PARLE FOODS PTY LTD

ENVIRONMENTAL IMPACT STATEMENT,

PROPOSED FOOD PROCESSING PLANT,

FARM 1059, WILLBRIGGIE, NSW

AWL6615/1

EIS APPENDICES

APPENDIX A

DUAP and Agency Requirements

Department of
Urban Affairs and Planning

Development and Infrastructure
Assessment
Level 22, 1 Farrer Place
Sydney NSW 2000
GPO Box 3927
Sydney NSW 2001

Facsimile: 02 9391 2151

Mr Tony Edwards
Coffey Geosciences Pty Ltd
P O Box 803
ALBURY NSW 2640

Dear Mr Edwards

Proposed Food Processing Plant – Lot 1059, DP 751686, Pt 77 Millis Road, Willbriggie
Our reference: S9901625

Thank you for your letter of 8 December 1999 seeking consultation with the Director-General for the preparation of an Environmental Impact Statement (EIS) for the above development.

Under clause 55 of the *Environmental Planning and Assessment Regulation 1994* (the Regulation), the EIS should specifically address the issues outlined below.

Specific Issues

Specific details to be addressed within the EIS are outlined in the requirements from the Environment Protection Authority, attached correspondence from regulatory bodies, minutes from the planning focus meeting and Attachments 1 and 2. A summary of the key issues is provided below.

- Wastewater management – effluent disposal will need to be carefully managed because of the fluctuations expected in concentrations of levels of salinity, BOD etc and the impact this can have on soil and groundwater. The EIS should detail in full how the effluent reuse scheme will be developed, irrigation application and drainage characteristics, and the measures to be put in place to minimise impacts. Appropriate stormwater runoff from the site will need to be managed to ensure there are no off-site impacts.
- Agronomic considerations for the woodlots and effluent reuse – discussions of best management practices to be adopted to ensure sustainability of the system and to minimise negative impacts on surrounding landowners and the environment. This should include:
  - (a) an assessment of the soils, involving soil testing and mapping of the site, to determine the suitability of the site for the development;
  - (b) details of crop / pasture rotation for all areas being intensively utilised;
  - (c) a nutrient budget which determines if there is a nutrient balance between those applied and those removed.
  - (d) an assessment of the impact of salinity and sodicity of the effluent produced; and
  - (e) details on irrigation methods.
- Water supply – the EIS should identify the water requirements for the proposed use and the associated impacts resulting from this use.
- Impact on watercourses / waterbodies – details on the proximity of the site to watercourses / waterbodies, whether it is subject to flooding, and the likelihood of runoff affecting these areas.

- Groundwater – the EIS should consider the likelihood of the proposal resulting in a rise in groundwater level, or in contamination of the groundwater. The likely magnitude of any impact and its significance should be discussed. Any methods to mitigate or monitor impacts should be described.
- Solid waste management – quantities and type of wastes together with the disposal method should be clearly described within the EIS.
- Erosion and sedimentation – measures and design features put in place to control erosion and sedimentation, both during construction and operation phases.
- Air quality – a description of air pollutants and air pollution equipment should be given, including details of the methods utilised to determine air quality.
- Noise – a Noise Impact Statement be prepared by an accredited acoustic consultant which will describe existing background noise levels, the major noise sources, examine the impact of noise on affected residences and other noise sensitive areas, and detail the proposed mitigation measures.
- Heritage – should the company proceed with relocating a heritage item to the site, the EIS should assess the impact on the heritage significance.
- Aboriginal archaeology - document the archaeological survey and assess the Aboriginal significance.
- Native vegetation – details of any clearing of native vegetation, together with a justification and assessment of ecological impact should be included. An aerial photograph should be supplied, as well as a map of the vegetation communities present.
- Amenity – the potential impact of noise, air quality and traffic generation on surrounding land uses will need to be assessed. Appropriate buffering will need to be included such as set back provisions and consent from residences to aerially apply pesticides.
- Traffic Generation and Access – a traffic impact study should be completed in accordance with section two of the Road & Traffic Authority's publication 'Guide to Traffic Generating Developments'.
- Crown land - consideration should be given to whether the development impinges / impacts on Crown land. If the proposal has implications for Travelling Stock Routes and Reserves, the appropriate Rural Lands Protection Board should be contacted.
- A report on threatened species, populations or ecological communities, or their habitats, including the following:
  - (a) a description of the study area, including details of the types and condition of the habitat(s) in, and adjacent to, the land to be affected by the proposal;
  - (b) a list of those threatened species, populations or ecological communities known to occur in the same or similar habitats in the region; and
  - (c) an assessment of the likelihood of those species, populations or ecological communities identified in (b) occurring within the study area, given their habitat requirements and the habitats present within the study area.
- Environmental monitoring – all aspects of site management and monitoring should be addressed, including the establishment of baseline data for environmental monitoring.
- Property Management Plan – a whole property plan should be provided which provides a practical means for the implementation of agronomic strategies and ensures continuity and uniformity of management practices.

Attachment No. 1 outlines the statutory matters that must be included in any EIS under clauses 54 and 54A of the Regulation. Attachment No. 2 contains a guide to the issues that may be relevant to the preparation of the EIS for your proposal.

As a result of amendments to the *Environmental Planning and Assessment Act 1979*, Development Applications (DAs) lodged after 1 July 1998 are "integrated development" where certain licences or approvals are required from bodies other than the consent authority. The Environment Protection Authority (EPA) is an integrated approval body for this development. Attachment No. 3 contains the EPA's key information requirements for the proposal.

If further integrated approvals are identified before the Development Application is lodged, you must conduct your own consultation with the relevant agencies to identify their requirements for the EIS. Attachment No. 4 contains issues of concern raised by relevant agencies.

When lodging your Development Application, you must lodge at least one copy of the Development Application and supporting documentation (including a fee of $250) with <u>each</u> of the agencies from which you need an integrated approval.

You should consult with Griffith Council and take into account any comments Council may have in the preparation of the EIS. The EIS should also address other issues that emerge from consultations with relevant local, State and Commonwealth government authorities, service providers and community groups.

The Development application should be lodged with the Sydney Office of this Department rather than the Council because this proposal is State Significant Development. When submitting your Development Application, please include at least 25 copies of the EIS and other supporting documentation.

Please contact Danielle Lautrec on (02) 93912231 if you require any further information regarding the Director-General's requirements for the EIS or lodgement of the DA.

Yours sincerely

G Noonan 28 · 2 · 00

Geoff Noonan
Director
Development and Infrastructure Assessment
As Delegate for the Director-General

DEPARTMENT OF URBAN AFFAIRS AND PLANNING

Attachment No. 1

STATUTORY REQUIREMENTS FOR THE PREPARATION OF AN ENVIRONMENTAL IMPACT STATEMENT UNDER PART 4 OF THE ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979

In accordance with the *Environmental Planning and Assessment Act 1979* (the Act), an environmental impact statement (EIS) must meet the following requirements.

Content of EIS

Pursuant to Schedule 2 and clause 54A of the *Environmental Planning and Assessment Regulation 1994* (the Regulation), an EIS must include:

1. A summary of the environmental impact statement.
2. A statement of the objectives of the development or activity.
3. An analysis of any feasible alternatives to the carrying out of the development or activity, having regard to its objectives, including:
   - (a) the consequences of not carrying out the development or activity; and
   - (b) the reasons justifying the carrying out of the development or activity.
4. An analysis of the development or activity, including:
   - (a) a full description of the development or activity; and
   - (b) a general description of the environment likely to be affected by the development or activity, together with a detailed description of those aspects of the environment that are likely to be significantly affected; and
   - (c) the likely impact on the environment of the development or activity, having regard to:
     - (i) the nature and extent of the development or activity; and
     - (ii) the nature and extent of any building or work associated with the development or activity; and
     - (iii) the way in which any such building or work is to be designed, constructed and operated; and
     - (iv) any rehabilitation measures to be undertaken in connection with the development or activity; and
   - (d) a full description of the measures proposed to mitigate any adverse effects of the development or activity on the environment.
5. The reasons justifying the carrying out of the development or activity in the manner proposed, having regard to biophysical, economic and social considerations and the principles of ecologically sustainable development.
6. A compilation, (in a single section of the environmental impact statement) of the measures referred to in item 4(d).
7. A list of any approvals that must be obtained under any other Act or law before the development or activity may lawfully be carried out.
8. For the purposes of Schedule 2, the principles of **ecologically sustainable development** are as follows:
   - (a) The precautionary principle - namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.
   - (b) Inter-generational equity - namely, that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.
   - (c) Conservation of biological diversity and ecological integrity.
   - (d) Improved valuation and pricing of environmental resources.

Note

The matters to be included in item (4)(c) might include such of the following as are relevant to the development or activity:

- (a) the likelihood of soil contamination arising from the development or activity;
- (b) the impact of the development or activity on flora and fauna;
- (c) the likelihood of air, noise or water pollution arising from the development or activity;
- (d) the impact of the development or activity on the health of people in the neighbourhood of the development or activity;
- (e) any hazards arising from the development or activity;
- (f) the impact of the development or activity on traffic in the neighbourhood of the development or activity;

(g) the effect of the development or activity on local climate;
(h) the social and economic impact of the development or activity;
(i) the visual impact of the development or activity on the scenic quality of land in the neighbourhood of the development or activity;
(j) the effect of the development or activity on soil erosion and the silting up of rivers or lakes;
(k) the effect of the development or activity on the cultural and heritage significance of the land.

An environmental impact statement referred to in Section 78A(8) of the Act shall be prepared in written form and shall be accompanied by a copy of Form 2 of the Regulation signed by the person who has prepared it.

Procedures for public exhibition of the EIS are set down in clauses 57 to 61 of the Regulation.

Attention is also drawn to clause 115 of the Regulation regarding false or misleading statements in EISs.

Note

If the development application to which the EIS relates is not exhibited within 2 years from the date of issue of the Director-General's requirements, under clause 55(7) of the Regulation the proponent is required to reconsult with the Director-General.

– ✧ –

Department of Urban Affairs and Planning

ATTACHMENT NO 2
ADVICE ON THE PREPARATION OF AN ENVIRONMENTAL IMPACT STATEMENT (EIS) FOR AGRICULTURAL PRODUCE INDUSTRIES

The purpose of this paper is to outline various issues relevant to the preparation of an EIS for agricultural produce industries. It is intended to assist in the preparation of the EIS. It is the applicant's responsibility to identify and address, as fully as possible, the matters relevant to the specific development proposal in complying with the statutory requirements for EIS preparation (see Attachment No. 1).

The matters nominated in this paper are not intended as a comprehensive identification of all issues which may arise in respect of agricultural produce industries. Some of the issues nominated may not be relevant to a specific proposal. On the other hand, there may be other issues, not included, that are appropriate for consideration in the EIS.

1. Background

The background to the EIS should provide a description of the planning framework including:

- zoning, permissibility and any land use constraints;
- compatibility of the proposal with Environmental Planning and Assessment Act (as amended) 1979, State Environmental Planning Policy Nos 11 and 34 (and others where relevant), Griffith LEP 1994, relevant Development Control Plans and any relevant draft plans;
- description of existing and projected land uses in the surrounding locality;
- description of statutory requirements of other regulatory agencies;
- justification for the proposal;
- assessment of alternative site options;

2. Description of the proposal

The description of the proposal should provide general background information on the location and extent of the proposed works, details of the site, land tenure, zonings, description of surrounding land uses, relevant forward planning proposals and any other land use constraints.

This section should provide specific information on the nature, intent and form of the development. It should, as far as possible, include such details as the processes involved, wastes created and the process for management of these wastes, water requirements, transport management and site layout and landscaping. A description should also be provided of associated operations such as the transport of materials.

Particular details that may be relevant include:

- maps and/or plans clearly indicating the location of the proposed works and stages of the development including the proximity of the development to natural features such as drainage lines, watercourses, wetlands, significant stands of vegetation etc;

- proposed works and stages of development including site preparation and construction (ie equipment, hours and stages of construction);
- provide an indicative full flow schematic diagram of the production processes highlighting relevant factors to specific processes;
- a list of the major chemical materials, plus an hazardous materials, to be used, stored, processed or produced, and the rates of usage or production;
- a brief description of the type of machinery and equipment to be used and degree of automation of the operation;
- a brief description of the chemical processes used on the site;
- sources and quantities of raw materials and products to be stored and the storage arrangements including stockpiling details;
- number of persons to be employed during construction and operation of the plant;
- hours of operation;
- capacity of the proposed plant, expected life of the operation of the plant, any proposals for future expansion, including staging and timing;
- details of transport management including details of access to the site, internal movement within the site, parking, unloading and loading, traffic generation and peak movements, truck type and routes;
- site drainage and erosion controls;
- details of the water budget for the proposal, including quantity, source, required infrastructure and storage options during low flows;
- expected noise levels - both internal and external to the operation.;
- infrastructure requirements to service the site;
- wastewater treatment and proposed reuse options;
- solid waste management; and
- details of any heritage buildings associated with the site.

Reference should also be made to the required information for Development Applications listed on Form 1 of the EP&A Regulations.

2. Description of the Environment

This should provide details of the environment in the vicinity of the development site and also of aspects of the environment likely to be affected by any facet of the proposal. In this regard, physical, natural, social, archaeological and economic aspects of the environment should be described to the extent necessary for assessment of the environmental impact of the proposed development.

3. Analysis of Environmental Impacts

Environmental impacts usually associated with agricultural industries are listed below. Where relevant to the specific proposal, these should be addressed in the EIS, taking into account the adequacy of safeguards proposed to minimise them.

Noise

- Likely noise disturbance by the operations, including transport operations on nearby residences;

Transport Management

- other impacts of trucking movements, including access to the site, capacity of the current road network to accommodate the proposed development based on the current level of service, requirement for upgrading to accommodate the proposal,

Air Quality

- potential for air pollution, including odours, organic vapours, dust and particulate matter during both construction and operation of the facility. This should include a discussion on the impact of greenhouse gas emissions and the potential for carbon balancing;

Water Management

- water supply requirements and the effects on the existing water supply system. This should include details on options for water storage during periods of low flow;
- proposals for separating clean and contaminated runoff before discharge. Options for discharge;
- proposed erosion and sedimentation control;

Waste Management

- treatment and disposal of solid waste material including the control of salinity and BOD impacts on the soil and groundwater from composting;
- options for other solid waste and proposed waste minimisation strategies;
- water treatment; quality and quantity of effluent for disposal, options for reuse of wastewater on the site, including vegetation composition and management. This should include discussion on the impact of treated wastewater on the irrigation channel system, groundwater and soil and the vegetation composition and management of reuse;

Flora and Fauna

- details of any clearing on the site including plant species, number of plants and/or area to be cleared. A justification should be made of the need for the clearing, and an assessment should be included of the ecological impact of the clearing including the impact on any Threatened species and their habitats; and
- details of any impacts on aquatic habitats.

Crown Land

- consideration should be given to whether the development impinges on or affects any Crown Land, including Crown Roads;

Visual Environment

- effects on the visual environment;

Residential Amenity

- compatability of the use with the surrounding land uses and future uses; and

Heritage and Archaeology

- the impact of relocation of the historic Letona SPC building in Leeton to the site.

In addition, any proposal to monitor and reduce environmental impact should be included.

4. Contact with Relevant Government Authorities.

In preparing the EIS, it is necessary for the proponent to consult with the relevant integrated approval bodies regarding their requirements for issuing necessary licences or approvals. In this case the Environment Protection Authority will need to be consulted in regard to air, water and noise impacts and relevant pollution control legislation requirements. Other relevant authorities, particularly, MIA, NSW Agriculture, NSW National Parks & Wildlife Service, the Department of Land and Water Conservation, Roads and Traffic Authority and Griffith City Council should be consulted and their comments taken into account in the EIS.

It is the responsibility of the person preparing the EIS to determine those Departments relevant to the proposed development and to ensure all comments are addressed in the EIS.

ATTACHMENT NO. 3

EPA Requirements

Our Reference : GF222/GFF2317
Contact : Melissa Daniher

EPA

South West Region

The Director General
Department of Urban Affairs and Planning
GPO Box 3927
Sydney NSW 2001

Attention: Geoff Noonan

Dear Sir/Madam

Re: Proposed Food Processing Plant, Willbriggie

I refer to the Planning Focus Meeting held on 2 February 2000 for the proposed food processing plant by Parle Foods Pty Ltd at Farm 1059 Willbriggie.

The EPA has considered the details of the proposal as provided by your department and has identified the information it requires to issue its general terms of approval in Attachment 'A'. In summary, the EPA's key information requirements for the proposal are:

1. Wastewater management
2. Solid waste management
3. Air quality issues
4. Noise and visual impacts

Based on the information provided to the EPA, the applicant will require an environment protection licence in regard to the following:

- carry out scheduled development work, and
- carru out scheduled activities.

The applicant will need to make a separate application to the EPA to obtain this licence.

The EPA requests that the applicant provide 2 copies of the DA/EIS when lodging its application with the EPA. These documents should be lodged at the EPA South West Regional Office, Suite 8, Level 1, 130-140 Banna Avenue Griffith.

I hope this information is of assistance to you. Should you require any further information or need any further clarification about this matter please do not hesitate to contact Melissa Daniher by telephoning 02 6964 1880 or by electronic mail at daniherm@epa.nsw.gov.au

Yours faithfully

C. Bretherton 4.2.2000

Craig Bretherton
Acting Head Regional Operations Unit South West
for **Director General**

ATTACHMENT 'A'

General

1. A locality and/or site plan with clear dimensions marked showing the following.

    (a) Distances between plant, site boundaries, and residential premises (both existing and approved future developments).

    (b) Isolated residences within the likely area of impact.

    (c) Other adjoining premises.

    (d) Any public roads or places.

    (e) Any natural or artificial waters.

    (f) Any buffer zones proposed.

2. A description of the proposed installation detailing the raw materials involved in both the process and the finished product, including the annual quantity expressed in tonnes, and the likely waste products requiring disposal.

3. General arrangement drawings of the subject plant and equipment.

4. Details of the proposed pollution control equipment to be installed, complete with specifications of the overall plant and equipment.

5. A description of the process, including a simplified process flow diagram highlighting potential emission points.

6. Details of any fuels to be burned including type and consumption rate (kilograms per hour) for normal operation as well as the design maximum. Include the sulphur content specifications of the fuel also.

Air Pollution

7. A site plan showing the location of all plant together with all air pollutant point sources and area sources. Include the proposed height and exit diameter of any chimney(s) and indicate locations and dimensions of all nearby buildings within a radius of ten chimney heights from the location of the chimney(s).

8. Details of any air pollutants, including odours, likely to be emitted and their sources and include the following items.

   (a) Pollutant concentration (in parts per million) and mass emission rate (in grams per second).

   (b) Exit velocity of flue gases from chimney(s) at equipment design rate.

   (c) Concentration of any particulate matter and the size ranges.

   (d) Any pollutants which may have adverse impacts on human or animal health, vegetation, materials or the degradation of ambient air quality.

9. Specifications of all air pollution equipment proposed to be installed including details of proposed maintenance schedules and any visual or audible alarm systems that it is proposed will be installed to indicate equipment failure.

10. Details of the proposed methods of monitoring, recording and reporting the significant air pollutants. Include dispersion modelling results for the most significant air pollutant (or odour) used in the determination of proposed chimney height(s). Include all assumptions and input data as well as the air quality criteria against which the modelling output was compared. Background ambient levels should be taken into account.

11. Details of the proposed methods of preventing air-borne and vehicle-borne dust escaping from the premises.

Noise Impact

It would seem appropriate for a Noise Impact Statement (NIS) to be prepared by an accredited acoustic consultant for the proposed development. The NIS should take into account the noise impact of the development and be prepared in accordance with Chapter 24 of the NSW EPA Environmental Noise Control Manual AND Industrial Noise policy and provide details of the following.

