buildings. It is not expected that noise will reach nuisance levels at the boundaries of the site.

(c) WASTEWATER

Following treatment, concentrations of the wastewater constituents will be reduced to levels deemed by EPA and the Water Authority of Western Australia to be suitable for irrigation onto red mud amended soil.

(d) TRAFFIC

The plant is expected to increase traffic along Lakes Road by 180 to 200 cars and 10 to 15 trucks (semi-trailers) per day.

3. SUMMARY OF PUBLIC AND GOVERNMENT AGENCIES' SUBMISSIONS

3.1 INTRODUCTION

A total of 6 public and Government submissions on this proposal were received by the Environmental Protection Authority. Names of contributors are given in Appendix 3. Submissions indicated that phosphorus enrichment of the groundwater is the main potential environmental problem. No submission suggested that the project was unmanageable.

3.2 SPECIFIC ISSUES RAISED IN SUBMISSIONS BY THE PUBLIC AND GOVERNMENT AGENCIES

Comments from submissions are broadly classified as follows:

- accuracy of PER;
- future location of abattoirs on the Coastal Plain;
- stock holding facilities;
- treatment of effluent and ponding system;
- irrigation and red mud amendment of soil;
- eutrophication of surroundings;
- groundwater extraction;
- odour;
- cropping, tree planting and fodder;
- solid waste disposal;
- conditions of licence and monitoring programme;
- traffic;
- planning requirements; and
- disease;

3.3 PROPONENT'S RESPONSE TO ISSUES RAISED

The proponent believes that most of the issues raised including eutrophication, odour, effluent treatment and disposal, soil amendment, cropping, water logging of receiving soil, stock holding yard management, solid waste disposal, licensing and monitoring are answered in the PER, Commitments (Appendix 1) and written responses (Appendix 2).

In addition, the proponent commits itself to ensuring that the proposal meets the requirements of the Health Department of Western Australia including standards for treated effluent used for irrigation and disposal of crops.

The land uses in this locality are presently under review by the State Planning Commission which advises that the locality is unlikely to be recommended as a major noxious industrial site in view of its proximity to the Serpentine River system and Mandurah townsite, and consideration for public groundwater protection. Nevertheless, the Commission acknowledges that in terms of existing planning requirements the proposal is acceptable and has been recognised as a pre-existing use in reference to the "Kennel Estate".

4. ENVIRONMENTAL IMPACTS

4.1 GENERAL INTRODUCTION

The Authority has identified the following aspects as those with potential to cause impacts: phosphorous export offsite, odour, dust, biological oxygen demand (BOD), treatment pond leakage, overloading treatment ponds, waterlogging of irrigated receiving soil and methods and frequency of red mud amendment of receiving soils. Given the location of the proposed abattoir, phosphorus leaching to the groundwater and hence the Peel Harvey system has the greatest potential to pollute and requires strict management and monitoring.

The Authority considers the project to be environmentally acceptable and that it could proceed subject to the commitments given by the proponent in the PER and in response to subsequent questions (Appendices 1 and 2), and to the Authority's recommendations in this report.

RECOMMENDATION 1

The Environmental Protection Authority concludes that the proposal, as described in the Public Environmental Report, is environmentally acceptable, and recommends that the proposal could proceed subject to the Authority's recommendations in this report and the commitments made by the proponent which include:

- **the abattoir will be designed to minimise water use;**
- **wastewater treatment and disposal will incorporate the most appropriate technology currently available meet EPA and the Water Authority of Western Australian requirements for irrigation;**
- **mending pond leaks immediately, constructing additional lagoons and correcting mechanical failures as required;**
- **suitable management of livestock holding facilities;**

- **a tree planting programme to assist the removal of phosphorus from the groundwater and to improve the amenity of the site;**

- **minimising odour and noise;**

- **monitoring;**

- **red mud amendment of site as required;**

- **cropping of the irrigated area as required; and**

- **removal of solid waste to an approved site.**

4.2 PHOSPHORUS

The stage 2 ERMP for the Peel Inlet and Harvey Estuary Management Strategy recommends that phosphorus input to the Peel-Harvey Estuary should be reduced to an average of 85 tonnes annually. This translates to approximately 1kg/ha/annum in sandy soil at North Dandalup. The proponent notes in the PER that this value could be achieved with red amendment. In addition, the proponent has made the commitment to amend the soil to be irrigated with red mud in a manner satisfactory to EPA. Such amendment could strip sufficient phosphorus from the irrigated water so as not to cause further impact on the receiving environment. In addition, 12 ha will be used for growing crops and 25 ha for growing trees to remove phosphorus from the site. This will be done in a manner satisfactory to EPA. The proponent will also monitor the receiving environment before and during discharge to make sure that no detrimental effects develop.