12. The measured background noise levels at affected residences at the proposed times of operation particularly those times when the differences between the plant noise and the background noise will be the greatest.

13. An estimate of the LA_{10} level contributions at all nearby potentially affected residences due to all noise sources located on the site. This should take account of all noise sources which may reasonably be expected when the plant is fully operational, and should include reference to any future plans the company may have for later expansion which may cause or increase noise.

14. A general description of the building construction around major noise sources and the building layout, for example whether the buildings are closed and mechanically ventilated or open and naturally ventilated, and whether doors and loading bays are normally open or normally closed while the enclosed noise producing equipment is in operation.

15. The detailed noise control measures proposed to contain or control noise from each major noise source including details on such matters as the materials and thickness of enclosures, construction and height of screen walls, insertion loss of silencers and times of operation.

16. A schedule of proposed truck movements and access routes through adjacent residential areas and anticipated operating times of plant and equipment.

17. An assessment of noise impact describing the effect of the predicted noise levels on people in nearby residential areas, neighbouring vacant land and other noise sensitive areas.

Water

18. A drainage diagram showing any proposal to divert stormwater around the site.

19. Details of the processes generating any wastewater, including a process flow diagram highlighting potential discharge points.

20. Details of the volume and quality of wastewater to be generated.

21. Details of the wastewater treatment methods proposed, including the method of disposal of any sludge or solid wastes.

22. Details of other alternatives to dispose of wastewater other than the methods proposed.

Wastewater Disposal

Should you propose to dispose of wastewater by irrigation onto land, the following matters must also be addressed in the EIS.

23. A locality and/or site plan, either drawn to scale or with clear dimensions marked showing the following.

    (a) Clearly delineating the proposed irrigation areas including the distances in relation to site boundaries, any public roads or places, any natural or artificial waters and proposed buffer zones.

    (b) Residences within the likely area of impact

(c) Other adjoining premises.

24. Topographic or contour map of the irrigation areas.

25. Details of the topography of the irrigation areas including the following.

(a) Ground slope.

(b) Erosion potential.

(c) Flood potential.

(d) Area (hectares).

26. A description of the climate including the following.

(a) Precipitation analysis (mean and 90 percentile monthly distribution).

(b) Storm intensities.

(c) Evapotranspiration (mean monthly distribution).

27. Details of groundwater at the site including the following.

(a) Depth to groundwater.

(b) Location of existing wells on site or adjacent to the site.

(c) Any current use of the groundwater.

(d) Is the site a groundwater recharge area or discharge area?

(e) A statement of the quality of the groundwater.

28. Details of the soils occurring on the irrigation area including the following.

(a) Type and description.

(b) A map showing distribution of soil types.

(c) Infiltration and percolation potential.

(d) Soil profile.

(e) Surface and subsoil nutrient and salinity status.

29. Details relevant to surface waters including the following.

(a) Drainage lines/flow characteristics at the site.

(b) Proximity to surface waters.

(c) Current use of surface waters.

(d) Quality of surface waters.

30. A farm Management Plan detailing the planned operation of the irrigation area including the following.

(a) Cropping regime.

(b) Method and scheduling of irrigation.

(c) Any dilution of wastewater with supply water.

31. Hydraulic, organic, nutrient and salt balances for any wastewater disposal areas must be determined.

32. Details of any catch drains to be provided to convey contaminated stormwater within the controlled drainage area/irrigation areas and other wastewater to the reticulation system.

33. Details of any proposed tailwater recirculation system to be provided.

34. Estimated average and maximum volumes of liquid to be irrigated in kilolitres/day.

34. Details of the anticipated hours of operation of irrigation equipment.

35. The proposed means of transporting the wastewater to the disposal site, and any measures (such as visual or audible alarms) to be put in place to minimise the potential for pollution in the event of any spillage of same.

36. The monitoring program proposed for the wastewater reuse site.

ATTACHMENT NO. 4

Issues Raised by Other Relevant Authorities

- Department of Land & Water Conservation
- Roads & Traffic Authority
- Murrumbidgee Irrigation
- Griffith City Council
- NSW Agriculture

LAND & WATER CONSERVATION

Geoff Noonan, Director
Development and Infrastructure Assessment
Department of Urban Affairs and Planning
GPO Box 3927
SYDNEY NSW 2000

Our File: 93/C3211

3 February 2000

Dear Sir

Re: Proposed Food Processing Plant – Parle Foods, Griffith

At the Planning Focus Meeting held at Griffith City Council Chambers on 2 February 2000 it was agreed that agencies would forward to you their requirements in regard to the Environmental Impact Statement (EIS).

Our Department requires that the EIS contains sufficient information to demonstrate that the plant and associated activities, such as effluent disposal, will not result in degradation of land or water, or unjustified loss of native vegetation.

The following issues should be addressed in the EIS:

Water Supply

The document should describe the water requirements for the development, and the proposed source of the water.

(We understand that the water will be obtained from Murrumbidgee Irrigation. A License under the Water Act from DLWC will therefore not be required.)

Proximity to Water Courses / Waterbodies

The document should describe the location of the proposed development in relation to drainage lines, watercourses, wetlands, etc. (A map would be useful for this.) Whether or not the development site is subject to flooding should be mentioned.

The likelihood and significance of runoff from the factory area or effluent storage / disposal areas entering natural water bodies should be discussed.

Groundwater

The existing groundwater conditions (ie depth and nature of aquifers, and quality of the groundwater) in the vicinity of the development should be described. (Our Groundwater Manager, Scott Lawson, can provide information / advice on this issue. He is based at our Leeton Office.)

The EIS should consider the likelihood of the proposal (particularly the effluent disposal component) resulting in a rise in groundwater level, or in contamination of the groundwater. The likely magnitude of any impact, and its significance should be discussed. Any methods proposed to mitigate or monitor impacts should be described.

Waste / Effluent Management

The EIS should describe the nature and provide an estimate of the quantity of the wastes and / or effluent which will be generated. It should demonstrate how this will be disposed of (or used) in a sustainable manner, without off-site impacts.

Erosion and Sedimentation

The potential for erosion and sedimentation at the development site should be considered (taking into account such factors as; soil type, steepness and length of slope.)

The measures and design features which will be put into place to control erosion and sedimentation, both during construction and operation phases, should be described.

Native Vegetation

DLWC regulates the clearing of native vegetation in NSW under the Native Vegetation Conservation Act 1997 (NVCA). As this proposal is designated development, there is no requirement for an application for clearing (which is part of this development) to be made to our Department under the NVCA.

However, the details of any clearing should be included in the EIS. The clearing should be fully described in terms of plant species, numbers of plants and / or area to be cleared. A justification should be made of the need for the clearing, and an assessment should be included of the ecological impact of the clearing, including the impact on any Threatened Species or their habitats.

Crown Land

Consideration should be given to whether the development impinges on or affects any Crown Land, including Crown Roads. (If any Crown Land is likely to be affected, our Land NSW Office in Griffith should be consulted.)

I would be happy to provide further explanation of the above if required.

Yours faithfully

P. E. G

Phil Green
Environmental Officer
for
Regional Director, Murrumbidgee

503.5351
Kerry Crisp
☎(02) 6938 1147

The Director
Department of Urban Affairs and Planning
GPO Box 3927
SYDNEY NSW 2001

Attention: Mr Geoff Noonan

Roads and Traffic Authority
www.rta.nsw.gov.au

South Western Regional Office
1 Simmons Street
Wagga Wagga NSW 2650
Telephone (02) 6938 1111
Facsimile (02) 6938 1183
PO Box 484
Wagga Wagga NSW 2650

PLANNING FOCUS MEETING – PROPOSED FOOD PROCESSING PLANT – LOT 1059, DP 751686, PT 77 MILLIS ROAD, WILLBRIGGIE

Dear Sir

This letter is to confirm the Authority's requirements regarding the proposed development as discussed at a Planning Focus meeting held 2 February 2000. The Authority would request that a Traffic Impact Study be completed in accordance with section two of the Authority's publication 'Guide to Traffic Generating Developments'.

The Authority would expect the EIS to address the overall traffic impacts of the development and include reference to:

- access
- type and volume of traffic
- hours of operation
- peak traffic movements and the time of day these would occur
- impact on road and intersection capacity and safety
- traffic noise and dust effects
- internal traffic arrangements

Any required roadworks such as:

- sealing from the edge of the roadway to the boundary
- width of access to be a minimum 10 to 12 metres
- type 'AUR' right turn treatment for the intersection of Crawford Road and Main Road 321 (Kidman Way)
- acceleration and deceleration lanes should be constructed to Council's standards and indicated in the EIS.

The possibility of expansion of the facility and the likely effect of this should also be addressed.

Under section 138(1) of the Roads Act 1993 the developer will need to lodge an application with Council for consent to undertake the roadworks required for this development. Council may not give its consent except with the concurrence of the RTA in accordance with Section 138(2) of the Roads Act 1993.

Yours faithfully

C E Blomfield

C E Blomfield
Regional Manager

22 FEB 2000

MURRUMBIDGEE IRRIGATION

ABN 084 943 037

MURRUMBIDGEE IRRIGATION

DEVELOPMENT & INFRASTRUCTURE ASSESSMENT

RECEIVED

22 FEB ...

Location	GRIFFITH
Contact Name	Lilian Parker
Our Reference	
Your Reference	

Department of Urban Affairs and Planning
Director Development and Infrastructure Assessment
Governor Macquarie Tower
1 Farrer Place
SYDNEY NSW 2000

FAXED 16/2/00

ATTENTION: GEOFF NOONAN

Dear Geoff

Proposed Food Processing Plant – Parle Foods, Willbriggie (Your Reference: S9901625)

While it is noted that extensive development has already occurred on the site the following issues will require addressing in the Environmental Impact Statement for the above proposal:

1. Irrigation options for waste water

Drainage from areas irrigated with waste water will not be accepted into the regional drainage system. Any integrated proposal for disposal of the effluent generated by the development must be reviewed by Murrumbidgee Irrigation. For example boundary plantings would have to be bunded and would need a buffer from any channel and drainage system.

Since the meeting we have received further information on the amount of water to be supplied to the processing plant. This amount does not correlate with the level of discharge stated during the Planning Focus Meeting, so the levels of discharge need to be detailed in the EIS.

2. Stormwater disposal options

Stormwater from hard surfaced areas is not accepted into the regional drainage system at rates of flow volume and quality above predevelopment levels. Therefore, detention basins may be required if this water is not captured and reused. Under the Murrumbidgee Irrigation EPA licence any drainage that is or may be contaminated by hazardous or agricultural chemicals (including pesticides, herbicides, fertilisers, organic matter) will not be accepted into the regional drainage scheme so specific bunding and contingency plans are required for any chemicals housed or used on site.

Dunn Avenue, P.O. Box 519
LEETON NSW 2705
Telephone (02) 6953 0100 Fax (02) 6953 0197

462 - 468 Banna Avenue, P.O. Box 492
GRIFFITH NSW 2680
Telephone (02) 6962 0200 Fax (02) 6962 0209

3. Groundwater issues

Water application rates and effluent disposal must not produce further seepage to or contamination of groundwater. No subsurface drainage, including, for example, subsurface drainage of the freezer facilities, will be accepted into the regional drainage system. Evaporative disposal systems may be required.

4. Water supply

Arrangements and agreements for supply of water may change for an industrial development. The developer should note that supply from the irrigation system is not continuous throughout the year and there is no guarantee of the quality of water. Transfer of water to other sites would be subject to Murrumbidgee Irrigation's application and approval process.

Yours faithfully

Lilian Parker

Lilian Parker
Environmental Services Manager

16 February 2000

c.c. Tony Parle

Griffith City Council
progress with pride

DEVELOPMENT & INFRASTRUCTURE ASSESSMENT
RECEIVED
2 FEB 2000

436:Lot 1059, DP 751686
KT:WK

In reply quote: Kelly Tyson
☎ (02) 69 620 146
Enquiries to: Monday – Friday
8.30 am – 4.30 pm

18 February 2000

Director
Development & Infrastructure Assessment
Department Urban Affairs & Planning
GPO Box 3927
SYDNEY NSW 2001

Attention: Geoff Noonan

Dear Geoff

Thank you for your letter of 4 February received by Council on 14 February 2000.

The matters which Council would like to see addressed in the EIS are:-

1. Description of the biophysical environment.
2. The social and economic impact of the proposal, particularly for the local community.
3. The means of managing waste disposal. This should include where relevant, details of research undertaken, scientific analysis and proposed implementation regime for managing and monitoring the recommended systems.
4. Impact on the environment, particularly, noise, air, water and soils.
5. Transport and impact on the local road systems, identifying any future likely costs to Council.
6. Buffer distance requirements in view of development in the locality.
7. Proposed landscaping corridors and links (if possible) with vegetation in the locality, including recommended species. This needs to link in with effluent management.
8. Anticipated future development plan for the industry and designation of defined on-site building envelopes and defined buffer/landscape areas.

Yours faithfully

K TYSON
DEVELOPMENT PLANNING MANAGER

W:\Environmental Services\Development Planning Manager\General Correspondence\KT 000216 - DUAP re Lot 1059, DP 751686 - Proposed Food Processing Plant wk.doc

MURRUMBIDGEE IRRIGATION
A.C.N. 084 943 037

Location:	GRIFFITH
Contact Name:	Lilian Parker
Our Reference:	
Your Reference:	

11 May 2000

Mr Nigel Cates
Parle Foods
PO Box 545
GRIFFITH NSW 2680

Dear Nigel

PARLE FOODS PROCESSING PLANT

The water quality parameters which the licensing of the MIA is based upon are derived from ANZECC Water Quality Guidelines "Protection of Aquatic Ecosystem" levels. The Company's licensing also requires monitoring for a range of agricultural chemicals, some of which are used at significant levels on maize crops. Other irrigators within the MIA who grow maize and similar summer crops are being encouraged to develop recycling systems with storages to minimise discharges that are likely to be contaminated with agricultural chemicals.

The make up of the water for irrigation disposal is also of concern. Wash down wastewater from the proposed plant would need significant treatment for reuse (due to likely solids and organic matter). Other industries in the area are not permitted to discharge this type of effluent directly or indirectly to the MIA drainage system under the Company's present policy.

At this stage, your proposals to discharge would not meet the water quality guidelines under which this company is required to operate. I would be interested in discussing other integrated disposal options which could incorporate wood lots/evap basins/crops.

Yours sincerely

Lilian Parker

Lillian Parker
Environmental Services Manager
MURRUMBIDGEE IRRIGATION

Env.ESM.TM

Rural Lands Protection Board
Narrandera

Communications to be addressed to:
THE ADMINISTRATIVE OFFICER
P.O. Box 11, Narrandera 2700
Telephone (02) 6959 2322
Fax (02) 6959 3077

BOARD OFFICE
8 Bolton Street,
NARRANDERA 2700

17th March, 2000

Nigel Cates
PO Box 545
GRIFFITH NSW 2680

Dear Nigel,

Re: Parle Foods Processing Plant – Hanwood

We refer to your correspondence of 14/3/00 and advise that the above development should have no detrimental impacts on travelling stock.

The Kidman Way is a Travelling Stock Route but Crawford Road is not and is not usually used by the Board for walking stock.

Should you have any further inquiries, please contact me.

Yours faithfully

Chris Wills
Administrative Officer.

Our Ref: skc/DD
Phone: (02) 69512750
Fax: (02) 69557580

Yanco
Agricultural
Institute
NSW Agriculture

Private Mail Bag
YANCO NSW 2703

Telephone: (02) 69512611
Facsimile: (02) 69557580

21 February, 2000

Mr G Noonan
Director
Development and Infrastructure Assessment
GPO Box 3927
SYDNEY NSW 2001

Dear Geoff

Thank you for the opportunity to be involved in the Planning Focus Industry (PFM) concerning the proposed Parle Foods Processing Plant at Willbriggee.

It certainly is an imaginative project which might compliment the areas acknowledged agricultural productivity.

The future specific interests of NSW Agriculture were difficult to determine at the PFM due to the uncertainty of:

- whether to establish a commercial woodlot?
- whether to establish perimeter windbreaking?
- whether the effluent was suitable for permanent horticultural plantings?
- unknown type, volume and composition of solid wastes?
- undetermined management of the recently acquired holdings not impacted by construction works
- unknown possibilities of additional waste processing with the neighbouring poultry enterprise etc

All of the above possibilities appear feasible, (at this stage) with the eventual proposal needing to be substituted with data and reasoning.

Attached to this letter is a generic document outlining the Departments general requirements relating to large scale irrigation developments.

The details will have relevance in identifying issues requiring clarification once management has determined more specifically how they will manage solid and liquid wastes.

Other options not discussed on the day include composting, recycling and disposal via evaporation.

NSW Agriculture expertise covers all agronomic matters involving soil, water, plant, nutrient and pest management.

During the PFM discussions I raised the future likelihood of fruit and vegetable importations. This action may have quarantine implications and may require consent under proclaimation provisions from the Chief, Plant Industries, NSW Agriculture. Obviously determination of such actions could involve a significant lead time so early consideration is recommended.

Further contact on this matter should be to Mr Bob Paton NSW Agriculture Locked Bag 21 Orange 2800, 02 63913 153.

The issue of fruit and vegetable waste being utilized as stock feed is initially appealing. However caution is needed considering recent difficulties associated with chemical residues. As with quarantine the issue of waste feeding to livestock should be clarified and protocols developed to reduce future problems.

Further enquiries should be to Mr Graeme Williamson, Wollongbar Agricultural Institute, Wollongbar 2477, 02 6624 0200.

If the Department can be of assistance in those areas of our specific expertise please do not hesitate to contact me on 02 69512 750.

Yours sincerely

David Davis

David Davis
Agricultural Environment Officer

NSW Agriculture Interests Regarding Environmental Impact and Protection in Preparation for Large Scale Irrigation Developments

The primary concern of NSW Agriculture is that preliminary documentation addresses all the issues in the first instance. This will give the greatest opportunity for success Ommissions simply result in unnecessary delay and frustration.

The following issues require detailed consideration. Some are also of concern to other government agencies:

- Irrigation layout
- Agronomic considerations
- Buffering
- Impact on waterways (ephemeral, perennial, wetlands, underground)
- Travelling stockroutes and reserves
- Environmental monitoring procedures
- Property Management Plan.

Irrigation Layout

The proposed landforming detail should be quantified and include a plan containing all aspects of irrigation application and drainage characteristics.

This would presumably be completed by experienced industry personnel.

Agronomic Considerations

The Department's primary concern is that the development is sustainable in the long term and that it has a minimum negative impact on surrounding landholders and the environment. The adoption of industry "best management" practices is required to ensure sustainability of the system and to prevent contamination of surface or sub-surface waters:

Soil Testing

- A program of soil testing and description should be undertaken for the site. Details of the types of tests required and areas to be tested are specified in Appendix I to this attachment The results of the tests carried out should be included as an Appendix and the data interpreted in the main body of the document. A soil map based on the test results should be included to facilitate the interpretation offered.

- An assessment of the soils should be made describing their suitability for the development. This should relate to their suitability for; irrigated cropping to utilise applied nutrients, constructing holding ponds and other associated works.

Crop Rotations

- The documentation detail crop/pasture rotation for all areas being intensively utilised.

Nutrient Balances

- A nutrient budget should be provided which details levels of applied nutrients (particularly nitrogen, phosphorus and potassium) from all sources and balances these against nutrients removed by harvesting of the crops/pastures in the rotation. If a balance between applied nutrients and crop uptakes is not achievable the likely impact on the soil, future plant growth and surface and groundwater quality will need to be addressed.

Salinity and Sodicity

- An assessment of the impact of the salinity and sodicity of the effluent should be made, including: an assessment of the need to dilute groundwater (or recycled water) to achieve acceptable salinity and sodicity levels for irrigation and, discussion of the effect of any build up of soil salinity and sodicity over time arising from the development. Leaching or run off of salts from the irrigated areas should be known.

Irrigation Methods

The application rate should be based on the moisture utilisation by the proposed crop or pasture (irrigation scheduling) and should not rely on percolation to groundwater to achieve a balance.

- The application method should be described (eg centre pivot vs lateral spray vs flood irrigation).
- The availability of suitable and sufficient water for crop irrigation and effluent dilution should be addressed.
- The mean rates and timing of any organic manure spreading and incorporation should be stated.

Buffering

Legislative responsibility for issues such as odour, noise, dust, etc. lie with other agencies. However, the Department encourages early consultation with neighbours to help allay concerns. Neighbours can also offer valuable insight into specific location issues that may need to be addressed by the proponents. The impact of the development on surrounding landuse options should be addressed.

Set back provisions should occur next to major thoroughfares, irrigation supply channels neighbouring dwellings etc.

The Pesticides Act specifically requires consent to aerially applying pesticides from residences within 150m of the target area.

Impact on Waterways

Consideration must be given to the potential for pollution of groundwater or surface water. Choice of the site is critical to ensure it is located away from flood prone areas or drainage lines that will result in pollution of streams affecting native terrestrial and aquatic habitat and water quality. The Department of ~~Water Resources~~ Land and Water Conservation and Environment Protection Authority have legislative control with these matters. Should there be any potential adverse impact on waterways, wetlands, or other fisheries habitat, measures to protect those areas from pollution should be addressed and NSW Fisheries consulted.

Travelling Stock Routes and Reserves

Should any proposals have implications for Travelling Stock Routes and Reserves, the appropriate Rural Lands Protection Board should be contacted.

Environmental Monitoring Procedures

The Development Application should address all aspects of site management and monitoring. It should also establish baseline data for environmental monitoring. Any management program will require sufficient knowledge of the soil and agronomic aspects to support a sound monitoring program able to detect any pollution of ground or surface waters and to ensure sustainable agricultural production. The proposed monitoring program should be stated.

NSW Agriculture is particularly concerned about soil degradation. The soil testing program attached as Appendix I will enable an assessment to be made of all soils. This will provide base resource information upon which to compare future readings. The approach is necessary to provide an early warning of potential problems and an indication of the sustainability or otherwise of water storage and management.

Property Management Plan

The development of a whole property plan will provide a practical means for implementation of all the above strategies. It will also serve as a tool to ensure continuity and uniformity of management practices in the likelihood of staff changes during the lifespan of the development. Much of the agronomic issues raised earlier will comprise a major part of the plan.

APPENDIX I - Soil Testing Program

For Irrigation Paddocks

One composite surface sample collected from either 0 to 7.5 cm or 0 to 15 cm per management unit (ie, areas receiving different treatments) and per soil type (if differences occur within management units). If soil type and management units are uniform within a paddock then one sample per paddock is adequate. Composite samples are to comprise 30 to 40 individual cores bulked together, air dried and sieved to pass a 2 mm sieve.

Chemical analysis is to be undertaken to determine:

- pH ($CaCl_2$)
- Exchangeable cations
- Salinity as EC 1:5
- Available phosphorus and phosphorus sorption
- Total nitrogen, nitrate
- Organic carbon
- Total potassium

A field test is to be undertaken to determine:

- Porosity or bulk density
- Surface characteristics (eg hard setting, cracking or self mulching)
- Colour (eg red brown grey etc)
- Texture
- Infiltration rates (using a disc permeameter or other acceptable procedure):

One profile sample is to be taken for each management unit, soil type or paddock, as described above. Depths will vary depending on soil conditions (at least 3 depths to be sampled).

Chemical analysis is to be undertaken to determine:

- pH ($CaCl_2$)
- Exchangeable cations
- Salinity as EC 1:5
- Total nitrogen
- Organic carbon

Physical analysis to be undertaken to determine:

- Soil texture
- Porosity or bulk density
- Colour
- Infiltration rate
- % dispersion

For Areas Where Storage Dams and other Structures are Proposed

Profile samples only are required and should be carried out for physical properties only

The suitability of soils for adequate "sealing" can then be assessed.

Parle Foods PFM
Griffith : 2 February 2000

Attendees

Sitwinder Sandhu	Griffith City Council
Kelly Tyson	Griffith City Council
Brent McAlister	Griffith City Council
Melissa Daniher	EPA
Phil Green	Dept. of Land & Water Conservation
Kerry Crispe	RTA
David Davis	NSW Agriculture
Phil Horwell	FreightCorp
Jim Grant	Dept. of State & Regional Development
Brian Dance	Parle Foods P/L
Tony Edwards	Coffey Geosciences P/L
Lilian Parker	Murray Irrigation Area
Garry Williams	Great Southern Energy
Tim Grant	Depart. of State & Regional Development
Chris Blake	Freight Corp

General

- Geoff Noonan explained in general terms why the project was classified as a SEPP 34 development and then the procedures that would need to be followed to have the project approved.

- Brian Dance representing Parle Foods then gave the meeting an overview of the company's background and the proposed new development.

- Griffith City Council noted that the Stage 1 development had been approved as a storage shed.

- To facilitate timely processing of the development application DUAP scheduled authority submissions to be due by 18 February 2000.

Water Management

- Murrumbidgee Irrigation Authority will write a contract with Parle to supply its water entitlements.

- MIA noted that there would not be a continuous supply available in the channel all year and hence there would probably be a need for an onsite storage.

- MIA wants site bunded to prevent surface run-off entering its agricultural drains.

- Parle purchased two previous rice farms that had extraction licences. The water available far exceeds Parle's needs. They expect to divert the surplus water to their proposed peach farms.

- MIA to issue a letter confirming their position.

- Some water inflows to the site will need to be treated to potable standard.

Waste Management

- Effluent disposal will need to be tightly managed. It will have varying levels of salinity and BOD, both of which could be quite high at times.

- Parle proposes to apply treated effluent to land. CSIRO has been commissioned to design an application regime that will not ruin the soil or underlying ground water
  : this will be difficult. This aspect will need to be managed very tightly by Parle through the life of the operations because of the high sensitivity of the area and the likelihood of severe and permanent impacts.

- EPA will provide requirements for this in their GTA. They will cover it in their licences.

Conservation Issues

- Parle is to have a survey conducted for native vegetation
  . : because proposal is designated, separate approval under the *Native Vegetation Conservation Act 1997* will not be required. DLWC will comment on native vegetation issues in their submission to the EIS.

- Parle is to do an archaeological survey of the site
  : unknown if there are artefacts etc of interest.

- A feature of the proposal is the application of effluent to an artificial woodlot on their site, but there is no design of a woodlot available yet
  : this decision is critical ÷ the site is saline and siting will influence potential harvesting (note: need to take account of new plantation management legislation if commercial harvesting is an option).

  : nutrient and carbon balancing for this will need to take account of the possible reuse of the organic solid wastes as well. Parle proposes to compost the solids and spread them on the trees.

- DLWC raised concerns with soil sustainability under wastewater irrigation.

- NPWS had indicated they saw no issues arising regarding threatened species.

Amenity Issues

Parle Foods PFM
Griffith : 2 February 2000

There are two properties in the vicinity.

- One is Barter Chickens who create their own dust noise and odours. Also, claimed to work closely with Parle.

- Other is a residence in Crawford Drive who could be impacted. Parle has not yet spoken to them but will (and confirm the owner/occupier status etc).

- Impacts on these residences from trucks, noise, dust, and odour associated with the factory needs to be addressed.

- Factory operations will be 24 hours and noisy (eg handling of cans). Site is remote so no problems are likely so long as other occupants don't move into the area in future).

Transport

- RTA will write to specify a range of management requirements for the 3-4 roads in the activity area. Millis Road to be closed off for heavy transport.

- Council has no roads plan, so will defer to RTA.

- Council will pay to seal Crawford Drive up to the point where the trucks will turn-off into Parle (but not up to the residents mentioned above). Council will not be looking for financial contributions from the Company.

Heritage

Parle is considering dismantling the historic Letona SPC building in Leeton and relocating it to their new site. Does this raise heritage issues for the Leeton Council?

Geoff Noonan
3/2/00

\\FS7_GMT\DATA\GROUP\mah\Geoff\Parle Food notes.doc

NSW
NATIONAL
PARKS AND
WILDLIFE
SERVICE

A P Edwards
Manager
Coffey Geosciences Pty. Ltd.
PO Box 803
ALBURY NSW 2640

Our reference: 97/261
Your reference:

Enquires: Liz Mazzer
Phone: (02) 6883 5325

1st March 2000

Dear Sir,

RE Proposed Parle Foods Processing Plant, Farm 1059, Millis Road, Willbriggie via Griffith, NSW

Thankyou for giving the NPWS an opportunity to comment on the Environmental Impact Statement for the above proposal. Please accept our apologies, for the delay in our response.

While the Service has no detailed comment to make on the proposal at this stage, NPWS recognises that you intend to plant screening vegetation, and recommends that a diversity of local native vegetation be used. Secondly it would be preferable if effluent and water storage ponds could be made suitable for wildlife, rather than just the standard shapes and underwater slopes.

A copy of the Service's Environmental Assessment Guidelines for flora, fauna and cultural heritage are attached for your information. The guidelines are designed for environmental impact assessment documents and therefore their content is relevant to the EIS. They address requirements under the *Environmental Planning and Assessment Act* (1979) and the Service's areas of responsibility (eg. flora, fauna, cultural heritage and threatened species, populations and ecological communities and their habitats).

Should you require further information please contact Liz Mazzer, Environmental Planning Officer, on (02) 6883 5325.

Yours sincerely,

Liz Mazzer
Environmental Planning Officer
WESTERN ZONE

Western Directorate
Level 1
48-52 Wingewarra St
Dubbo NSW
PO Box 2111
Dubbo NSW 2830
Fax: (02) 6884 8675
Tel: (02) 6883 5330

Head Office
43 Bridge Street
Hurstville NSW
Australia
PO Box 1967
Hurstville 2220
Fax: (02) 9585 6555
Tel: (02) 9585 6444

ENVIRONMENTAL ASSESSMENT GUIDELINES FLORA AND FAUNA

INTRODUCTION

The Environmental Planning and Assessment Act (1979) requires that proponents of a development/activity and the Consent / Determining Authorities adequately assess the impact of a development or activity in any Environmental Impact Assessment (EIA) documents. These EIA documents include:

- Statement of Environmental Effects (SoEE), or
- Review of Environmental Factors (REF), or
- Environmental Impact Statement (EIS).

These are introductory, generic specifications of the National Parks and Wildlife Service (NPWS) for an adequate assessment of the impacts of a development proposal on native flora and fauna (ie including protected and threatened species). However, the Service recognises that the scale and complexity of the project will to some extent, dictate the level of information that is required to address the questions posed below. Consequently, flora and fauna assessments need to be tailored to suit the proposal. For example, a development which is proposed on land which has already been totally (or substantially) cleared should address the issues raised below but the amount of work required to address these issues may be substantially less than if the area comprised undisturbed bushland and, therefore, of more significant wildlife habitat value. A preliminary assessment, including a desktop investigation and a preliminary site inspection, may indicate the need for a detailed survey of the site.

Aboriginal cultural heritage and archaeological sites may still be present on substantially disturbed areas and appropriate assessment of these is required. (Please refer to separate Cultural Heritage Assessment Guidelines included.)

It is up to the proponent (and later the consent and/or determining authorities after appropriate consultation) to determine the detail and comprehensiveness of assessment required to form legally defensible conclusions regarding the impact of the proposal. The scale and intensity of the proposed development should dictate the detail of investigation.

It is important that all conclusions are supported by adequate data and that these data are clearly presented in EIA documentation.

ENVIRONMENTAL ASSESSMENT GUIDELINES CULTURAL HERITAGE

Aboriginal sites are widespread throughout New South Wales. There is considerable regional variation in the types of sites, their age, their contents and how they are situated on the landscape. It is important that these sites are conserved as fragile and irreplaceable Aboriginal heritage. In some cases there is Aboriginal oral tradition concerning specially significant sites or landscape features

The National Parks and Wildlife Service has a statutory role in the protection and preservation of Aboriginal sites. This includes reviewing and assessing the Aboriginal cultural and archaeological aspects of environmental studies, as well as a regulatory role in their impact or destruction.

The EIS or other environmental assessment should consider Aboriginal cultural heritage, even if the area is disturbed in some way. The EIS should consider:

- Accessing the Service's Aboriginal Sites Register in the initial planning stage. This is to determine if there are any already known sites which will require protection, or a Consent to Destroy (see below). The Register is not a conclusive indicator of the likelyhood of sites that may exist in the development area. The Register of Aboriginal Sites is available from the NPWS, Register Officer (02) 9585 6471. A routine search with map coordinates provided will cost $30.00, a larger search will cost $80.00/hour.

- The Aboriginal community (Local Aboriginal Land Council in the first instance) needs to be consulted so that they can be advised that there may be impact to sites relevant to their heritage. There also may be knowledge in the community about sites in the development area, particularly those related to oral tradition. This process of Aboriginal consultation should be maintained throughout the entire EIS procedure.

- An assessment of the need for an archaeological survey, and if so, to what level of detail. This should be defined by a study plan or research design. In most cases, an on-the-ground systematic archaeological investigation will be needed. If there is a likelihood of

SEPP No. 44 - Koala Habitat Protection

The Shire may be listed in Schedule 1 of SEPP No. 44 - Koala Habitat Protection. If so, the requirements of the SEPP regarding Koala habitat protection should be considered by the proponents.

THREATENED SPECIES OF FAUNA AND FLORA

Apart from the need to consider the impact on protected species, the proponents will need to address the requirements of legislation that currently governs threatened species protection and impact assessment in NSW.

Attached is an information package on the Threatened Species Conservation Act (1995). The proponents will need to consider the provisions of this Act.

If during the flora or fauna assessment or survey, threatened species are **found** or are **likely** to occur in the area, the proponents must undertake an "Eight Part Test of Significance" as outlined in the new section 5A of the EP&A Act (as amended by the TSC Act) to determine whether or not the development would be likely to have a significant impact upon threatened species.

If, after having addressed Section 5A, the assessment concludes that there is likely to be a significant impact to threatened species then the proponents will need to furnish a Species Impact Statement (SIS) to the Director-General of NPWS, in accordance with any formal requirements which she might deem appropriate, in this case. The proponent (not the consultant) must write to the Director General for such requirements.

Methods to reduce the impact on the protected and threatened species should be considered fully.

The Service advises that conducting an 'Eight Part Test' or a SIS according to the provisions of the EP&A Act and the TSC Act is a complex task and should be undertaken by suitably qualified person(s).

Eight Part Test

The '8 part test' is a statutory mechanism which allows decision makers to assess whether a proposed development or activity is likely to have a significant effect on threatened species, populations or ecological communities, or their habitats.

The '8 part test' is contained within section 5A of the EP&A Act and consists of eight factors which need to be addressed for informed decisions to be made regarding the effect of a proposed development or activity on threatened species, populations or ecological communities, or their habitats.

An information circular is available from the Western Zone for detailed information about the '8 part test".

Report Requirements

The EIA documentation should include a report on the flora which includes the following:

- detailed location map and identification of the area surveyed (including the location of photographs, transects, areas of significance etc),
- at least one of the following: a land satellite image, vegetation communities map, aerial photograph, or a remnant vegetation map,
- a complete plant list (including scientific names of those plants) of all tree, shrub, ground cover and aquatic species, categorised according to country of origin (ie., native *vs* exotic),
- a detailed description of vegetation structure (in terms of a scientifically accepted classification system) and spatial distribution (i.e. plant densities and patterning) on the site, including a vegetation map,
- describe the condition and integrity of the vegetation including a description of any past disturbance,
- an account of the likely original vegetation communities (pre-, or at early settlement), and an assessment of the likely regional distribution of the original communities,
- an assessment of whether the plant communities are adequately represented in conservation reserves or otherwise protected,
- an account of the hydrology of the area and how this relates to the dynamics of the vegetation communities,
- a list of **known** and **likely** threatened species as listed under Schedules 1 & 2 (Threatened Species Conservation Act 1995) which might occur at the site. The NPWS database needs to be accessed and the likelihood of occurrence of threatened flora species determined,
- an assessment of the impacts of the proposal on flora, on-site and off-site (eg siltation, water availability or drainage changes) and measures to mitigate these impacts,
- an assessment of the significance of the impact of the development at both the site and at the regional scale,
- a detailed rehabilitation/management plan including a list of the plant species to be used during rehabilitation (if required),
- detail methodologies used and a list of the reference literature cited, and
- any other issues that may be considered relevant.

The above guidelines will provide some data for the "Eight Part Test of Significance" required for threatened flora and fauna under Section 5a of the EP&A Act or an application made to clear native vegetation under the Native Vegetation Conservation Act (1997). However the above relates mostly to the specific environmental assessment processes under the EP&A Act and does not constitute an "Eight Part Test of Significance".

Native Vegetation Conservation Act (1997)

The Service suggests that the proponents should also consider the provisions of the Native Vegetation Conservation Act (1997). The proposal may require the consent of the Director General of Land and Water Conservation.

APPENDIX B

Coffey Geosciences Pty Ltd – Air Quality Assessment

PARLE FOODS PTY LTD

PROPOSED FOOD PROCESSING PLANT, FARM 1059

WILLBRIGGIE, NSW

AWL6615/1

9 April, 2000

AWL6615/1 AS:MH
9 April, 2000

PARLE FOODS PTY LTD
Farm 1059
GRIFFITH NSW 2680

Attention: Mr Anthony Parle

Dear Sir,

RE: PROPOSED FOOD PROCESSING PLANT, FARM 1059 WILLBRIGGIE, NSW

This report presents our air quality assessment as part of an Environmental Impact Study being carried out for the above project. Three copies of the report are provided for your information.

If you have any questions related to the report or we can be of further assistance, please do not hesitate to contact the undersigned.

For and on behalf of
COFFEY GEOSCIENCES PTY LTD

ANTHONY STUART
ENVIRONMENTAL SCIENTIST
Bach of Agr Science, GradDip EnvMgt

Unit 1/151 Wytarra Drive
North Albury NSW 2640 Australia
PO Box 803 Albury NSW 2640 Australia
Telephone +61 2 6040 3847
Facsimile +61 2 6040 3861
Email albury@coffey.com.au

1. INTRODUCTION

This report details an assessment of air quality and greenhouse impacts from the proposed food processing plant to be constructed on Farm 1059 at Willbriggie, NSW. The assessment has been undertaken by Coffey Geosciences Pty Ltd (Coffey) on behalf of the proponent, Parle Foods Pty Ltd (Parle).

The tasks undertaken as part of the assessment were:

- Estimation of gaseous emissions (greenhouse and criteria pollutants) from the burner and heat plant with consideration of recent plant test results for an operationally similar plant operated by Parle in the region;
- Assessment of potential dust sources during plant construction and operation;
- Description of air pollution control equipment and operational procedures to minimise air quality impacts;

This EIS was based on the requirements of the Department of Urban Affairs and Planning (DUAP) and the Environment Protection Authority of NSW (EPANSW).

2. EXISTING AIR QUALITY

There are no air quality monitoring stations operated in the Griffith region and background air quality data are therefore not available. It is expected that the population and industrial base in the area is not large enough to produce significant regional air quality problems, although there is likely to be potential for localised elevated levels of air pollutants occurring, for example, in the vicinity of major roads in the region.

With regard to odours, there have been occasional complaints made by Hanwood residents to Griffith City Council (GCC) in the past (Mr M. Hebold, GCC, personal communication, 2000). These complaints may relate to the Bartter Enterprises poultry operation, which is located approximately 2 kilometres from the site of the proposed Parle plant.

3. PROPOSED OPERATION

It is estimated that up to 200,000 tonnes of produce would be processed at the plant at peak capacity. Processed and packaged product would be in the form of drums, retail packs and cans. Raw produce and final products would be transferred to and from the site via road trains.