Whilst the Authority recognises the extensive commitment given by the proponent to manage all environmental aspects of the proposal properly, the Authority views the discharge of phosphorus to the Peel Harvey catchment area with concern. Given the eutrophied state of the estuarine system, the high water table in winter and the expanse of the site, this Authority believes that phosphorus control procedures additional to those presented in the PER are required so that phosphorus stripping is always adequate. This could be achieved by tertiary treatment of the effluent before irrigation. In addition, a more substantial tree planting programme could be undertaken should so as to intercept as much phosphorous as possible before it disperses into the catchment area.

The Authority also points out that the application of the proposed nutrient load to the cropped area may cause nutrient toxicity to the crop and hence render it ineffective for phosphorus control. Hence, tertiary treatment of the effluent to manage nutrient levels may be required to ensure the Environmental Protection Authority's requirements for minimal nutrient export offsite are met.

RECOMMENDATION 2

The Environmental Protection Authority recommends that the disposal of treated effluent via irrigation is environmentally acceptable. Should detrimental environmental impacts be detected, the EPA should require, as a condition of licence, that the proponent modify the operation to the satisfaction of EPA.

RECOMMENDATION 3

The Environmental Protection Authority recommends that prior to commissioning the plant, the proponent should prepare and subsequently implement a tree planting programme to the satisfaction of EPA. This programme should be prepared in consultation with the Department of Conservation and Land Management with the objective of assisting with removal of phosphorus from the site.

RECOMMENDATION 4

The Environmental Protection Authority recommends that prior to construction the proponent submit, and subsequently implement a monitoring programme to the satisfaction of EPA.

The monitoring programme is to include:

- initial baseline sampling period to determine whether impacts are presently occurring or likely to occur;
- parameters to be measured;
- sampling sites and times;
- reporting times to EPA, and
- commitment to modify the environmental management programme, if necessary, to reduce the impact of pollution to the satisfaction of the EPA.

RECOMMENDATION 5

The Environmental Protection Authority recommends that earthen stock holding paddocks should be amended by the proponent with sufficient red mud to reduce phosphorus losses to groundwater prior to use to levels acceptable to the EPA and that the area be monitored by the proponent to the satisfaction of EPA.

4.3 ODOURS, EFFLUENT AND DUST FROM OPERATION

Odour should not be a problem as the stockyards will be cleaned daily and will comply with Department of Health regulations. In addition the area is sparsely populated. The Shire of Murray notes that nearest residences are approximately 2.5 km away. Odours generated within buildings can be managed by suitable ventilation. Odours generated from the rendering plant are not likely to cause a problem as the plant has been operating intermittently for five years already without complaint to EPA. In addition, the proponent has made commitments to rectify immediately any plant failure which causes odour.

For wastewater treatment the proponent will employ a lagoon system similar to that of other abattoirs and wool scourers. Such ponding arrangements are standard industry practice. In addition, the proponent proposes to remove floatables and solids by dissolved air floatation which is effective in reducing overload on the anaerobic ponds.

Data indicate that biological oxygen demand (BOD) values as low as 100 mg/L, and negligible suspended solids and grease can be achieved in the final effluent if the wastewater stream is managed properly. Given the relatively low volume of water to be irrigated and the large area available for irrigation (at times) and allowance for long soil resting periods, these parameters should not cause a significant environmental impact.

Dust should not be a problem as most animals will be held on concrete floored stockyards which will be managed in compliance with the Department of Health requirements. In addition, as the abattoir will produce for export, strict dust control will be employed at all times to comply with export regulations. To this end, the minimum number of stock will be held in earthen paddocks for the shortest period possible. The paddocks will be dust controlled using a water sprinkler system.