The processing factory is expected to have three natural gas fired boilers to provide energy for cooling and heating. Based on the boiler configuration at the proponent's existing processing plant in Griffith, it is assumed that the boiler sizes would be 5 megawatts (MW), 10 MW and 15 MW. These boilers would operate 24 hours each day, 350 days per year. Hourly natural gas consumption for the three boilers is assumed to be 22500 MJ (5 MW), 45000 MJ (15 MW) and 67500 MJ (15 MW).

Wastewater from food processing will be treated and re-used to irrigate commercial tree crops established at the site. Waste soil from vegetable processing would be stockpiled and used as fertiliser and soil conditioner.

4. CRITERIA AIR POLLUTANTS

The major source of air pollutants is expected to be boiler and heat plant operation. The energy source for these plant items will be a natural gas. Products of combustion will include the criteria pollutants sulphur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), volatile organic compounds (VOC) and particulate matter (PM). Natural gas is a relatively clean burning fuel and the substances NO_2 and CO are emitted in the largest quantities. The low sulphur content of natural gas supplied to the area (estimated to be 0.00063% by weight) means that SO_2 emissions from boiler operation are not considered to be significant.

Smaller potential sources of criteria pollutants would be fuel storage tanks, forklift operation and transport truck movements. Emissions from these sources are expected to be relatively small in magnitude and have not been inventoried in this study. Storage tanks would be regularly tested for leaks.

The results of boiler and stack testing undertaken by Tomlinson Boilers (Attachment A) were used to estimate emission rates of SO_2, NO_2 and CO. A summary of emissions data is presented in Table 1. Note that the range in mass emission rates refers to the difference in emissions between the small (5 MW) and large (15 MW) boilers.

TABLE 1. STACK EMISSIONS DATA

Pollutant	Flue Gas Concentration (ppm)	Mass Emission Rate (g/sec)	Exit Velocity (m/s)
SO_2	5	0.01 - 0.03	11.10
NO_2	30	0.06 - 0.15	11.10
CO	130	0.30 - 0.73	11.10

4.1 Particulate Matter

Emissions of PM from the boilers were estimated using emission factors recommended by the United States Environmental Protection Agency (USEPA, 1995), based on operation of the three boilers at full load and 80% efficiency. The parameters used in the calculations are presented in Table 2.

TABLE 2. STACK PARTICULATE EMISSION PARAMETERS

Parameter (unit)	Value
Hourly Energy Usage (MJ/hr)	135,000
Natural Gas Energy Content (MJ/m3)	38.8
PM Emission Factor (kg/106 m3)	219
PM Daily Emission (kg/day)	18.3
PM Mass Emission Rate (g/s)	0.21

The SPECIATE database (USEPA, 1993) reports that approximately 95% of the particulate matter emitted from natural gas fired boilers is less than 10μm.

Stack testing and boiler maintenance would be carried out on an annual basis to ensure proper operation.

4.2 Odour

It is expected that the most significant odour source would be food processing effluent, which may have a high Biological Oxygen Demand (BOD) and associated high odour-producing potential. The proponent intends to initially treat the effluent by mechanical screening and filtration to a level suitable for irrigation of commercial trees and crops to be grown on the site.

GCC have advised that there are some odour issues related to the operation of an existing food processing plant owned by the proponent. The odour issue relates to improper disposal of wastewater containing high levels of organic matter. Environmental management measures to be instigated for the proposed plant would include regular monitoring and auditing of treatment processes and rapid cleanup of spills and other mishaps.

4.3 Dispersion Modelling

4.4 Dispersion Modelling

Dispersion modelling of boiler stack emissions was undertaken using AUSPLUME for the pollutants NO_2 and CO. Model runs were done using the METSAMP screening file that is supplied with the AUSPLUME software. The screening procedure is based on a contrived artificial set of wind speeds, mixing heights and stability classes that span all those that could be reasonably expected to occur. Because of the conservative assumptions involved, the use of an artificial screening file is often sufficient to ensure that regulatory requirements are met. The screening simulation can only be carried out for averaging times of 1 hour or less.

The boiler stacks were modelled as three discrete sources in the centre of the site. Ground level concentrations were calculated at receptor locations up to 2 kilometres from the centre of the site. Other major assumptions used in the modelling are presented in Table 3 with the AUSPLUME output files included in Attachment B.

The proposed stack height of 18.5m has been assumed for the three boiler stacks. This height was calculated by Tomlinson Boilers (Attachment A) based on operation of the 15 MW boiler unit, using the methodology described in the Air Pollution Control Manual (CASANZ, 1990).

Effects of nearby buildings were modelled based on the dimensions of the processing shed (12.8m height and 200m width). These dimensions are consistent with a northerly wind carrying pollutants towards Farm 1060, which is the residence closest to the processing plant.

TABLE 3. AUSPLUME MODEL RUN ASSUMPTIONS

Parameter (unit)	**Boiler Size**		
	5 MW	**10 MW**	**15 MW**
Stack Height (m)	18.5	18.5	18.5
Exit Velocity (m/s)	11.1	11.1	11.1
Exhaust Flow (m3/sec)	3.025	7.25	10.875
Outlet Diameter (m)	0.58	0.8	1.25
Exit Temperature (degree C)	180	180	180
NO2 Emission Rate (g/sec)	0.06	0.15	0.22
CO Emission Rate (g/sec)	0.30	0.73	1.09

The air quality criteria used for comparison with modelled results are adopted from the National Environmental Protection Measure (NEPM) for ambient air quality (NEPC, 1998). The criteria are:

- CO - 9 ppm for averaging time of 8 hours;
- NO2 – 0.12 ppm for averaging time of 1 hour

The results of dispersion modelling of ground level concentrations under worst-case meteorological conditions are:

- CO – 0.08 ppm approximately 100 metres downwind of the boiler stacks (1 hour average);
- NO2 – 0.02 ppm approximately 100 metres downwind of the boiler stacks (1 hour average);

These results indicate that the boiler emissions would not have a significant impact on ambient air quality, assuming that background air quality is relatively good with limited potential for incremental air quality impacts. The calculated maximum ground level concentrations are well below the adopted air quality criteria and occur within the site boundary. Note that CO concentrations were conservatively estimated over an averaging period of one hour and compared with the 8 hour average.

Input and output data relating to the model runs are included in Attachment B.

4.5 Dust Control

Dust or particulate matter (PM) is generated by the action of mechanical apparatus and wind on exposed surfaces. Dust particles that are fine enough to remain suspended in the atmosphere constitute a health risk and have aesthetic effects such as reducing visibility. Larger particles that are deposited can reduce amenity of an area by soiling surfaces and materials. The amount of dust produced can vary significantly according to a number of factors such as wind speed, rainfall, surface moisture and temperature.

Construction activities will include building demolition and construction, pavement construction, removal of structures such as fences, vegetation clearance and excavation/earthworks. The main impacts of dust emissions on air quality generally occur during topsoil stripping and excavation/earthworks.

Dust control measures implemented during the construction phase would be:

- watering of working and haulage areas to suppress dust generation;
- establishment of vegetation on cleared areas to reduce wind erosion;
- phased approach to clearing areas to minimise wind erosion;
- cessation of construction activities under meteorological conditions which favour generation and transport of dust. (dry and windy conditions).

During operation of the plant, the main sources of dust and particulate emissions would be from truck movements travelling to and from the site, product handling and stockpiling of raw materials. Whilst it is considered that the emissions potential of these sources are not large enough to impact on adjacent areas, the following management practices would be instigated:

- paving of all access roads travelled by heavy vehicles;
- paving of product handling areas;

- covering or wetting of material stockpiles to prevent wind erosion. Such stockpiles would include soil waste from vegetable processing.

4.6 Environmental Monitoring

At the outset of the project, a baseline air quality monitoring exercise would be undertaken to assess background levels of SO2, NO2, CO and PM at the boundary of the site. The emission estimates of this EIS would be compared against the monitoring data to ensure that additional pollutant loadings caused by plant operation do not result in breaches of applicable air quality goals.

Monitoring of these parameters would also be undertaken in the same location on an annual basis once the plant is operating at full capacity. Monitoring data would be used to verify the emission estimates of this study. All monitoring data would be submitted to EPANSW for review.

Odour monitoring of the operational plant is not planned at this stage. It is recommended that Parle establish a community liaison group with the participation of Hanwood residents. _Liaison group representatives would provide a pathway to alert plant management of any odour issues. It is noted that Bartter Enterprises operation may be an existing odour source in the region and detailed odour sampling and analysis may be required to establish odour sources in the event of continuing odour complaints.

5. GREENHOUSE GAS EMISSIONS

Emissions of CO_2, CH_4 and N_20 from the burner and heat plant have been estimated using the Australian methodology recommended by the National Greenhouse Gas Inventory Committee (NGGIC, 1996). This method, endorsed by the Intergovernmental Panel on Climate Change (IPCC) involves the estimation of fuel consumption by each source and application of emission factors that relate the emission of greenhouse gas to the energy content of the fuel consumed. Greenhouse gas emissions from other sources such as transport trucks and forklifts are expected to be small in comparison with the boiler and heat plant and have not been estimated.

Emission factors for CO_2, CH_4 and N_20 for a natural gas fired industrial boiler are shown in Table 4. These emission factors, as used in the EIS, are currently recommended by NGGIC (1996) and are based on USEPA (1995) and IPCC (1995) data. The total carbon content of the fuel consumed is assigned to CO_2 emissions and solid products such as soot. Under operating conditions, however, a small proportion of the fuel carbon is released as CH_4, CO and other organic gases:-

TABLE 4

GREENHOUSE GAS EMISSION RATES FOR NATURAL GAS[a]

Compound	Emission Factor (kg/GJ)
CO_2	51.4
CH_4	0.0012
N_20	0.0001

a. NGGIC (1996)

Estimates of greenhouse gas emissions from the combustion of natural gas at the plant appear in Table 5. These are presented as mass emissions and as CO_2 equivalents that allow more meaningful comparison to be made between the greenhouse gases in relation to their relative effect on global warming. The global warming potential (GWP) of CH_4 and N_2O is expressed as a multiple of CO_2 equivalents and is reported to be 21 and 290 respectively (NGGIC, 1996).

TABLE 5

GREENHOUSE GAS EMISSIONS

Compound	Tonnes/year	CO_2 equiv. (tonnes)/year
CO_2	58454	58454
CH_4	1.36	29
N_20	0.11	33

Inventories of NSW greenhouse gas emissions established for 1988 and 1990 show total gross emissions of 202,000 and 212,000 Gg respectively. Linear extrapolation of these figures suggests that greenhouse emissions from the proposed plant would account for less than 0.03% of state emissions.

The proponent intends to establish a commercial tree plantation on the site, using treated wastewater for irrigation purposes. This represents an opportunity for carbon sequestration (carbon balancing) as carbon is taken from the atmosphere by plants through photosynthesis. Photosynthesis will exceed respiration in actively growing plants until maturity, which will result in the plantation acting as a net carbon sink. Carbon is known to comprise around 50% of the dry weight of plant biomass. The amount of carbon sequestered will depend on a range of factors, including climate, soil types, tree species and life cycle stage (AGO, 1999).

6. CONCLUSIONS

The conclusions of this study are:

- Air pollutant emissions resulting from normal plant operations are not expected to have a significant impact on ambient air quality in areas adjacent to the plant;
- The proposed air quality monitoring program will be used to verify that plant construction and operation does not degrade local air quality;
- Control of dust emissions will be achieved by wetting/covering of material stockpiles and paving of handling areas and access roads. Regular monitoring and auditing of wastewater treatment and disposal processes will be undertaken to ensure that the potential for odour impacts are minimised.

The limitations of this study are:

- The boiler and heat plant configuration is assumed to be the same as an existing operationally similar plant owned by the proponent. Detailed specifications for the proposed plant are not currently available;
- Possible odour impacts of the proposed plant have not been quantified. There are some current effluent odour issues at an existing plant operated by the proponent that is close to residential areas

(GCC, personal communication, 2000)

The recommendations of this study are:

- To review the EIS findings once the plant is operating to ensure that the assumptions made are reasonable
- To implement ongoing air quality monitoring, including community participation and reporting, to ensure compliance with air quality goals.

7. REFERENCES

AGO (1999) Discussion Paper 3 – Crediting the Carbon. Australian Greenhouse Office, Canberra.

CASANZ (1990) Air Pollution Control Manual. Clean Air Society of Australia and New Zealand.

IPCC (1995) IPCC Guidelines for National Greenhouse Gas Inventories: Volume 2, Greenhouse Gas Inventory Workbook..

NEPC (1998). National Environment Protection Measure for Ambient Air. National Environment Protection Council.

NGGIC (1996) Workbook for fuel combustion activities (stationary sources). Workbook 1.1. Revision 1. National Greenhouse Gas Inventory Committee, Dept of the Environment, Sport and Territories.

USEPA (1995) (and supplements) Compilation of Air Pollutant Emission Factors. Vol 1. Stationary Point and Area Sources. 5th Edition, Research Triangle Park, North Carolina, USA.

USEPA (1993) SPECIATE Data System.

For and on behalf of
COFFEY GEOSCIENCES PTY LTD

Per

ANTHONY STUART

TABLE OF CONTENTS

ATTACHMENT A

Tomlinson Boilers

81 WARREN ROAD, SMITHFIELD, NEW SOUTH WALES, 2164. PH: (02) 9681 4177 FAX: (02) 9681 1152
POSTAL ADDRESS: BOX 6648 WETHERILL PARK, NEW SOUTH WALES, 2164.

FACSIMILE TRANSMISSION

DATE:	2 May, 2000
COMPANY:	PARLE FOODS
ATTENTION:	MR. NIGEL GATES
FAX NO.:	6962 6874
FROM:	PETER RANKIN
RE:	EPA SUBMISSION & STACK HEIGHTS
NO. OF PAGES:	TWO

Nigel

After studying the EPA requirement you sent me it seems to me that there are only two items we have to take into consideration.

1. Fig. 3 uncorrected chimney height for natural gas fuel.
2. Building effects and terrain.

As the land is flat terrain should not come into the equation. Based on the 15000 kW boiler the uncorrected stack height is 12 metres adding the building effect I calculate this as follows:

$$h_t = Ah_c + Bh_b$$

$$ht = 0.76 \times 12 + 0.76 \times 12$$
$$= 9.12 + 9.12$$
$$= 18.24 \text{ metres}$$

Assume 18.5 metres

The diameters of the stack are 5000 kW = 580mm
10000 kW = 800mm
15000 kW = 1250 mm

Diameters based on stacks being guyed. If the stacks are to be self supporting the dia. will increase at the base

Revised EPA emissions attached

../2

Tomlinson Boilers

CONTINUATION

Please find below emission data for the boiler at Griffith NSW.

Boilers	Maxitherm 15000kw Watertube Tomlinson 5000kw Firefube Maxitherm 10000kw Watertube		
Fuel	Natural Gas		
Exhaust Gas Flow (at 180°C)	Maxitherm 15000kw - 10.675m³/sec Tomlinson 5000kw - 3.026m³/sec Maxitherm 10000kw - 7.250m³/sec		
NOX levels:	Typically 70 - 100 ppm corrected to 3% O_2		
Flue Gas Velocity.	11.1m/sec before efflux cone		
Typical (gas) Exhaust Detail (Composition (Dry Basis):	O_2	-	4.5% by volume
	CO_2	-	9.3% by volume
	N_2	-	86.2% by volume
Composition (Wet Basis):	O_2	-	3.7% by volume
	CO_2	-	7.7% by volume
	$H2O_2$	-	17.4% by volume
	N_2	-	71.2% by volume
Sulphur Content of Fuel:	0.00063% by weight		
Products of Combustion:	SO_2	-	3.5 mg/m3 of flue gas
	NO_2	-	0.020g./m3 of flue gas
	NO	-	0.20g/m3 of flue gas
	CO	-	0.10g/m3 of flue gas
	CH_4	-	0.002g/m3 of flue gas
Gas consumption at	at full load - Maxitherm 15000kw = 67500 MJ/Hr Tomlinson 5000kw = 22500 MJ/Hr Maxitherm 10000kw = 45000 MJ/Hr		

Regards

TOTAL P.03

ATTACHMENT B

Ausplume version 4.0

Parle Foods EIS - CO

Concentration or deposition	Concentration
Emission rate units	grams/second
Concentration units	microgram/m3
Units conversion factor	1.00E+06
Background concentration	0.00E+00
Terrain effects	None
Smooth stability class changes?	No
Other stability class adjustments ("urban modes")	None
Ignore building wake effects?	No
Decay coefficient (unless defined in met. file)	0.000
Anemometer height	10 m

DISPERSION CURVES

Horizontal dispersion curves for sources <100m high	Pasquill-Gifford
Vertical dispersion curves for sources <100m high	Pasquill-Gifford
Horizontal dispersion curves for sources >100m high	Briggs Rural
Vertical dispersion curves for sources >100m high	Briggs Rural
Enhance horizontal plume spreads for buoyancy?	Yes
Enhance vertical plume spreads for buoyancy?	Yes
Adjust horizontal P-G formulae for roughness height?	Yes
Adjust vertical P-G formulae for roughness height?	Yes
Roughness height	0.100m
Adjustment for wind directional shear	None

PLUME RISE OPTIONS

Gradual plume rise?	Yes
Stack-tip downwash included?	Yes
Building downwash algorithm:	Schulman-Scire
Entrainment coeff. for neutral & stable lapse rates	0.60,0.60
Partial penetration of elevated inversions?	No

Disregard temp. gradients in the hourly met. file? No

and in the absence of boundary-layer potential temperature gra
dients
given by the hourly met. file, a value from the following tabl
e
(in K/m) is used:

Wind Speed Category	Stability Class A	B	C	D	E	F
1	0.000	0.000	0.000	0.000	0.020	0.035
2	0.000	0.000	0.000	0.000	0.020	0.035
3	0.000	0.000	0.000	0.000	0.020	0.035
4	0.000	0.000	0.000	0.000	0.020	0.035
5	0.000	0.000	0.000	0.000	0.020	0.035
6	0.000	0.000	0.000	0.000	0.020	0.035

WIND SPEED CATEGORIES
Category boundaries (in m/s) are: 1.54, 3.09, 5.14, 8.23,
10.80

WIND PROFILE EXPONENTS
"Irwin Rural" values (unless defined in met. file)

AVERAGING TIMES
1 hour
8 hours

Parle Foods EIS - CO

SOURCE CHARACTERISTICS

Stack Source: s15000

X(m)	Y(m)	Ground Elev.	Stack Height	Diam.	Temp.	Speed
0	0	0m	19m	1.25m	180C	11.1m/s

______ Effective building dimensions (in metres) __
____

Wind dir. 10° 20° 30° 40° 50° 60° 70° 80° 90° 100° 1
10° 120°
Width 200.0200.0200.0200.0200.0200.0200.0200.0200.0200.020
0.0200.0
Height 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 1
2.8 12.8

Wind dir. 130° 140° 150° 160° 170° 180° 190° 200° 210° 220° 2
30° 240°
Width 200.0200.0200.0200.0200.0200.0200.0200.0200.0200.020
0.0200.0
Height 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 1
2.8 12.8

Wind dir. 250° 260° 270° 280° 290° 300° 310° 320° 330° 340° 3
50° 360°
Width 200.0200.0200.0200.0200.0200.0200.0200.0200.0200.020
0.0200.0
Height 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 1
2.8 12.8

(Constant) emission rate = 1.09E+00 grams/second
No gravitational settling or scavenging.

Stack Source: s5000

X(m)	Y(m)	Ground Elev.	Stack Height	Diam.	Temp.	Speed
0	0	0m	19m	0.58m	180C	11.1m/s

______ Effective building dimensions (in metres) __
____

Wind dir. 10° 20° 30° 40° 50° 60° 70° 80° 90° 100° 1
10° 120°
Width 200.0200.0200.0200.0200.0200.0200.0200.0200.0200.020
0.0200.0
Height 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 1
2.8 12.8

Wind dir. 130° 140° 150° 160° 170° 180° 190° 200° 210° 220° 2

30° 240°
Width 200.0200.0200.0200.0200.0200.0200.0200.0200.0200.020
0.0200.0
Height 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 1
2.8 12.8

Wind dir. 250° 260° 270° 280° 290° 300° 310° 320° 330° 340° 3
50° 360°
Width 200.0200.0200.0200.0200.0200.0200.0200.0200.0200.020
0.0200.0
Height 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 1
2.8 12.8

(Constant) emission rate = 3.03E-01 grams/second
No gravitational settling or scavenging.

Stack Source: s10000

X(m) Y(m) Ground Elev. Stack Height Diam. Temp. S
peed
0 0 0m 19m 0.80m 180C
11.1m/s

Effective building dimensions (in metres)

Wind dir. 10° 20° 30° 40° 50° 60° 70° 80° 90° 100° 1
10° 120°
Width 200.0200.0200.0200.0200.0200.0200.0200.0200.0200.020
0.0200.0
Height 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 1
2.8 12.8

Wind dir. 130° 140° 150° 160° 170° 180° 190° 200° 210° 220° 2
30° 240°
Width 200.0200.0200.0200.0200.0200.0200.0200.0200.0200.020
0.0200.0
Height 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 1
2.8 12.8

Wind dir. 250° 260° 270° 280° 290° 300° 310° 320° 330° 340° 3
50° 360°
Width 200.0200.0200.0200.0200.0200.0200.0200.0200.0200.020
0.0200.0
Height 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 1

2.8 12.8

(Constant) emission rate = 7.25E-01 grams/second
No gravitational settling or scavenging.

Parle Foods EIS - CO

RECEPTOR LOCATIONS

The Cartesian receptor grid has the following x-values (or eas
tings):

```
     0.m      50.m     100.m     150.m     200.m     250.m
 300.m
   350.m     400.m     450.m     500.m     550.m     600.m
 650.m
   700.m     750.m     800.m     850.m     900.m     950.m
1000.m
  1050.m    1100.m    1150.m    1200.m    1250.m    1300.m
1350.m
  1400.m    1450.m    1500.m    1550.m    1600.m    1650.m
1700.m
  1750.m    1800.m    1850.m    1900.m    1950.m    2000.m
```

and these y-values (or northings):

```
  -500.m    -450.m    -400.m    -350.m    -300.m    -250.m
-200.m
  -150.m    -100.m     -50.m       0.m      50.m     100.m
 150.m
   200.m     250.m     300.m     350.m     400.m     450.m
 500.m
```

Meteorological data file information:

"METSAMP" test meteorological file

---

1 Peak values for the 100 worst cases (in microgram/
m3)

Averaging time = 1 hour

Rank	Value	Time Recorded hour date	Coordinates (* denotes polar)
1	5.83E+01	06,01/01/00	(100, 0)
2	5.83E+01	06,03/01/00	(100, 0)
3	5.83E+01	16,04/01/00	(100, 0)
4	5.83E+01	02,06/01/00	(100, 0)
5	5.83E+01	12,07/01/00	(100, 0)
6	5.83E+01	22,08/01/00	(100, 0)
7	5.83E+01	08,10/01/00	(100, 0)
8	5.58E+01	13,01/01/00	(100, 0)
9	5.58E+01	13,03/01/00	(100, 0)
10	5.58E+01	23,04/01/00	(100, 0)
11	5.58E+01	09,06/01/00	(100, 0)
12	5.58E+01	19,07/01/00	(100, 0)
13	5.58E+01	05,09/01/00	(100, 0)
14	5.58E+01	15,10/01/00	(100, 0)
15	5.37E+01	12,01/01/00	(100, 0)
16	5.37E+01	12,03/01/00	(100, 0)
17	5.37E+01	22,04/01/00	(100, 0)
18	5.37E+01	08,06/01/00	(100, 0)

19	5.37E+01	18,07/01/00	(	100,
0)				
20	5.37E+01	04,09/01/00	(	100,
0)				
21	5.37E+01	14,10/01/00	(	100,
0)				
22	5.25E+01	05,01/01/00	(	100,
0)				
23	5.25E+01	05,03/01/00	(	100,
0)				
24	5.25E+01	15,04/01/00	(	100,
0)				
25	5.25E+01	01,06/01/00	(	100,
0)				
26	5.25E+01	11,07/01/00	(	100,
0)				
27	5.25E+01	21,08/01/00	(	100,
0)				
28	5.25E+01	07,10/01/00	(	100,
0)				
29	5.06E+01	05,02/01/00	(	150,
0)				
30	5.06E+01	05,04/01/00	(	150,
0)				
31	5.06E+01	15,05/01/00	(	150,
0)				
32	5.06E+01	01,07/01/00	(	150,
0)				
33	5.06E+01	11,08/01/00	(	150,
0)				
34	5.06E+01	21,09/01/00	(	150,
0)				
35	5.06E+01	07,11/01/00	(	150,
0)				
36	5.06E+01	19,11/01/00	(	150,
0)				
37	5.00E+01	04,02/01/00	(	150,
0)				
38	5.00E+01	04,04/01/00	(	150,
0)				
39	5.00E+01	14,05/01/00	(	150,
0)				
40	5.00E+01	24,06/01/00	(	150,
0)				
41	5.00E+01	10,08/01/00	(	150,
0)				

42	5.00E+01	20,09/01/00	(	150,
0)				
43	5.00E+01	06,11/01/00	(	150,
0)				
44	5.00E+01	18,11/01/00	(	150,
0)				
45	4.75E+01	06,02/01/00	(	150,
0)				
46	4.75E+01	06,04/01/00	(	150,
0)				
47	4.75E+01	16,05/01/00	(	150,
0)				
48	4.75E+01	02,07/01/00	(	150,
0)				
49	4.75E+01	12,08/01/00	(	150,
0)				
50	4.75E+01	22,09/01/00	(	150,
0)				
51	4.75E+01	08,11/01/00	(	150,
0)				
52	4.75E+01	20,11/01/00	(	150,
0)				
53	4.74E+01	18,01/01/00	(	150,
0)				
54	4.74E+01	18,03/01/00	(	150,
0)				
55	4.74E+01	04,05/01/00	(	150,
0)				
56	4.74E+01	14,06/01/00	(	150,
0)				
57	4.74E+01	24,07/01/00	(	150,
0)				
58	4.74E+01	10,09/01/00	(	150,
0)				
59	4.74E+01	20,10/01/00	(	150,
0)				
60	4.68E+01	19,01/01/00	(	150,
0)				
61	4.68E+01	19,03/01/00	(	150,
0)				
62	4.68E+01	05,05/01/00	(	150,
0)				
63	4.68E+01	15,06/01/00	(	150,
0)				
64	4.68E+01	01,08/01/00	(	150,
0)				

65	4.68E+01	11,09/01/00	(	150,
0)				
66	4.68E+01	21,10/01/00	(	150,
0)				
67	4.64E+01	03,02/01/00	(	150,
0)				
68	4.64E+01	03,04/01/00	(	150,
0)				
69	4.64E+01	13,05/01/00	(	150,
0)				
70	4.64E+01	23,06/01/00	(	150,
0)				
71	4.64E+01	09,08/01/00	(	150,
0)				
72	4.64E+01	19,09/01/00	(	150,
0)				
73	4.64E+01	05,11/01/00	(	150,
0)				
74	4.64E+01	17,11/01/00	(	150,
0)				
75	4.50E+01	17,01/01/00	(	150,
0)				
76	4.50E+01	17,03/01/00	(	150,
0)				
77	4.50E+01	03,05/01/00	(	150,
0)				
78	4.50E+01	13,06/01/00	(	150,
0)				
79	4.50E+01	23,07/01/00	(	150,
0)				
80	4.50E+01	09,09/01/00	(	150,
0)				
81	4.50E+01	19,10/01/00	(	150,
0)				
82	4.36E+01	11,01/01/00	(	100,
0)				
83	4.36E+01	11,03/01/00	(	100,
0)				
84	4.36E+01	21,04/01/00	(	100,
0)				
85	4.36E+01	07,06/01/00	(	100,
0)				
86	4.36E+01	17,07/01/00	(	100,
0)				
87	4.36E+01	03,09/01/00	(	100,
0)				

88 4.36E+01 13,10/01/00 (100,
0)
89 4.32E+01 18,02/01/00 (150,
0)
90 4.28E+01 07,02/01/00 (150,
0)
91 4.28E+01 07,04/01/00 (150,
0)
92 4.28E+01 17,05/01/00 (150,
0)
93 4.28E+01 03,07/01/00 (150,
0)
94 4.28E+01 13,08/01/00 (150,
0)
95 4.28E+01 23,09/01/00 (150,
0)
96 4.28E+01 09,11/01/00 (150,
0)
97 4.28E+01 21,11/01/00 (150,
0)
98 4.15E+01 04,03/01/00 (100,
0)
99 4.15E+01 14,04/01/00 (100,
0)
100 4.15E+01 06,10/01/00 (100,
0)

---

1 Peak values for the 100 worst cases (in microgram/
m3)

Averaging time = 8 hours

Rank Value Time Recorded Coordinates
hour date (* denotes p
olar)

1 4.26E+01 08,02/01/00 (150,
0)
2 4.26E+01 08,04/01/00 (150,
0)
3 4.26E+01 24,09/01/00 (150,
0)
4 4.20E+01 16,08/01/00 (150,

0)

5	4.20E+01	24,11/01/00	(150, 0)
6	3.73E+01	24,07/01/00	(150, 0)
7	3.58E+01	16,05/01/00	(200, 0)
8	3.58E+01	08,11/01/00	(200, 0)
9	3.26E+01	16,06/01/00	(150, 0)
10	3.18E+01	08,07/01/00	(150, 0)
11	3.13E+01	16,01/01/00	(150, 0)
12	3.13E+01	16,03/01/00	(150, 0)
13	3.13E+01	08,09/01/00	(150, 0)
14	3.12E+01	08,06/01/00	(100, 0)
15	3.08E+01	16,04/01/00	(100, 0)
16	3.08E+01	08,10/01/00	(100, 0)
17	2.87E+01	16,11/01/00	(200, 0)
18	2.74E+01	16,07/01/00	(100, 0)
19	2.72E+01	24,05/01/00	(150, 0)
20	2.58E+01	08,05/01/00	(150, 0)
21	2.58E+01	24,10/01/00	(150, 0)
22	2.52E+01	24,06/01/00	(250, 0)
23	2.50E+01	24,04/01/00	(100, 0)
24	2.50E+01	16,10/01/00	(100, 0)
25	2.41E+01	08,03/01/00	(100, 0)
26	2.41E+01	24,08/01/00	(100, 0)
27	2.40E+01	08,01/01/00	(100,

0)

28	1.99E+01	16,09/01/00	(	150,
0)				
29	1.99E+01	24,03/01/00	(	150,
0)				
30	1.99E+01	24,01/01/00	(	150,
0)				
31	1.91E+01	08,08/01/00	(	300,
0)				
32	1.47E+01	24,02/01/00	(	1200,
0)				
33	1.19E+01	16,02/01/00	(	1000,
0)				

Ausplume version 4.0

Parle Foods EIS - NO2

Concentration or deposition	Concentra tion
Emission rate units	grams/sec ond
Concentration units	microgram /m3
Units conversion factor	1.00E+06
Background concentration	0.00E+00
Terrain effects	None
Smooth stability class changes?	No
Other stability class adjustments ("urban modes")	None
Ignore building wake effects?	No
Decay coefficient (unless defined in met. file)	0.000
Anemometer height	10 m

DISPERSION CURVES

Horizontal dispersion curves for sources <100m high	Pasquill-Gifford
Vertical dispersion curves for sources <100m high	Pasquill-Gifford
Horizontal dispersion curves for sources >100m high	Briggs Rural
Vertical dispersion curves for sources >100m high	Briggs Rural
Enhance horizontal plume spreads for buoyancy?	Yes
Enhance vertical plume spreads for buoyancy?	Yes
Adjust horizontal P-G formulae for roughness height?	Yes
Adjust vertical P-G formulae for roughness height?	Yes
Roughness height	0.100m
Adjustment for wind directional shear	None

PLUME RISE OPTIONS

Gradual plume rise?	Yes
Stack-tip downwash included?	Yes
Building downwash algorithm:	Schulman-Scire
Entrainment coeff. for neutral & stable lapse rates	0.60,0.60
Partial penetration of elevated inversions?	No

Disregard temp. gradients in the hourly met. file? No

and in the absence of boundary-layer potential temperature gra
dients
given by the hourly met. file, a value from the following tabl
e
(in K/m) is used:

Wind Speed Category	Stability Class A	B	C	D	E	F
1	0.000	0.000	0.000	0.000	0.020	0.035
2	0.000	0.000	0.000	0.000	0.020	0.035
3	0.000	0.000	0.000	0.000	0.020	0.035
4	0.000	0.000	0.000	0.000	0.020	0.035
5	0.000	0.000	0.000	0.000	0.020	0.035
6	0.000	0.000	0.000	0.000	0.020	0.035

WIND SPEED CATEGORIES
Category boundaries (in m/s) are: 1.54, 3.09, 5.14, 8.23,
10.80

WIND PROFILE EXPONENTS
"Irwin Rural" values (unless defined in met. file)

AVERAGING TIMES
1 hour
average over all hours

Parle Foods EIS - NO2

SOURCE CHARACTERISTICS

Stack Source: s15000

X(m)	Y(m)	Ground Elev.	Stack Height	Diam.	Temp.	Speed
0	0	0m	19m	1.25m	180C	11.1m/s

______ Effective building dimensions (in metres) __
____

Wind dir. 10° 20° 30° 40° 50° 60° 70° 80° 90° 100° 1
10° 120°
Width 200.0200.0200.0200.0200.0200.0200.0200.0200.0200.020
0.0200.0
Height 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 1
2.8 12.8

Wind dir. 130° 140° 150° 160° 170° 180° 190° 200° 210° 220° 2
30° 240°
Width 200.0200.0200.0200.0200.0200.0200.0200.0200.0200.020
0.0200.0
Height 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 1
2.8 12.8

Wind dir. 250° 260° 270° 280° 290° 300° 310° 320° 330° 340° 3
50° 360°
Width 200.0200.0200.0200.0200.0200.0200.0200.0200.0200.020
0.0200.0
Height 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 1
2.8 12.8

(Constant) emission rate = 2.18E-01 grams/second
No gravitational settling or scavenging.

Stack Source: s5000

X(m) Y(m) Ground Elev. Stack Height Diam. Temp. S
peed
0 0 0m 19m 0.58m 180C
11.1m/s

______ Effective building dimensions (in metres) __
____

Wind dir. 10° 20° 30° 40° 50° 60° 70° 80° 90° 100° 1
10° 120°
Width 200.0200.0200.0200.0200.0200.0200.0200.0200.0200.020
0.0200.0
Height 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 1
2.8 12.8

Wind dir. 130° 140° 150° 160° 170° 180° 190° 200° 210° 220° 2

30° 240°
Width 200.0200.0200.0200.0200.0200.0200.0200.0200.0200.020
0.0200.0
Height 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 1
2.8 12.8

Wind dir. 250° 260° 270° 280° 290° 300° 310° 320° 330° 340° 3
50° 360°
Width 200.0200.0200.0200.0200.0200.0200.0200.0200.0200.020
0.0200.0
Height 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 1
2.8 12.8

(Constant) emission rate = 6.05E-02 grams/second
No gravitational settling or scavenging.

Stack Source: s10000

X(m) Y(m) Ground Elev. Stack Height Diam. Temp. S
peed
0 0 0m 19m 0.80m 180C
11.1m/s

______ Effective building dimensions (in metres) __
_____

Wind dir. 10° 20° 30° 40° 50° 60° 70° 80° 90° 100° 1
10° 120°
Width 200.0200.0200.0200.0200.0200.0200.0200.0200.0200.020
0.0200.0
Height 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 1
2.8 12.8

Wind dir. 130° 140° 150° 160° 170° 180° 190° 200° 210° 220° 2
30° 240°
Width 200.0200.0200.0200.0200.0200.0200.0200.0200.0200.020
0.0200.0
Height 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 1
2.8 12.8

Wind dir. 250° 260° 270° 280° 290° 300° 310° 320° 330° 340° 3
50° 360°
Width 200.0200.0200.0200.0200.0200.0200.0200.0200.0200.020
0.0200.0
Height 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 1

2.8 12.8

(Constant) emission rate = 1.45E-01 grams/second
No gravitational settling or scavenging.

Parle Foods EIS - NO2

RECEPTOR LOCATIONS

The Cartesian receptor grid has the following x-values (or eastings):

0.m 50.m 100.m 150.m 200.m 250.m
300.m
350.m 400.m 450.m 500.m 550.m 600.m
650.m
700.m 750.m 800.m 850.m 900.m 950.m
1000.m
1050.m 1100.m 1150.m 1200.m 1250.m 1300.m
1350.m
1400.m 1450.m 1500.m 1550.m 1600.m 1650.m
1700.m
1750.m 1800.m 1850.m 1900.m 1950.m 2000.m

and these y-values (or northings):

-500.m -450.m -400.m -350.m -300.m -250.m
-200.m
-150.m -100.m -50.m 0.m 50.m 100.m
150.m
200.m 250.m 300.m 350.m 400.m 450.m
500.m

Meteorological data file information:

"METSAMP" test meteorological file

AVERAGE OVER ALL HOURS AND FOR ALL SOURCES
in microgram/m3

Y (km) \ X (km):	0.000	0.050	0.100	0.150	0.200	0.250
0.500	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.14E-06	1.26E-03
0.450	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.29E-04	4.04E-03
0.400	0.00E+00	0.00E+00	0.00E+00	1.17E-06	2.03E-03	1.18E-02
0.350	0.00E+00	0.00E+00	0.00E+00	4.61E-04	8.02E-03	3.15E-02
0.300	0.00E+00	0.00E+00	0.00E+00	3.36E-03	2.80E-02	7.60E-02
0.250	0.00E+00	0.00E+00	2.97E-04	1.87E-02	8.34E-02	1.70E-01
0.200	0.00E+00	0.00E+00	6.24E-03	8.03E-02	2.20E-01	3.53E-01
0.150	0.00E+00	0.00E+00	6.14E-02	2.79E-01	5.24E-01	7.07E-01
0.100	0.00E+00	6.99E-03	3.70E-01	8.21E-01	1.21E+00	1.49E+00
0.050	0.00E+00	2.36E-01	1.55E+00	2.51E+00	3.14E+00	3.32E+00
0.000	0.00E+00	2.39E+00	5.24E+00	5.58E+00	5.35E+00	4.85E+00
-0.050	0.00E+00	2.36E-01	1.55E+00	2.51E+00	3.14E+00	3.32E+00
-0.100	0.00E+00	6.99E-03	3.70E-01	8.21E-01	1.21E+00	1.49E+00
-0.150	0.00E+00	0.00E+00	6.14E-02	2.79E-01	5.24E-01	7.07E-01
-0.200	0.00E+00	0.00E+00	6.24E-03	8.03E-02	2.20E-01	3.53E-01
-0.250	0.00E+00	0.00E+00	2.97E-04	1.87E-02	8.34E-02	1.70E-01
-0.300	0.00E+00	0.00E+00	0.00E+00	3.36E-03	2.80E-02	7.60E-02
-0.350	0.00E+00	0.00E+00	0.00E+00	4.61E-04	8.02E-03	3.15

```
E-02
   -0.400     0.00E+00 0.00E+00 0.00E+00 1.17E-06 2.03E-03 1.18
E-02
   -0.450     0.00E+00 0.00E+00 0.00E+00 0.00E+00 4.29E-04 4.04
E-03
   -0.500     0.00E+00 0.00E+00 0.00E+00 0.00E+00 2.14E-06 1.26
E-03


    X (km):   0.300    0.350    0.400    0.450    0.500    0.55
0
      ____________________________________________________________
_______
   Y (km)
    0.500     5.99E-03 1.59E-02 3.07E-02 4.78E-02 6.57E-02 8.25
E-02
    0.450     1.45E-02 3.24E-02 5.46E-02 7.80E-02 1.01E-01 1.22
E-01
    0.400     3.29E-02 6.19E-02 9.36E-02 1.24E-01 1.53E-01 1.77
E-01
    0.350     6.92E-02 1.13E-01 1.57E-01 1.95E-01 2.28E-01 2.54
E-01
    0.300     1.38E-01 2.00E-01 2.55E-01 2.99E-01 3.35E-01 3.65
E-01
    0.250     2.61E-01 3.41E-01 4.06E-01 4.60E-01 5.03E-01 5.38
E-01
    0.200     4.75E-01 5.77E-01 6.58E-01 7.23E-01 7.78E-01 8.22
E-01
    0.150     8.72E-01 1.01E+00 1.12E+00 1.20E+00 1.26E+00 1.29
E+00
    0.100     1.73E+00 1.89E+00 1.98E+00 2.01E+00 2.00E+00 1.96
E+00
    0.050     3.36E+00 3.29E+00 3.15E+00 2.98E+00 2.81E+00 2.64
E+00
    0.000     4.47E+00 4.11E+00 3.77E+00 3.47E+00 3.19E+00 2.95
E+00
   -0.050     3.36E+00 3.29E+00 3.15E+00 2.98E+00 2.81E+00 2.64
E+00
   -0.100     1.73E+00 1.89E+00 1.98E+00 2.01E+00 2.00E+00 1.96
E+00
   -0.150     8.72E-01 1.01E+00 1.12E+00 1.20E+00 1.26E+00 1.29
E+00
   -0.200     4.75E-01 5.77E-01 6.58E-01 7.23E-01 7.78E-01 8.22
E-01
   -0.250     2.61E-01 3.41E-01 4.06E-01 4.60E-01 5.03E-01 5.38
E-01
```

-0.300	1.38E-01	2.00E-01	2.55E-01	2.99E-01	3.35E-01	3.65E-01
-0.350	6.92E-02	1.13E-01	1.57E-01	1.95E-01	2.28E-01	2.54E-01
-0.400	3.29E-02	6.19E-02	9.36E-02	1.24E-01	1.53E-01	1.77E-01
-0.450	1.45E-02	3.24E-02	5.46E-02	7.80E-02	1.01E-01	1.22E-01
-0.500	5.99E-03	1.59E-02	3.07E-02	4.78E-02	6.57E-02	8.25E-02

X (km):	0.600	0.650	0.700	0.750	0.800	0.850
Y (km)						
0.500	9.88E-02	1.15E-01	1.28E-01	1.41E-01	1.52E-01	1.62E-01
0.450	1.41E-01	1.58E-01	1.73E-01	1.85E-01	1.96E-01	2.07E-01
0.400	1.98E-01	2.16E-01	2.30E-01	2.44E-01	2.61E-01	2.73E-01
0.350	2.76E-01	2.95E-01	3.15E-01	3.32E-01	3.47E-01	3.62E-01
0.300	3.92E-01	4.15E-01	4.36E-01	4.56E-01	4.74E-01	4.91E-01
0.250	5.69E-01	5.97E-01	6.22E-01	6.45E-01	6.64E-01	6.79E-01
0.200	8.58E-01	8.86E-01	9.08E-01	9.23E-01	9.33E-01	9.37E-01
0.150	1.31E+00	1.31E+00	1.31E+00	1.30E+00	1.28E+00	1.26E+00
0.100	1.91E+00	1.85E+00	1.78E+00	1.72E+00	1.66E+00	1.60E+00
0.050	2.48E+00	2.34E+00	2.20E+00	2.08E+00	1.97E+00	1.87E+00
0.000	2.73E+00	2.54E+00	2.38E+00	2.23E+00	2.10E+00	1.98E+00
-0.050	2.48E+00	2.34E+00	2.20E+00	2.08E+00	1.97E+00	1.87E+00
-0.100	1.91E+00	1.85E+00	1.78E+00	1.72E+00	1.66E+00	1.60E+00
-0.150	1.31E+00	1.31E+00	1.31E+00	1.30E+00	1.28E+00	1.26E+00
-0.200	8.58E-01	8.86E-01	9.08E-01	9.23E-01	9.33E-01	9.37

E-01

-0.250	5.69E-01	5.97E-01	6.22E-01	6.45E-01	6.64E-01	6.79E-01
-0.300	3.92E-01	4.15E-01	4.36E-01	4.56E-01	4.74E-01	4.91E-01
-0.350	2.76E-01	2.95E-01	3.15E-01	3.32E-01	3.47E-01	3.62E-01
-0.400	1.98E-01	2.16E-01	2.30E-01	2.44E-01	2.61E-01	2.73E-01
-0.450	1.41E-01	1.58E-01	1.73E-01	1.85E-01	1.96E-01	2.07E-01
-0.500	9.88E-02	1.15E-01	1.28E-01	1.41E-01	1.52E-01	1.62E-01

X (km):	0.900	0.950	1.000	1.050	1.100	1.150
Y (km)						
0.500	1.70E-01	1.79E-01	1.88E-01	1.98E-01	2.06E-01	2.13E-01
0.450	2.19E-01	2.30E-01	2.40E-01	2.49E-01	2.57E-01	2.66E-01
0.400	2.85E-01	2.96E-01	3.07E-01	3.18E-01	3.28E-01	3.38E-01
0.350	3.76E-01	3.89E-01	4.02E-01	4.13E-01	4.24E-01	4.34E-01
0.300	5.07E-01	5.21E-01	5.33E-01	5.44E-01	5.53E-01	5.60E-01
0.250	6.92E-01	7.02E-01	7.10E-01	7.15E-01	7.17E-01	7.18E-01
0.200	9.38E-01	9.35E-01	9.31E-01	9.23E-01	9.14E-01	9.04E-01
0.150	1.23E+00	1.21E+00	1.18E+00	1.16E+00	1.13E+00	1.10E+00
0.100	1.54E+00	1.48E+00	1.43E+00	1.38E+00	1.34E+00	1.29E+00
0.050	1.78E+00	1.70E+00	1.62E+00	1.55E+00	1.49E+00	1.43E+00
0.000	1.88E+00	1.78E+00	1.70E+00	1.62E+00	1.55E+00	1.48E+00
-0.050	1.78E+00	1.70E+00	1.62E+00	1.55E+00	1.49E+00	1.43E+00
-0.100	1.54E+00	1.48E+00	1.43E+00	1.38E+00	1.34E+00	1.29E+00

```
   -0.150       1.23E+00 1.21E+00 1.18E+00 1.16E+00 1.13E+00 1.10
E+00
   -0.200       9.38E-01 9.35E-01 9.31E-01 9.23E-01 9.14E-01 9.04
E-01
   -0.250       6.92E-01 7.02E-01 7.10E-01 7.15E-01 7.17E-01 7.18
E-01
   -0.300       5.07E-01 5.21E-01 5.33E-01 5.44E-01 5.53E-01 5.60
E-01
   -0.350       3.76E-01 3.89E-01 4.02E-01 4.13E-01 4.24E-01 4.34
E-01
   -0.400       2.85E-01 2.96E-01 3.07E-01 3.18E-01 3.28E-01 3.38
E-01
   -0.450       2.19E-01 2.30E-01 2.40E-01 2.49E-01 2.57E-01 2.66
E-01
   -0.500       1.70E-01 1.79E-01 1.88E-01 1.98E-01 2.06E-01 2.13
E-01


    X (km):     1.200    1.250    1.300    1.350    1.400    1.45
0
    ____________________________________________________________
________
   Y (km)
    0.500       2.20E-01 2.27E-01 2.34E-01 2.41E-01 2.47E-01 2.53
E-01
    0.450       2.74E-01 2.82E-01 2.90E-01 2.97E-01 3.04E-01 3.10
E-01
    0.400       3.47E-01 3.55E-01 3.63E-01 3.70E-01 3.77E-01 3.82
E-01
    0.350       4.43E-01 4.50E-01 4.57E-01 4.63E-01 4.67E-01 4.71
E-01
    0.300       5.66E-01 5.71E-01 5.74E-01 5.76E-01 5.77E-01 5.77
E-01
    0.250       7.18E-01 7.16E-01 7.13E-01 7.09E-01 7.04E-01 6.98
E-01
    0.200       8.93E-01 8.81E-01 8.68E-01 8.55E-01 8.42E-01 8.29
E-01
    0.150       1.08E+00 1.05E+00 1.03E+00 1.00E+00 9.82E-01 9.60
E-01
    0.100       1.25E+00 1.21E+00 1.17E+00 1.14E+00 1.11E+00 1.08
E+00
    0.050       1.38E+00 1.33E+00 1.28E+00 1.24E+00 1.20E+00 1.16
E+00
    0.000       1.42E+00 1.37E+00 1.32E+00 1.27E+00 1.23E+00 1.19
E+00
   -0.050       1.38E+00 1.33E+00 1.28E+00 1.24E+00 1.20E+00 1.16
```

```
E+00
   -0.100     1.25E+00 1.21E+00 1.17E+00 1.14E+00 1.11E+00 1.08
E+00
   -0.150     1.08E+00 1.05E+00 1.03E+00 1.00E+00 9.82E-01 9.60
E-01
   -0.200     8.93E-01 8.81E-01 8.68E-01 8.55E-01 8.42E-01 8.29
E-01
   -0.250     7.18E-01 7.16E-01 7.13E-01 7.09E-01 7.04E-01 6.98
E-01
   -0.300     5.66E-01 5.71E-01 5.74E-01 5.76E-01 5.77E-01 5.77
E-01
   -0.350     4.43E-01 4.50E-01 4.57E-01 4.63E-01 4.67E-01 4.71
E-01
   -0.400     3.47E-01 3.55E-01 3.63E-01 3.70E-01 3.77E-01 3.82
E-01
   -0.450     2.74E-01 2.82E-01 2.90E-01 2.97E-01 3.04E-01 3.10
E-01
   -0.500     2.20E-01 2.27E-01 2.34E-01 2.41E-01 2.47E-01 2.53
E-01


    X (km):   1.500    1.550    1.600    1.650    1.700    1.75
0
              ______________________________________________________
_______
   Y (km)
    0.500     2.59E-01 2.64E-01 2.70E-01 2.74E-01 2.79E-01 2.83
E-01
    0.450     3.16E-01 3.21E-01 3.26E-01 3.31E-01 3.35E-01 3.38
E-01
    0.400     3.87E-01 3.92E-01 3.96E-01 3.99E-01 4.02E-01 4.04
E-01
    0.350     4.75E-01 4.77E-01 4.79E-01 4.80E-01 4.80E-01 4.80
E-01
    0.300     5.77E-01 5.76E-01 5.74E-01 5.71E-01 5.68E-01 5.65
E-01
    0.250     6.92E-01 6.86E-01 6.79E-01 6.72E-01 6.65E-01 6.57
E-01
    0.200     8.16E-01 8.03E-01 7.90E-01 7.77E-01 7.64E-01 7.52
E-01
    0.150     9.38E-01 9.18E-01 8.98E-01 8.79E-01 8.60E-01 8.42
E-01
    0.100     1.05E+00 1.02E+00 9.92E-01 9.66E-01 9.42E-01 9.19
E-01
    0.050     1.12E+00 1.09E+00 1.06E+00 1.03E+00 9.98E-01 9.72
E-01
```

0.000	1.15E+00	1.11E+00	1.08E+00	1.05E+00	1.02E+00	9.90E-01
-0.050	1.12E+00	1.09E+00	1.06E+00	1.03E+00	9.98E-01	9.72E-01
-0.100	1.05E+00	1.02E+00	9.92E-01	9.66E-01	9.42E-01	9.19E-01
-0.150	9.38E-01	9.18E-01	8.98E-01	8.79E-01	8.60E-01	8.42E-01
-0.200	8.16E-01	8.03E-01	7.90E-01	7.77E-01	7.64E-01	7.52E-01
-0.250	6.92E-01	6.86E-01	6.79E-01	6.72E-01	6.65E-01	6.57E-01
-0.300	5.77E-01	5.76E-01	5.74E-01	5.71E-01	5.68E-01	5.65E-01
-0.350	4.75E-01	4.77E-01	4.79E-01	4.80E-01	4.80E-01	4.80E-01
-0.400	3.87E-01	3.92E-01	3.96E-01	3.99E-01	4.02E-01	4.04E-01
-0.450	3.16E-01	3.21E-01	3.26E-01	3.31E-01	3.35E-01	3.38E-01
-0.500	2.59E-01	2.64E-01	2.70E-01	2.74E-01	2.79E-01	2.83E-01

X (km):	1.800	1.850	1.900	1.950	2.000
Y (km)					
0.500	2.87E-01	2.91E-01	2.94E-01	2.97E-01	3.00E-01
0.450	3.42E-01	3.45E-01	3.47E-01	3.49E-01	3.51E-01
0.400	4.06E-01	4.07E-01	4.08E-01	4.09E-01	4.09E-01
0.350	4.80E-01	4.79E-01	4.78E-01	4.76E-01	4.74E-01
0.300	5.62E-01	5.58E-01	5.54E-01	5.50E-01	5.45E-01
0.250	6.50E-01	6.42E-01	6.34E-01	6.27E-01	6.19E-01
0.200	7.40E-01	7.28E-01	7.16E-01	7.05E-01	6.93E-01
0.150	8.25E-01	8.09E-01	7.93E-01	7.77E-01	7.62E-01
0.100	8.98E-01	8.77E-01	8.57E-01	8.38E-01	8.19E-01
0.050	9.47E-01	9.23E-01	9.00E-01	8.78E-01	8.57E-01
0.000	9.64E-01	9.39E-01	9.15E-01	8.92E-01	8.71E-01
-0.050	9.47E-01	9.23E-01	9.00E-01	8.78E-01	8.57E-01
-0.100	8.98E-01	8.77E-01	8.57E-01	8.38E-01	8.19E-01
-0.150	8.25E-01	8.09E-01	7.93E-01	7.77E-01	7.62E-01
-0.200	7.40E-01	7.28E-01	7.16E-01	7.05E-01	6.93E-01
-0.250	6.50E-01	6.42E-01	6.34E-01	6.27E-01	6.19E-01
-0.300	5.62E-01	5.58E-01	5.54E-01	5.50E-01	5.45E-01
-0.350	4.80E-01	4.79E-01	4.78E-01	4.76E-01	4.74E-01

-0.400	4.06E-01	4.07E-01	4.08E-01	4.09E-01	4.09E-01
-0.450	3.42E-01	3.45E-01	3.47E-01	3.49E-01	3.51E-01
-0.500	2.87E-01	2.91E-01	2.94E-01	2.97E-01	3.00E-01

---

1 Peak values for the 100 worst cases (in microgram/m3)

Averaging time = 1 hour

Rank	Value	Time Recorded hour date	Coordinates (* denotes polar)
1	1.17E+01	06,01/01/00	(100, 0)
2	1.17E+01	06,03/01/00	(100, 0)
3	1.17E+01	16,04/01/00	(100, 0)
4	1.17E+01	02,06/01/00	(100, 0)
5	1.17E+01	12,07/01/00	(100, 0)
6	1.17E+01	22,08/01/00	(100, 0)
7	1.17E+01	08,10/01/00	(100, 0)
8	1.12E+01	13,01/01/00	(100, 0)
9	1.12E+01	13,03/01/00	(100, 0)
10	1.12E+01	23,04/01/00	(100, 0)
11	1.12E+01	09,06/01/00	(100, 0)
12	1.12E+01	19,07/01/00	(100, 0)
13	1.12E+01	05,09/01/00	(100, 0)
14	1.12E+01	15,10/01/00	(100, 0)
15	1.07E+01	12,01/01/00	(100, 0)
16	1.07E+01	12,03/01/00	(100,

0)
17 1.07E+01 22,04/01/00 (100,
0)
18 1.07E+01 08,06/01/00 (100,
0)
19 1.07E+01 18,07/01/00 (100,
0)
20 1.07E+01 04,09/01/00 (100,
0)
21 1.07E+01 14,10/01/00 (100,
0)
22 1.05E+01 05,01/01/00 (100,
0)
23 1.05E+01 05,03/01/00 (100,
0)
24 1.05E+01 15,04/01/00 (100,
0)
25 1.05E+01 01,06/01/00 (100,
0)
26 1.05E+01 11,07/01/00 (100,
0)
27 1.05E+01 21,08/01/00 (100,
0)
28 1.05E+01 07,10/01/00 (100,
0)
29 1.01E+01 05,02/01/00 (150,
0)
30 1.01E+01 05,04/01/00 (150,
0)
31 1.01E+01 15,05/01/00 (150,
0)
32 1.01E+01 01,07/01/00 (150,
0)
33 1.01E+01 11,08/01/00 (150,
0)
34 1.01E+01 21,09/01/00 (150,
0)
35 1.01E+01 07,11/01/00 (150,
0)
36 1.01E+01 19,11/01/00 (150,
0)
37 1.00E+01 04,02/01/00 (150,
0)
38 1.00E+01 04,04/01/00 (150,
0)
39 1.00E+01 14,05/01/00 (150,

0)

40	1.00E+01	24,06/01/00	(	150, 0)
41	1.00E+01	10,08/01/00	(	150, 0)
42	1.00E+01	20,09/01/00	(	150, 0)
43	1.00E+01	06,11/01/00	(	150, 0)
44	1.00E+01	18,11/01/00	(	150, 0)
45	9.50E+00	06,02/01/00	(	150, 0)
46	9.50E+00	06,04/01/00	(	150, 0)
47	9.50E+00	16,05/01/00	(	150, 0)
48	9.50E+00	02,07/01/00	(	150, 0)
49	9.50E+00	12,08/01/00	(	150, 0)
50	9.50E+00	22,09/01/00	(	150, 0)
51	9.50E+00	08,11/01/00	(	150, 0)
52	9.50E+00	20,11/01/00	(	150, 0)
53	9.48E+00	18,01/01/00	(	150, 0)
54	9.48E+00	18,03/01/00	(	150, 0)
55	9.48E+00	04,05/01/00	(	150, 0)
56	9.48E+00	14,06/01/00	(	150, 0)
57	9.48E+00	24,07/01/00	(	150, 0)
58	9.48E+00	10,09/01/00	(	150, 0)
59	9.48E+00	20,10/01/00	(	150, 0)
60	9.36E+00	19,01/01/00	(	150, 0)
61	9.36E+00	19,03/01/00	(	150, 0)
62	9.36E+00	05,05/01/00	(	150,

0)
63 9.36E+00 15,06/01/00 (150,
0)
64 9.36E+00 01,08/01/00 (150,
0)
65 9.36E+00 11,09/01/00 (150,
0)
66 9.36E+00 21,10/01/00 (150,
0)
67 9.27E+00 03,02/01/00 (150,
0)
68 9.27E+00 03,04/01/00 (150,
0)
69 9.27E+00 13,05/01/00 (150,
0)
70 9.27E+00 23,06/01/00 (150,
0)
71 9.27E+00 09,08/01/00 (150,
0)
72 9.27E+00 19,09/01/00 (150,
0)
73 9.27E+00 05,11/01/00 (150,
0)
74 9.27E+00 17,11/01/00 (150,
0)
75 9.00E+00 17,01/01/00 (150,
0)
76 9.00E+00 17,03/01/00 (150,
0)
77 9.00E+00 03,05/01/00 (150,
0)
78 9.00E+00 13,06/01/00 (150,
0)
79 9.00E+00 23,07/01/00 (150,
0)
80 9.00E+00 09,09/01/00 (150,
0)
81 9.00E+00 19,10/01/00 (150,
0)
82 8.73E+00 11,01/01/00 (100,
0)
83 8.73E+00 11,03/01/00 (100,
0)
84 8.73E+00 21,04/01/00 (100,
0)
85 8.73E+00 07,06/01/00 (100,

0)

86	8.73E+00	17,07/01/00	(100, 0)
87	8.73E+00	03,09/01/00	(100, 0)
88	8.73E+00	13,10/01/00	(100, 0)
89	8.63E+00	18,02/01/00	(150, 0)
90	8.55E+00	07,02/01/00	(150, 0)
91	8.55E+00	07,04/01/00	(150, 0)
92	8.55E+00	17,05/01/00	(150, 0)
93	8.55E+00	03,07/01/00	(150, 0)
94	8.55E+00	13,08/01/00	(150, 0)
95	8.55E+00	23,09/01/00	(150, 0)
96	8.55E+00	09,11/01/00	(150, 0)
97	8.55E+00	21,11/01/00	(150, 0)
98	8.30E+00	04,03/01/00	(100, 0)
99	8.30E+00	14,04/01/00	(100, 0)
100	8.30E+00	06,10/01/00	(100, 0)

APPENDIX C

Archaeological Study

Coffey

AWL6615/1-AH AE:MH
17 February, 2000

Mr Robert Carroll
Office Manager
Griffith Local Aboriginal Council
PO Box 1424
GRIFFITH NSW 2680

Dear Sir,

RE: PROPOSED PARLE FOOD PTY LTD, FOOD PROCESSING PLANT, GRIFFITH, NSW

Further to our telephone conversation of today, we have been commissioned by Parle Foods to carry out an environmental impact study for the above project.