RECOMMENDATION 6

The Environmental Protection Authority recommends that the proponent should ensure the quality of the effluent from the water treatment system conform to the requirements of the Health Department of Western Australia, the Water Authority of Western Australia and EPA.

RECOMMENDATION 7

The Environmental Protection Authority recommends that odours and dust be controlled by the proponent at all times to the satisfaction of EPA, the Health Department of Western Australia and the Shire of Murray.

4.4 UNDERPOND LEAKAGE

All ponds will be lined with 225 mm clay to prevent leakage to the groundwater. It is general practice to use clay linings with low permeability (in the order of $1x10^{-8}$ m/s) to prevent leakage. Falling head permeability tests of the clay in the base of the two unused lagoons gave permeability coefficients of $5x10^{-7}$ m/s and $5x10^{-10}$ m/s. However, the clay surface which has been eroded in places in the third pond will be repaired before use to the satisfaction of EPA. Whilst ponds have the potential to leak, the proponent has made a commitment to mend such leaks if they occur and meet licence conditions which would restrict export of pollutants from the site to the groundwater.

The proponent is committed to monitoring the groundwater to detect leaks and any other detrimental impacts.

RECOMMENDATION 8

The Environmental Protection Authority recommends that the treatment pond system be monitored by the proponent for leakage to the satisfaction of EPA. If leakage occurs at any time it should be rectified immediately by the proponent to the satisfaction of EPA.

4.5 WATERLOGGING AND SEEPAGE TO GROUNDWATER AND GROUNDWATER USE

Whilst the groundwater reaches the surface of some surrounding land in winter during periods of high rainfall, the irrigation site is less likely to suffer water logging because of its relative height. Site inspection during a high rainfall period showed no surface water on the land proposed

for irrigation. The proponent intends to bund the irrigated area and not use it in the event of the water table rising within 1m of it. In addition, abattoir production will decrease greatly during the winter months due to the falloff in cattle supply thus rendering the holding ponds under-utilised. However, the ponding system should have sufficient capacity to carry effluent over periods of very high rainfall so that the amended soil is not subjected to overload or surface runoff.

Given the phosphorus stripping capacity of red mud amended soil, and the proponent's commitment to monitor and reamend the soil if necessary, and rectify detrimental impacts, potential problems can be managed.

RECOMMENDATION 9

The Environmental Protection Authority recommends that the proponent ensure that the wastewater treatment facility has excess capacity to hold up to one month's irrigation water production in the event of soil water logging.

4.6 DISPOSAL OF SOLID WASTE

The solid waste produced in this process is not toxic but has the potential to produce odours. Hence daily solid waste disposal is essential.

RECOMMENDATION 10

The Environmental Protection Authority recommends that prior to commissioning the plant, the proponent should obtain the approval of the Shire of Murray, the Health Department of Western Australia and EPA for the method and location of solid waste disposal.

4.7 TRAFFIC

It is recognised by the EPA that there will be an increase in heavy duty traffic on the approach road to the abattoir and that this road would require upgrading with time. This Authority regards the issue as a Local Government planning issue.

5. CONCLUSIONS

Based on the information supplied in the PER and additional information supplied by the proponent, the Environmental Protection Authority has concluded that the project is environmentally acceptable and recommends that it could proceed subject to the commitments given in the PER and recommendations.

The project will use a high performance air floatation-biological lagooning treatment system and if managed properly should produce a high quality effluent. Whilst most aspects of treatment and disposal of treated effluent can be managed without concern, phosphorus loading to irrigated pasture requires strict monitoring and management. It can be managed using a combination of techniques such as red mud or lime amendment of receiving soil, harvesting of crops, growing trees, using a greater land area for irrigation if necessary, use of artificial wetlands, recycling of water and if necessary some tertiary treatment such as lime ponding.

APPENDIX 1

LIST OF COMMITMENTS

The proponent has provided the following commitments in the PER and in response to questions raised:

1. The abattoir will be designed and operated to minimise water use and maximise waste recovery, thereby ensuring the minimum practicable volume and strength of wastewater is produced.