As part of the study we need to address any heritage or cultural issues that may impact on the development as proposed.

I have enclosed a document describing the type of development and a site locality plan for your convenience.

As you will appreciate the land in more recent times has been heavily cultivated and used for rice production under irrigation.

Could you please visit the site as soon as practical and advise us if there are any identifiable heritage or cultural issues that would impact on the development as proposed.

We understand that there will be a fee for the site inspection and report based on an hourly rate of $55.00 per hour. Please forward the invoice for the work with your report to the above address.

If you require any further information or assistance please contact the undersigned.

For and on behalf of
COFFEY GEOSCIENCES PTY LTD

A P EDWARDS
MANAGER

cc B Dance (Parle)

Unit 1/151 Wylarra Drive
North Albury NSW 2640 Australia
PO Box 803 Albury NSW 2640 Australia
Telephone +61 2 **6040 3847**
Facsimile +61 2 6040 3861
Email albury@coffey.com.au

GRIFFITH LOCAL ABORIGINAL LAND COUNCIL

P.O. Box 1424, 5 Wiradjuri Place, Griffith NSW 2680
Tel: (02) 6962 6711 Fax: (02) 6964 1477

24th February 2000

Mr A.P Edwards
Manager
Coffey Geosciences Pty Ltd
Unit 1/151 Wytarra Drive
NORTH ALBURY NSW 2640

Dear Sir

I write in relation to the survey/inspection of Farm 1059, D.P 751686, PT 76 & 77 WILLBRIGGEE, NSW for evidence of Aboriginal Heritage e.g. Artifacts or sites.

This organisation has been advised by our representative who undertook the survey Mr John Simpson that an extensive inspection took place on the above parcel of land for any evidence of Aboriginal heritage.

Griffith Local Aboriginal Land Council advises that there is no evidence of Aboriginal artifacts or sites on this particular parcel of land.

This can be directly attributed to the fact that the land has been cleared of the majority of its native vegetation, lazered and heavily cropped over many years.

If you require any additional information do not hesitate to contact the undersigned.

Yours in Unity

R Carroll.

R CARROLL
OFFICE MANAGER

APPENDIX D

Coffey Geotechnical Report

WARBURTON CONSTRUCTIONS PTY LTD

GEOTECHNICAL INVESTIGATION

Parle Foods, Farm 1059, Willbriggie, NSW

AWL6557/1-AA

25 October, 1999

Coffey

AWL6557/1-AA AE:MH
25 October, 1999

The Manager
Warburton Constructions Pty Ltd
PO Box 1036
GRIFFITH NSW 2680

Attention: Mr Morris Wood

Dear Sir,

RE: PARLE FOODS DEVELOPMENT, FARM 1059, WILBRIDGIE, NSW

This letter serves to present our geotechnical investigation report for the above project.

If you have any queries regarding the contents of the report or require any additional information please contact the undersigned.

For and on behalf of
COFFEY GEOSCIENCES PTY LTD

A P EDWARDS
Manager

Unit 1/151 Wytarra Drive
North Albury NSW 2640 Australia
PO Box 803 Albury NSW 2640 Australia
Telephone +61 2 **6040 3847**
Facsimile +61 2 6040 3861
Email albury@coffey.com.au

TABLE OF CONTENTS

1. INTRODUCTION

This report describes a geotechnical investigation carried out by Coffey Geosciences Pty Ltd for Parle Foods at Farm 1059, Willbriggie, NSW.

The investigation was commissioned by Mr Morris Wood of Warburton Constructions Pty Ltd on 1 October, 1999 in response to our proposal AWP774/1 dated 28 September, 1999.

The objectives of the investigation were to provide factual data in respect to the existing soil conditions at the site and general recommendations for the construction of building infrastructure, roads, pavements and water treatment lagoons.

We understand that initial development will include the construction of a large processing building and freezer, access roads, hardstand pavements and waste water storage and treatment lagoons.

2. FIELD AND LABORATORY TESTING

The field investigation work was carried out by a senior geotechnician from our Albury office on 4 and 5 October, 1999 and comprised:

- The auger drilling of eleven (11) boreholes at select locations in the site using a trailer mounted drilling rig; and
- The sampling and logging of the soils and conditions encountered in the boreholes to depth of 4.0m.

The engineering logs of the boreholes together with explanation sheets defining the terms used on the logs are presented in Appendix A of this report.

A sketch showing the approximate locations of the investigation boreholes is included as Figure 1 following the text.

The laboratory testing of the disturbed and undisturbed samples collected during the investigation was carried out in Coffeys NATA registered laboratory in Albury and include the following:

- Visual classifications of all samples;
- Emerson Dispersions;
- Standard Compactions (3);
- Soaked California Bearing Ratio (CBRs) (2);
- Shrink/Swell (4);
- Moisture Contents (4); and
- Permeability (1).

The results of the laboratory tests are enclosed under Appendix B.

Coffey

3. SITE CONDITIONS

3.1 Surface Conditions

Farm 1059 is a 178.4 hectare property located at Willbriggie to the south of Griffith in southern NSW. Access to the site is via Crawford Road which connects to Main Road 321 which runs from Darlington Point to the City of Griffith.

The site in the past has been used for grazing and general farming and is relatively flat. Surface drainage in its undeveloped state appears to be towards the north.

3.2 Subsurface Conditions

The published geology of the site as shown on the NSW Department of Mines 1:250 000 *Narrandera* sheet S1 55-10 is:

> Quaternary period flood plains of black and red clayey silt, sand and gravel.

The site specific information derived from the logging of the soils encountered in the investigation boreholes confirms the above generalised geological description and can be summarised as comprising:

> Silty sandy clay, silty clay and clay topsoil of low to medium and medium plasticity to 0.2 to 0.5m overlying alluvial silty clays and clays of medium to high and high plasticity to at least 4.0m.

Groundwater was encountered in boreholes 1, 7 and 8 at depths of 3.0m at the time of the investigation and the groundwater piezometric level was measured in boreholes 1, 3 and 4 after being left open for twenty four (24) hours at levels of between 0.2m, 1.0m and 3.5m respectively.

4. DISCUSSION AND RECOMMENDATIONS

4.1 Building Infrastructure

Boreholes 1, 10 and 11 were located in the proposed initial building area.

Shrink/swell tests were carried out on undisturbed samples from boreholes 1 and 10 and based on those results and the soil logs we recommend that the site be classified as "Class H" in accordance with AS2870-1996.

Strip and pad footings found in the undisturbed alluvial silty clays and clays at a minimum depth of 0.5m below the natural surface can be designed for maximum allowable bearing of 100 and 125kPa respectively.

Concrete floor panels can be designed based on a subgrade reaction modulus (k) of up to 30kPa/mm.

At least 200mm of approved subbase quality gravel should be placed over the natural soils (excluding the topsoil) or fill beneath concrete floor panels to provide a working platform and to reduce *pumping* between panels. The subbase should be compacted to a relative density of at least 95% of Modified compaction (AS1289 5.4.1, 5.2.1).

The perimeter of all buildings supported on concrete raft slabs or with slab floors should be surface sealed to a distance of at least 3m from the building to prevent excessive moisture variations and consequential verticall movements beneath the building edge.

The surface around the perimeter should be graded to shed storm water away from the building and could be effectively sealed with either flexible access pavements, a sprayed bitumen cover, concrete or a HDPE type synthetic material beneath an ornamental covering.

4.2 Filling

Where it is proposed to place fill beneath the buildings, roads or pavements the following procedures are recommended:

- The topsoil should be stripped from the natural ground surface;
- The exposed subgrade should be proof rolled and any excessively wet or soft soils should be removed;
- The imported fill could comprise the onsite clays or silty clays from beneath the topsoil;
- The fill should be placed in loose layers not exceeding 300mm in thickness and them uniformly compacted using an 815 type static sheeps foot or pad foot roller. Vibrating compaction equipment should be avoided on the clays as it is likely to induce moisture percolation from the underlying stratum;
- General fill should be compacted to a relative density of at least 95% of Standard compaction until the final layer which should be compacted to at least 98% of Standard compaction (AS1289 5.4.1, 5.1.1).

4.3 Pavements

4.3.1 Flexible Pavements

In the absence of traffic information in terms of the type, weight and number the following pavement designs are presented as a guide and should be reviewed when specific traffic information is available:

ESAs	Pavement Layer	Layer Thickness	Compaction
1×10^5	Base	150mm	98% of Modified Compaction (AS1289 5.4.1, 5.2.1)
	Subbase	200mm	95% of Modified Compaction
	Prepared Subgrade or Fill	-	98% of Standard Compaction (AS1289 5.4.1, 5.1.1)
5×10^5	Base	150mm	98% of Modified Compaction
	Subbase	150mm	95% of Modified Compaction
	Select fill	120mm	95% of Modified Compaction
	Prepared Subgrade or Fill	-	98% of Standard Compaction

The select fill material should have a soaked CBR value of at least 10% when remoulded to a relative density of 95% of Modified compaction.

The wearing surface could comprise of a prime and two coat seal or a 30mm asphalt cover. Where there are likely to be turning movements of heavy vehicles or forklift traffic, asphalt should be used and in consideration of the summer temperatures of the region a 320 grade bitumen should be used in the asphalt.

4.3.2 Rigid Concrete Pavements

After stripping of the topsoil the exposed subgrade should be scarified and compacted to a relative density of at least 98% of Standard compaction. If fill is to be placed over the natural soils to raise the pavement level, the procedures recommended in Section 4.2 of this report should be applied.

After preparation of the subgrade has been completed an approved subbase quality gravel should be placed and compacted to a relative density of at least 95% of Modified compaction to form a 150mm minimum thickness layer.

The concrete pavement should be designed based on a subgrade reaction modulus *k* of 30kPa/mm.

The thickness, reinforcement and strength of the concrete should take into consideration the type, load and intensity of the proposed vehicles that will be trafficking the particular areas and the wheel type, i.e. solid or pneumatic in terms of pavement durability, refer AS3600.

4.4 Waste Water Storage and Treatment Lagoons

Boreholes 2 and 3 were excavated in the area where it is proposed to construct the waste water storage and treatment lagoons. Although no groundwater was encountered during the drilling, groundwater seepages infiltrated borehole 3, deliberately left open, and rose to a level of 1.0m below ground surface level after a period of twenty four (24) hours.

The occurrence and level of groundwater is usually expected to fluctuate as a result of variations in temperature, rainfall, irrigation etc. Given the flat nature of this site and the surrounding irrigation activity the above groundwater piezometric level is expected to be the norm rather than the exception.

As a result of the above groundwater conditions, the construction of waste water storage and treatment lagoons by way of an excavation is probably not practical as it would be extremely difficult to effectively line the lagoons and prevent interaction with the groundwater unless a synthetic liner is used which may or may not be economically viable.

In our opinion the most practical option is to minimise the depth of excavation and construct *turkey nest* type lagoons with a liner comprising compacted natural soils to meet the NSW EPA criteria.

The laboratory testing of the alluvial silty clays and clays from the area indicate that the soils are relatively stable in terms of erodability and dispersion (Emerson Dispersion test Class 6) and have low permeability if compacted and which meets the criteria of the NSW EPA for the protection of groundwater and containment of effluent (i.e. 1×10^{-9} m/sec).

Turkey nest lagoons could be constructed as follows:

- Strip to spoil the topsoil from the impounding area and embankment foundation to expose the natural silty clays or clays of medium to high or high plasticity;
- Excavate the soils to a depth of 1.0m within the containment area of the lagoon and extending laterally to approximate 1m beneath the toe of the proposed perimeter embankment;

- Replace the excavated clays and silty clays in three (3) loose layers of approximately 300mm each and uniformly compact with a 815 type static, sheeps foot or pad foot roller to a relative density of at least 98% of Standard compaction within the moisture range of ± 3% of the standard optimum moisture content. A minimum thickness of 900mm of compacted clay is required by the NSW EPA to form a liner;
- After completion of the above base liner, clay fill material excavated from below the topsoil in the designated borrow area (boreholes 7, 8 & 9) should be imported and placed in 300mm loose layers and compacted as above to form the lagoon embankments;
- The lagoon embankments should be constructed with a minimum crest width of 2m and batter slopes of no greater than 2:1 horizontal to vertical. If it is an operational requirement to traffic the crest of the lagoons the width should be increased to facilitate the particular type of traffic with an appropriate safety margin. The crest should also be crowned and covered with a minimum thickness of 100mm of subbase quality gravel to prevent rutting of the surface and the possibility of traffic sliding over the edge in wet conditions. If it is proposed to vegetate and maintain the outside batter by mowing, the slope should be reduced to at least 4:1 horizontal to vertical;
- The lagoons should be constructed with either a spillway to prevent overtopping during a peak storm event or alternatively designed with sufficient airspace provision (freeboard) to accommodate such a storm event; and
- The depth and size of the lagoons should take into consideration operational requirements together with the type of treatment or amelioration that is proposed, i.e. evaporation, aerobic or anaerobic.

4.5 General

As referred to in preceding sections of this report the site is generally poorly drained and with a relatively high perched water level and piezometric surface.

As a result (of this and the nature of the soils beneath the surface) trafficking of the site with heavy construction equipment will likely result in bogging in some areas. For this reason it is important that initial earthworks be carried out during dry summer periods.

A surface drainage strategy should be adopted and implemented prior to construction. An option that could be considered is to drain the site via open table drains to the proposed burrow area from which the water could then be pumped into the nearby drainage canal.

The burrow area if constructed to a depth of at least 3m and kept drained by regularly pumping into the irrigation channel would help reduce the piezometric level of the groundwater under the site.

In consideration of the characteristics of the foundation clay soils which can readily reduce in strength with moisture content increases, it is important that all footing excavations are protected from the ingress of water until the concrete is poured.

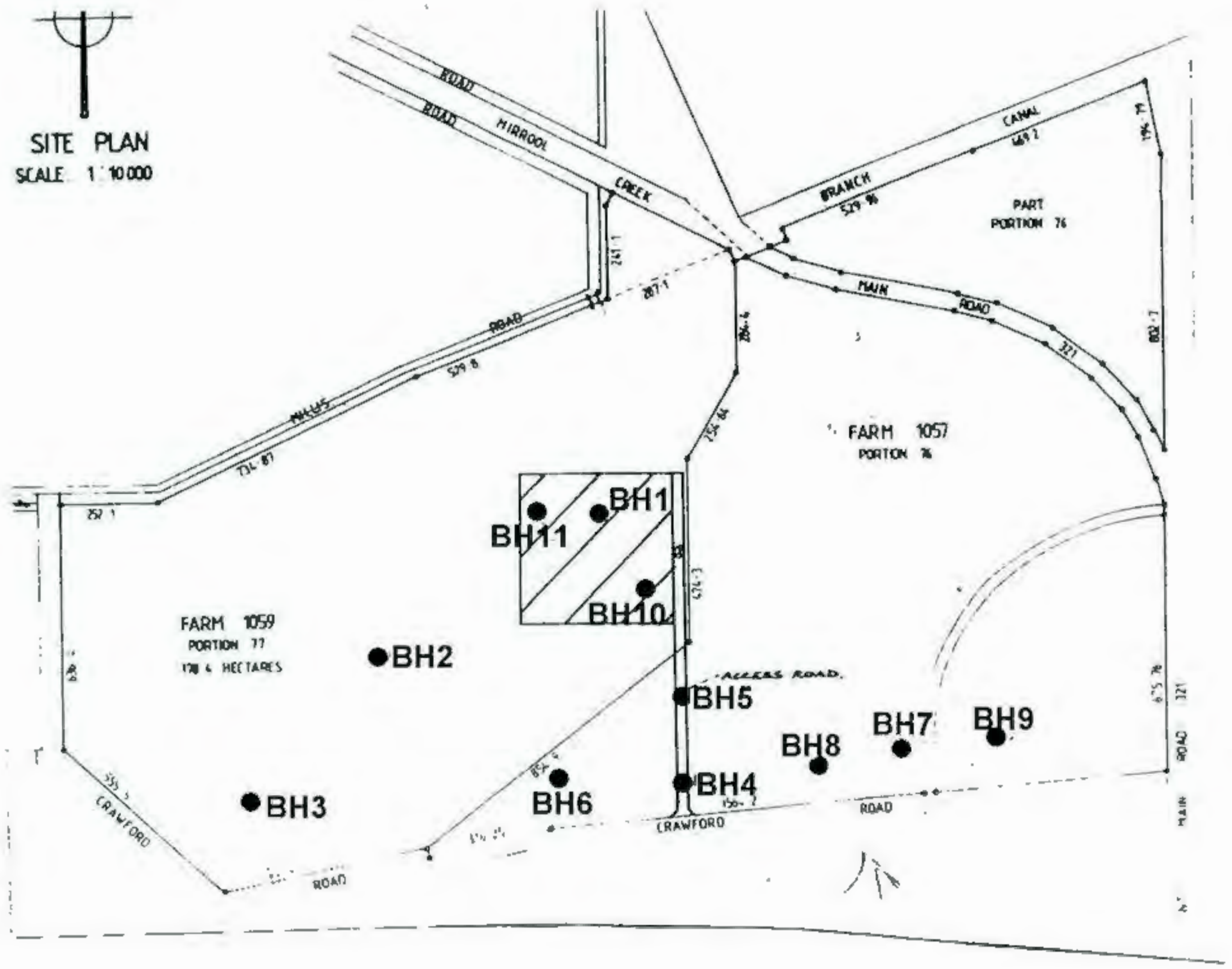
If conditions are encountered during excavation that differ significantly from those described in this report or on the borehole logs further advice should be sought from this office.

We bring to your attention the Important Information About Your Geotechnical Engineering Report that follows the text of this report.