2. The wastewater treatment and disposal system incorporates what is believed to be the most appropriate available technology currently available. Should any new technology for effluent treatment or disposal be developed which proves to be more efficient and cost effective than existing procedures, the proponent will approach EPA for permission to embody such technology in their system.

3. In the unlikely case that the proponent decides to introduce chemical addition as part of the wastewater treatment, chemical treatment would be carried out to the satisfaction of the EPA.

4. The proposed treatment and disposal system has been designed and will be operated to ensure that the concentrations of constituents in the wastewater will be reduced to levels deemed by the EPA and the Water Authority of Western Australia to be suitable for disposal without adverse impacts on the environment.

5. The proponent commits itself to having its discharge licenced and understands that limits within the licence will apply to accidental discharge such as leaks from the ponding system in addition to the normal discharge.

6. Live cattle will be unloaded from trucks and held in concrete-paved, roofed stockyards, before slaughter. The stockyards will be cleaned daily in accordance with the Department of Health requirements. Wastewater from the stockyards will be channelled to the lagooning system for treatment.

7. If wastewater constituent loads prove to be greater (or removal efficiencies are lower) than assumed, additional lagooning will be constructed if necessary to ensure that the loading criteria are not exceeded. Similarly, additional lagooning will be constructed if necessary to allow for any increase in slaughter rate above 200 cattle per day.

8. The proponent will consult the Department of Conservation and Land Management regarding a tree planting programme. A buffer of Tasmanian bluegum (Eucalyptus globus) trees covering approximately 25 ha will be planted along the western boundary of Nambeelup Brook to intercept nutrients in groundwater flowing towards the brook and lower the groundwater level. Additional trees will be planted along the Lakes Road boundary to improve visual amenity and provide a barrier for noise and odour control. Trees will be planted in areas which are presently cleared; no additional clearing is expected to be necessary. Tree planting will be done in a manner satisfactory to the EPA.

9. The proponent will undertake all necessary measures to minimise and if possible prevent the discharge of nuisance odours beyond the site boundaries.If a recurring odour nuisance is shown to result from the

rendering plant gases, Clover Meats will install equipment to the satisfaction of the EPA to remove odorous compounds from the rendering plant gases before they are discharged.

10. All machinery with a potential to cause nuisance noise levels will be enclosed to ensure that noise levels satisfy the Neighbourhood Annoyance regulations.

11. Any machinery which breaks down will be repaired promptly. The wastewater treatment and disposal system has been designed and will be operated to allow significant buffers to prevent any adverse environmental impacts resulting from equipment malfunction.

12. The proponent will monitor the receiving environment before and after discharge commences to ensure that any environmental impacts are at an acceptable level. To this end, the proponent commits itself to submitting a monitoring programme to the EPA for approval and carrying out the monitoring programme to the satisfaction of the EPA.

13. The proponent will monitor the performance of the wastewater treatment and disposal system to ensure that it is operating satisfactorily.

14. The proponent will monitor the groundwater to detect possible leaks from the treatment ponds and will promptly repair any treatment ponds which may be found to be causing a detrimental impact.

15. In the event that the monitoring programme indicates that an adverse environmental impact is occurring or developing, the proponent will alter the abattoir operation or introduce additional environmental management controls as necessary to reduce the impact to an acceptable level.

16. The proponent is aware that soil amended with red mud has a limited lifespan before saturation with phosphorous occurs and that desorption of phosphorous may occur. Measurement of the performance of the amended soil will be an important component of the monitoring programme. The proponent will co-operate with and in fact encourage the EPA and other interested Government bodies who may wish to collect data on the performance of the soil amended with red mud.

17. The proponent has adopted a red mud amendment rate and phosphorous application rate which are believed to be reasonable based on laboratory and field experiments. However, if the monitoring programme indicates that the red mud is not performing as expected, the proponent will modify the method used for disposal by irrigation by increasing the amended area or amending with a higher application rate of red mud. Any such modifications will be carried out in a manner satisfactory to the EPA.

18. Wastewater disposal will be achieved by irrigating crops grown in soil amended with neutralised red mud. No part of the site where groundwater is near the surface will be used for irrigation.

19. The proponent will ensure that personnel operating all of the

19. wastewater treatment and operating system, including the irrigated crops, will be technically competent to do so.

20. The treatment efficiency of the first anaerobic pond is expected to decrease with time due to the buildup of settled solids. When the pond is no longer providing efficient treatment, the proponent will review a number of options to provide additional capacity. It is likely that the preferred option will be to construct a new anaerobic pond and to fill in the old pond. Such work will be carried out by the proponent to the satisfaction of the EPA.

21. Where possible, solid waste will be recovered and exported from the site. Any remaining solid wastes will be disposed at sites approved by the EPA.

SEMMARY OF THE QUESTIONS RAISED IN THE PUBLIC AND GOVERNMENT SUBMISSIONS AND RESPONSES GIVEN BY THE PROPONENT

QUESTIONS

(a) Has the area selected for irrigation of treated waste sufficient elevation above winter water table?

(b) Assurance should be sought that no other activities involving the importation or application of nutrients will occur at the site, eg agistment of stock in paddocks pending slaughter.

(c) Clause 6.1 - the Water Authority does not recommend a wastewater volume of $5m^3/t.LWK$ for adoption. This figure is merely a guideline value used to check proposals of this type and is based on average usage quoted in literature for abattoirs. Realistic water usage should be determined in consultation with the proprietors after consideration of methods used to maintain hygiene and manage wastes within the abottoir complex.

(d) Figures for total nitrogen and phosphorus quoted in Table 4 (PER) are about 40 per cent and 25 per cent respectively lower than average figures obtained from ponding systems at other WA abattoirs. Considerable performance variations about these average figures would be expected. It is considered that a conservative approach to nutrient application to land is warranted, since the effectiveness of the irrigation disposal system is yet to be confirmed and performance is critically linked to these nutrient loadings.

(e) The application of high levels of N and P to amended soils (N-5.5t to 14t/annum and P-1.5t to 3t/annum) onto a 6 ha site each year is of concern for the following reasons:

  (i) There is no guarantee of even application of wastes to soil or fully effective P adsorption.

  (ii) The envisaged application rates may lead to soil toxicity problems restricting vegetation growth and enhancing possibility of erosive loss of nutrients.

  (iii) The AACM report (Appendix 2 Clause 5.2) indicates little research has been conducted on whether red mud adsorbed P is available for plant growth.

  (iv) There is no statement on whether experienced or qualified personnel will be assigned to the management of irrigated crop areas.

(f) More detail is required on proposals for sludge removal from ponds, proposal for effective dewatering methods, and wastewater management during the desludging process.

(g) A water balance showing irrigated crop needs on a seasonal basis against available wastewater quantities from the abattoir, seasonal rainfall and considering the groundwater extraction limit of 120ML/a is recommended.

(h) The E. globulus plantings appear to offer little enhancement of nutrient removal (refer Clause 5.4, Appendix 2).

The possible reduction of groundwater table produced by the extensive tree plantings may not be in the interests of others in the area accustomed to the higher water levels produced by years of catchment clearing. More data addressing this issue is recommended.

RESPONSES

(a) The need to provide sufficient elevation above the winter water table is acknowledged in the PER (p 15). During a recent site inspection (on 15 June 1988), a depth to groundwater exceeding 2m was observed in a pit from which sand has been excavated to provide fill material. These conditions are believed to be typical of the area to be used fro disposal by irrigation. Any sections of the site where winter groundwater levels are near the surface, such as adjacent to Nambeelup Brook, will not be used for disposal of the treated wastewater.

(b) The Proponent is well aware of the potential problems associated with importation of nutrients to the site. As discussed in the PER (p 8), all stock will be held in concrete-paved, roofed stockyards before slaughter to ensure that a minimum quantity of wastewater is generated from this area (by excluding rain) and that the wastewater is contained and channelled to the wastewater treatment units.

It may be necessary on occasion to hold stock on site over the weekend or overnight. Clover Meats would not be allowed to hold these stock in the concrete yards, since they would go lame. Hence Clover Meats proposes to use a small area (up to 2 ha) for earthen holding yards. These yards would be adjacent to the concrete stockyards and would be enclosed by fencing. Cattle would be fed with low protein hay or straw while being held. In nearly all cases these animals would be empty of paunch contents on arrival at the abattoir and, as they would be fed only a minimum ration of hay, very little manure would be left in the yards.

(c) & (d) The wastewater quantity and quality data were discussed with an officer of the Water Authority of WA during the initial stages of design of the wastewater treatment and disposal system. The important values of wastewater volume and nutrient concentrations were agreed to be realistic for a new abattoir incorporating equipment designed and operated with minimisation of water usage (and hence wastewater generation) as one of the principal criteria.

Water Authority data from wastewater analysis of a similarly sized (though older) abattoir slaughtering an average of 450 cattle/day showed phosphorus concentrations in the effluent from the final lagoon ranging from 14mg/L to 24mg/L in 1978 and 1979. This appears to support the value of 20mg/L adopted for the North Dandalup abattoir.

The Proponent agrees that a conservative approach to nutrient application to land is warranted. The design of the wastewater

about the performance of each component, particularly with respect to removals of phosphorus. As a result, the integrated system should incorporate an ample safety factor. This conclusion is based on the following points:

(i) Only a minimal (10 per cent) reduction in phosphorus has been assumed to occur in the solids separation stages (screening and dissolved air floatation). Removals may be much higher.

(ii) No phosphorus reduction has been assumed to occur in the lagoons, although operating data obtained from the Water Authority suggest that removals of perhaps 5 per cent occur in lagoons at other abattoirs.

(iii) The assumed phosphorus uptake in crops of maize is based on a conservative estimate of yield (5t/ha) and the minimum value of phosphorus uptake from the range of 50 - 75 kg/ha.a suggested by the agricultural sub-consultant (PER, Appendix 2). The actual phosphorus uptake in maize could be at least 450 kg/a instead of the 300 kg/a adopted for the design of the wastewater treatment and disposal system.

(iv) The assumed phosphorus uptake in a winter fodder crop is the minimum value from the range of 3 - 5 kg/ha.a suggested by the agricultural sub-consultant. The actual phosphorus uptake in the winter crop could be at least 30 kg/a instead of the 18 kg/a adopted for the design of the wastewater treatment and disposal system.

(v) Phosphorus adsorption on the soil amended with red mud is likely to be at least 90 per cent. As discussed in the PER , some experiments have shown removals of 99 per cent. The conservative estimate of 90 per cent has been adopted to determine the area to be amended with red mud.

(vi) The phosphorus uptake in crops and adsorption onto red mud is expected to balance the phosphorus output from the abattoir. The 25 ha plantation of Tasmanian bluegum trees is expected to provide an additional 75 kg/a uptake of phosphorus from the groundwater.

(vii) The abattoir will be operated initially at a slaughter rate of 200 cattle/day, although the wastewater treatment and disposal system has been designed for the wastewater quantity expected from a slaughter rate of 400 cattle/day. Hence it will be possible to monitor the performance of the system at half capacity to ensure it behaves as expected before increasing to full capacity.

(viii) If the wastewater treatment and disposal system operates as expected, the quantity of phosphorus leaching from the site will be no more than 196 kg/a, only one-third of the 600 kg/a which would be acceptable to the EPA.

(e) (i) The wastewater will be applied to the amended 6 ha areas by sprinklers designed and operated to provide even distribution of the wastewater (augmented by groundwater if necessary) to ensure

phosphorus adsorption efficiency will be as assumed, it is believed that adequate safeguards are built into the system (as discussed above) to ensure adverse effects do not result.

(ii) Two 6 ha areas will be used annually in rotation to overcome possible problems of soil toxicity and erosive loss.

(iii) It is proposed that maize will be grown on soil amended with red mud and irrigated with treated wastewater. Hence it is expected that crop uptake and adsorption onto the red mud will occur simultaneously. Experiments by the Department of Agriculture at a nearby property showed significant increases in productivity of clover and medics pastures (Tacey, Ward & Summers, 1984). AACM's comment referred to in the submission were related to the different situation of the potential for release of adsorbed phosphorus for crops grown on amended soil once irrigation with high loads of phosphorus has ceased.

(iv) The Proponent will ensure that personnel operating all of the wastewater treatment and disposal system, including the irrigated crops, will be technically competent to do so.

(f) Given that treatment in lagoons will be preceded by screening and dissolved air floatation, it is expected that sludge removal from the lagoons will not be required for several years. When the build-up of solids in the first anaerobic lagoon becomes excessive, the Proponent could adopt one of the following:

(i) Construct a new clay-lined lagoon, divert flow from the old lagoon to allow it to dewater by evaporation, then possibly seal it with a capping of clay or similar impervious material:

(ii) As for Option (i), but remove the dewatered contents of the old lagoon for disposal at another site and reinstate the lagoon for future service; or

(iii) As for Option (ii) but utilise the remaining anaerobic lagoon while the first one is out of service, rather than constructing a new lagoon.

The Proponent would wish to review the technical and economic aspects of these (or any other) options to determine the most effective method for sludge removal which did not cause any adverse environmental impact. Such a review should sensible be undertaken once the requirement for action is imminent, rather than now.

(g) Average seasonal water budget is presented in the attached table.

(h) As discussed above, the Tasmanian bluegum (E. globulus) plantation should result in a phosphorus uptake of about 75 kg/a. This uptake is additional to the amount required ot reduce the phosphorus output from the abattoir to acceptable levels - even if the tree uptake were zero, the treatment and disposal system would be expected to easily meet the EPA's phosphorus criterion.

Season	Crop	Crop Demand	Rain	Waste-Water	Ground-Water
Summer	Maize	58.8	4.5	93.6	0.7
Winter	Fodder	34.5	22.8	46.8	0.0

EFFECT OF TREE PLANTING ON ADJACENT LANDOWNERS

The area of the proposed tree plantation is 25 ha, only 12.5 per cent of the total site. It is proposed that the plantation should form a 200 m wide strip along the lower section of the property through which Nambeelup Brook flows. The Department of Conservation and Land Management (CALM) have advised that such a small plantation would not be expected to have any effect on regional groundwater levels. Indeed, CALM believes that there will be minimal effect on groundwater levels immediately under the trees and no effect at the boundaries of the property.

The Tasmanian bluegum (E. globulus) plantation will only affect groundwater levels if the water losses by evapo-transpiration exceed rainfall and the hydraulic conductivity is too low for the groundwater beneath the trees to be replenished. CLAM does not have data on the evapo-transpiration loss from Tasmanian bluegums. However, CALM suggests that data for pine trees (Pinus pinaster) can be used to gain an upper-bound estimate of water usage.

The Gnangara Mound Groundwater Resources ERMP (Dames & Moore, 1986) indicates that losses by evapo-transpiration for the Gnangara Mound and Pinjar areas to the north of Perth, which include 23,000 ha of pine plantation, range from 57 per cent to 70 per cent of rainfall. The report points out that evaporative losses from groundwater are significantly higher when the water table is close to the surface; hence lowering the water table by planting trees will reduce the loss by evaporation.

The Peel Inlet and Harvey Estuary ERMP (Kinhill Engineers Pty Ltd, 1988) suggests loss by evapo-transpiration of 80 per cent for native woodland and for thinned Pinus pinaster plantation, increasing to 100 per cent or more for unthinned Pinus pinaster plantations.

The Tasmanian bluegums to be grown at Clover Meats' North Dandalup abattoir will be thinned to promote growth of trees suitable for eventual harvesting for wood chips. In view of this, the statement by CALM that the proposed small plantation on Clover Meats' site will not adversely affect groundwater levels appears to be justified.

REFERENCES

Dames and Moore (1986) "Gnangara Mound Groundwater Resources. Environmental Review and Management Programme", November 1986.

Kinhill Engineers Pty Ltd (1988) "Peel Inlet and Harvey Estuary Management Strategy. Environmental Review and Management Programme - Stage 2", May 1988.

APPENDIX 3

LIST OF ORGANISATIONS AND INDIVIDUALS WHO MADE WRITTEN SUBMISSIONS

- Water Authority of Western Australia
- Peel Inlet Management Authority
- Shire of Murray
- River Districts Association
- Health Department of Western Australia
- State Planning Commission
- Environmental Protection Authority