For and on behalf of

COFFEY GEOSCIENCES PTY LTD

A P EDWARDS



●BH1 Denotes approximate location and number of investigation borehole

Coffey Geosciences Pty Ltd ACN 056 335 516		Geotechnical | Resources | Environmental | Technical | Project Management
Drawn	MH	WARBURTON CONSTRUCTIONS PTY LTD PARLE FOODS PROPOSED NEW DEVELOPMENT FARM 1059, WILBRIDGIE, NSW
Approved	AE	
Date	19/10/1999	Drawing no: FIGURE 1
Scale	N.T.S	Job no: AWL6557/1

APPENDIX A

Field Investigation

Coffey Geosciences Pty Ltd
ACN 056 335 516

engineering log - borehole

COFFEY

borehole no: BH1
sheet 1 of 1

office job no: AWL6557/1

client:	WARBURTON CONSTRUCTIONS PTY LTD	hole commenced:	04/10/1999
principal:	PARLE FOODS	hole completed:	04/10/1999
project:	PROPOSED NEW DEVELOPMENT, FARM 1059 WILLBRIGGIE, NSW	logged by:	RB
borehole location:	REFER FIGURE 1	checked by:	

drill model and mounting: GEMCO HS7		slope:	-90 DEG	R.L. Surface:	NOT MEASURED
hole diameter:	100	bearing:		datum:	

method	penetration 1 2 3 4	support	water	samples, tests, etc	R.L.	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components	moisture condition	consistency/density index	hand penetrometer kPa (100 200 300 400)	structure and additional observations
ADV		NIL	24hrs after drilling					CL	TOPSOIL: CLAY; medium plasticity, brown, grey, some sand fine to coarse grained,	M	St		rootzone/topsoil
				U50				CH	CLAY: high plasticity, grey, trace sand fine to coarse grained,		VSt		Shrinkage = 6.7% Swell = 0.0%
				U50		1							Shrinkage = 4.3% Swell = 0.0%
						2							
						3		CH	CLAY: high plasticity, yellow, orange, grey, some sand fine to coarse grained,				alluvium
						4			Borehole BH1 Terminated at 4.00 m				
						5							
						6							
						7							
						8							

METHOD
- AS auger screwing*
- AD auger drilling*
- RR roller/tricone
- W washbore
- CT cable tool
- HA hand auger
- DT diatube
- *bit shown by suffix
- B blank bit
- V V bit
- T TC bit
- e.g. ADT

SUPPORT
- Nil no support M mud
- C casing

PENETRATION
1 2 3 4
little resistance ranging to very slow progress

WATER
- * not measured 0 none observed
- water level
- water outflow
- water inflow

SAMPLES, TESTS, ETC
- U undisturbed sample (mm)
- D disturbed sample
- Bs bulk sample
- E environmental sample
- N standard penetration test
- N* SPT + sample recovered
- Nc SPT with solid cone
- VS vane shear
- PM pressuremeter
- DP dynamic penetrometer
- WS water sample
- PZ piezometer

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
based on unified classification system

MOISTURE
- D dry
- M moist
- W wet
- Wp plastic limit
- Wl liquid limit

CONSISTENCY/DENSITY INDEX
- VS very soft
- S soft
- F firm
- St stiff
- VSt very stiff
- H hard
- Fb friable
- VL very loose
- L loose
- MD medium dense
- D dense
- VD very dense

Coffey Geosciences Pty Ltd
ACN 056 335 516

engineering log - borehole

COFFEY

borehole no: BH2
sheet 1 of 1

office job no: AWL6557/1

client:	WARBURTON CONSTRUCTIONS PTY LTD	hole commenced:	04/10/1999
principal:	PARLE FOODS	hole completed:	04/10/1999
project:	PROPOSED NEW DEVELOPMENT, FARM 1059 WILLBRIGGIE, NSW	logged by:	RB
borehole location:	REFER FIGURE 1	checked by:	
drill model and mounting: GEMCO HS7	slope: -90 DEG	R.L. Surface:	NOT MEASURED
hole diameter: 100	bearing:	datum:	

method	penetration 1 2 3 4	support	water	samples, tests, etc	R.L.	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components	moisture condition	consistency/density index	hand penetrometer kPa (100 200 300 400)	structure and additional observations
ADV		NIL	D					CL	TOPSOIL: CLAY; medium plasticity, brown, grey, some sand fine to coarse grained.	M	St		rootzone/topsoil
				Bs		1, 2		CH	SILTY CLAY: high plasticity, grey, trace sand fine to coarse grained.		VSt		
				D		3		CH	SILTY CLAY: high plasticity, yellow, grey, some sand fine to coarse grained.				alluvium
						4			Borehole BH2 Terminated at 4.00 m				
						5, 6, 7, 8							

METHOD
- AS auger screwing*
- AD auger drilling*
- RR roller/tricone
- W washbore
- CT cable tool
- HA hand auger
- DT diatube
- *bit shown by suffix
- B blank bit
- V V bit
- T TC bit
- e.g. ADT

SUPPORT
- Nil no support
- M mud
- C casing

PENETRATION
1 2 3 4 little resistance ranging to very slow progress

WATER
- X not measured
- D none observed
- water level
- water outflow
- water inflow

SAMPLES, TESTS, ETC
- U undisturbed sample (mm)
- D disturbed sample
- Bs bulk sample
- E environmental sample
- N standard penetration test
- N* SPT + sample recovered
- Nc SPT with solid cone
- VS vane shear
- PM pressuremeter
- DP dynamic penetrometer
- WS water sample
- PZ piezometer

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
based on unified classification system

MOISTURE
- D dry
- M moist
- W wet
- Wp plastic limit
- Wl liquid limit

CONSISTENCY/DENSITY INDEX
- VS very soft
- S soft
- F firm
- St stiff
- VSt very stiff
- H hard
- Fb friable
- VL very loose
- L loose
- MD medium dense
- D dense
- VD very dense

Coffey Geosciences Pty Ltd
ACN 056 335 516

engineering log - borehole

COFFEY

borehole no: BH3

sheet 1 of 1

office job no: AWL6557/1

client:	WARBURTON CONSTRUCTIONS PTY LTD	hole commenced:	04/10/1999
principal:	PARLE FOODS	hole completed:	04/10/1999
project:	PROPOSED NEW DEVELOPMENT, FARM 1059 WILLBRIGGIE, NSW	logged by:	RB
borehole location:	REFER FIGURE 1	checked by:	

drill model and mounting: GEMCO HS7		slope: -90 DEG		R.L. Surface:	NOT MEASURED
hole diameter: 100		bearing:		datum:	

method	penetration 1 2 3 4	support	water	samples, tests, etc	R.L.	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components	moisture condition	consistency/density index	hand penetrometer kPa (100 200 300 400)	structure and additional observations
ADV		NIL						CL	TOPSOIL: SILTY CLAY; medium plasticity, brown, some sand fine to coarse grained.	M	St		rootzone/topsoil
			∇ 24hrs after drilling	D		1		CH	SILTY CLAY: high plasticity, light brown, trace sand fine to coarse grained.		St/VSt		
						2							
				D		3		CH	SILTY CLAY: high plasticity, orange, yellow, some sand fine to coarse grained, trace gravel fine to coarse grained.		VSt		alluvium
						4			Borehole BH3 Terminated at 4.00 m				
						5							
						6							
						7							
						8							

METHOD
AS auger screwing*
AD auger drilling*
RR roller/tricone
W washbore
CT cable tool
HA hand auger
DT diatube
*bit shown by suffix
B blank bit
V V bit
T TC bit
e.g. ADT

SUPPORT
Nil no support M mud
C casing

PENETRATION
1 2 3 4
little resistance ranging to very slow progress

WATER
X not measured D none observed
∇ water level
water outflow
water inflow

SAMPLES, TESTS, ETC
U undisturbed sample (mm)
D disturbed sample
Bs bulk sample
E environmental sample
N standard penetration test
N* SPT + sample recovered
Nc SPT with solid cone
VS vane shear
PM pressuremeter
DP dynamic penetrometer
WS water sample
PZ piezometer

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
based on unified classification system

MOISTURE
D dry
M moist
W wet
Wp plastic limit
Wl liquid limit

CONSISTENCY/DENSITY INDEX
VS very soft
S soft
F firm
St stiff
VSt very stiff
H hard
Fb friable
VL very loose
L loose
MD medium dense
D dense
VD very dense

Coffey Geosciences Pty Ltd
ACN 056 335 516

engineering log - borehole

COFFEY

borehole no	BH4
sheet	1 of 1

office job no: AWL6557/1

client:	WARBURTON CONSTRUCTIONS PTY LTD	hole commenced:	04/10/1999
principal:	PARLE FOODS	hole completed:	04/10/1999
project:	PROPOSED NEW DEVELOPMENT, FARM 1059 WILLBRIGGIE, NSW	logged by:	RB
borehole location:	REFER FIGURE 1	checked by:	✓

drill model and mounting:	GEMCO HS7	slope:	-90 DEG	R.L. Surface:	NOT MEASURED
hole diameter:	100	bearing:		datum:	

method	penetration 1 2 3 4	support	water	samples, tests, etc	R.L.	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components	moisture condition	consistency/density index	hand penetrometer kPa 100 200 300 400	structure and additional observations
ADV		NIL	◁ 24hrs after drilling					CL	TOPSOIL: SILTY CLAY; medium plasticity, grey, brown, some sand fine to coarse grained,	M	St		rootzone/topsoil
				Bs				CH	SILTY CLAY: high plasticity, grey, trace sand fine to coarse grained,		VSt		
						1							
						2		CH	SILTY CLAY: high plasticity, yellow, grey, orange, some sand fine to coarse grained,				alluvium
						3							
						4			Borehole BH4 Terminated at 4.00 m				
						5							
						6							
						7							
						8							

METHOD
AS auger screwing*
AD auger drilling*
RR roller/tricone
W washbore
CT cable tool
HA hand auger
DT diatube
*bit shown by suffix
B blank bit
V V bit
T TC bit
e.g. ADT

SUPPORT
Nil no support M mud
C casing

PENETRATION
1 2 3 4
little resistance ranging to very slow progress

WATER
* not measured 0 none observed
▽ water level
◁ water outflow
▷ water inflow

SAMPLES, TESTS, ETC
U undisturbed sample (mm)
D disturbed sample
Bs bulk sample
E environmental sample
N standard penetration test
N* SPT + sample recovered
Nc SPT with solid cone
VS vane shear
PM pressuremeter
DP dynamic penetrometer
WS water sample
PZ piezometer

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
based on unified classification system

MOISTURE
D dry
M moist
W wet
Wp plastic limit
Wl liquid limit

CONSISTENCY/DENSITY INDEX
VS very soft
S soft
F firm
St stiff
VSt very stiff
H hard
Fb friable
VL very loose
L loose
MD medium dense
D dense
VD very dense

Coffey Geosciences Pty. Ltd
ACN 056 335 516

engineering log - borehole

COFFEY

borehole no BH5
sheet 1 of 1

client:	WARBURTON CONSTRUCTIONS PTY LTD	office job no:	AWL6557/1
principal:	PARLE FOODS	hole commenced:	04/10/1999
project:	PROPOSED NEW DEVELOPMENT, FARM 1059 WILLBRIGGIE, NSW	hole completed:	04/10/1999
borehole location:	REFER FIGURE 1	logged by:	RB
		checked by:	

drill model and mounting:	GEMCO HS7	slope:	-90 DEG	R.L. Surface:	NOT MEASURED
hole diameter:	100	bearing:		datum:	

method	penetration 1 2 3 4	support	water	samples, tests, etc	R.L.	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics colour, secondary and minor components	moisture condition	consistency/ density index	hand penetrometer kPa 100 200 300 400	structure and additional observations
ADV		NIL	0					CL	TOPSOIL: SILTY CLAY; medium plasticity, brown, some sand fine to coarse grained,	M	St		rootzone/topsoil
				Bs				CH	SILTY CLAY: high plasticity, orange, some sand fine to coarse grained,		VSt		
				D		1		CH	SILTY CLAY: high plasticity, yellow, grey, some sand fine to coarse grained,				alluvium
						2							
						3							
						4			Borehole BH5 Terminated at 4.00 m				
						5							
						6							
						7							
						8							

METHOD
AS auger screwing*
AD auger drilling*
RR roller/tricone
W washbore
CT cable tool
HA hand auger
DT diatube
*bit shown by suffix
B blank bit
V V bit
T TC bit
e.g. ADT

SUPPORT
Nil no support M mud
C casing

PENETRATION
1 2 3 4
little resistance ranging to very slow progress

WATER
X not measured 0 none observed
water level
water outflow
water inflow

SAMPLES, TESTS, ETC
U undisturbed sample (mm)
D disturbed sample
Bs bulk sample
E environmental sample
N standard penetration test
N* SPT + sample recovered
Nc SPT with solid cone
VS vane shear
PM pressuremeter
DP dynamic penetrometer
WS water sample
PZ piezometer

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
based on unified classification system

MOISTURE
D dry
M moist
W wet
Wp plastic limit
Wl liquid limit

CONSISTENCY/DENSITY INDEX
VS very soft
S soft
F firm
St stiff
VSt very stiff
H hard
Fb friable
VL very loose
L loose
MD medium dense
D dense
VD very dense

Coffey Geosciences Pty Ltd
ACN 056 335 516

engineering log - borehole

COFFEY

borehole no: BH6
sheet 1 of 1

office job no: AWL6557/1

client:	WARBURTON CONSTRUCTIONS PTY LTD	hole commenced:	04/10/1999
principal:	PARLE FOODS	hole completed:	04/10/1999
project:	PROPOSED NEW DEVELOPMENT, FARM 1059 WILLBRIGGIE, NSW	logged by:	RB
borehole location:	REFER FIGURE 1	checked by:	

drill model and mounting:	GEMCO HS7	slope:	-90 DEG	R.L. Surface:	NOT MEASURED
hole diameter:	100	bearing:		datum:	

method	penetration 1 2 3 4	support	water	samples, tests, etc	R.L.	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics colour, secondary and minor components	moisture condition	consistency/ density index	hand penetrometer kPa 100 200 300 400	structure and additional observations
ADV		NIL	O					CL	TOPSOIL: SILTY CLAY; medium plasticity, brown, grey, some sand fine to coarse grained,	M	St		rootzone/topsoil
				Bs		1, 2		CH	SILTY CLAY: high plasticity, light brown, yellow, some sand fine to coarse grained,		St / VSt		
						3		CH	SILTY CLAY: high plasticity, yellow, grey, some sand fine to coarse grained,		VSt		alluvium
						4, 5, 6, 7, 8			Borehole BH6 Terminated at 4.00 m				

METHOD
- AS auger screwing*
- AD auger drilling*
- RR roller/tricone
- W washbore
- CT cable tool
- HA hand auger
- DT diatube
- *bit shown by suffix
- B blank bit
- V V bit
- T TC bit
- e.g. ADT

SUPPORT
- Nil no support
- M mud
- C casing

PENETRATION 1 2 3 4 — little resistance ranging to very slow progress

WATER
- X not measured
- O none observed
- water level
- water outflow
- water inflow

SAMPLES, TESTS, ETC
- U undisturbed sample (mm)
- D disturbed sample
- Bs bulk sample
- E environmental sample
- N standard penetration test
- N* SPT + sample recovered
- Nc SPT with solid cone
- VS vane shear
- PM pressuremeter
- DP dynamic penetrometer
- WS water sample
- PZ piezometer

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
based on unified classification system

MOISTURE
- D dry
- M moist
- W wet
- Wp plastic limit
- Wl liquid limit

CONSISTENCY/DENSITY INDEX
- VS very soft
- S soft
- F firm
- St stiff
- VSt very stiff
- H hard
- Fb friable
- VL very loose
- L loose
- MD medium dense
- D dense
- VD very dense

29/10/99 14:38:21 P01 COFBORE VERSION B4

Coffey Geosciences Pty. Ltd
ACN 056 335 516

COFFEY

engineering log - borehole

borehole no: BH7
sheet 1 of 1

office job no: AWL6557/1

client:	WARBURTON CONSTRUCTIONS PTY LTD	hole commenced:	04/10/1999
principal:	PARLE FOODS	hole completed:	04/10/1999
project:	PROPOSED NEW DEVELOPMENT, FARM 1059 WILLBRIGGIE, NSW	logged by:	RB
borehole location:	REFER FIGURE 1	checked by:	

drill model and mounting: GEMCO HS7 — slope: -90 DEG — R.L. Surface: NOT MEASURED
hole diameter: 100 — bearing: — datum:

method	penetration 1 2 3 4	support	water	samples, tests, etc	R.L.	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics colour, secondary and minor components	moisture condition	consistency/density index	hand penetrometer kPa 100 200 300 400	structure and additional observations
ADV		NIL						CL	TOPSOIL: SILTY SANDY CLAY; medium plasticity, brown, orange, sand fine to coarse grained,	M	F		rootzone/topsoil
				Bs				CL-CH	SILTY CLAY: medium to high plasticity, orange, yellow, some sand fine to coarse grained,		St		alluvium
						1					VSt		
						2							
			▽			3					VSt/H		
						4			Borehole BH7 Terminated at 4.00 m				
						5							
						6							
						7							
						8							

METHOD
AS auger screwing*
AD auger drilling*
RR roller/tricone
W washbore
CT cable tool
HA hand auger
DT diatube
*bit shown by suffix
B blank bit
V V bit
T TC bit
e.g. ADT

SUPPORT
Nil no support M mud
C casing

PENETRATION
1 2 3 4
little resistance ranging to very slow progress

WATER
not measured D none observed
water level
water outflow
water inflow

SAMPLES, TESTS, ETC
U undisturbed sample (mm)
D disturbed sample
Bs bulk sample
E environmental sample
N standard penetration test
N* SPT + sample recovered
Nc SPT with solid cone
VS vane shear
PM pressuremeter
DP dynamic penetrometer
WS water sample
PZ piezometer

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
based on unified classification system

MOISTURE
D dry
M moist
W wet
Wp plastic limit
Wl liquid limit

CONSISTENCY/DENSITY INDEX
VS very soft
S soft
F firm
St stiff
VSt very stiff
H hard
Fb friable
VL very loose
L loose
MD medium dense
D dense
VD very dense

Coffey Geosciences Pty Ltd
ACN 056 335 516

engineering log - borehole

COFFEY

borehole no: BH8
sheet 1 of 1
office job no: AWL6557/1

client:	WARBURTON CONSTRUCTIONS PTY LTD	hole commenced:	04/10/1999
principal:	PARLE FOODS	hole completed:	04/10/1999
project:	PROPOSED NEW DEVELOPMENT, FARM 1059 WILLBRIGGIE, NSW	logged by:	RB
borehole location:	REFER FIGURE 1	checked by:	

drill model and mounting:	GEMCO HS7	slope:	-90 DEG	R.L.Surface:	NOT MEASURED
hole diameter:	100	bearing:		datum:	

method	penetration 1 2 3 4	support	water	samples, tests, etc	R.L.	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics colour, secondary and minor components	moisture condition	consistency/density index	hand penetrometer kPa (100 200 300 400)	structure and additional observations
ADV		NIL						CL	TOPSOIL: SILTY SANDY CLAY; medium plasticity, brown, sand fine to coarse grained.	M	St		rootzone/topsoil
				D		1		CH	SILTY CLAY: high plasticity, light brown, yellow, trace sand fine to coarse grained.		VSt		alluvium
			▽			2, 3							
						4		CH	SILTY CLAY: high plasticity, yellow, grey, trace sand fine to coarse grained.				
						5, 6, 7, 8			Borehole BH8 Terminated at 4.00 m				

METHOD
- AS auger screwing*
- AD auger drilling*
- RR roller/tricone
- W washbore
- CT cable tool
- HA hand auger
- DT diatube
- *bit shown by suffix
- B blank bit
- V V bit
- T TC bit
- e.g. ADT

SUPPORT
- Nil no support
- M mud
- C casing

PENETRATION 1 2 3 4
little resistance ranging to very slow progress

WATER
- X not measured
- D none observed
- ▽ water level
- water outflow
- water inflow

SAMPLES, TESTS, ETC
- U undisturbed sample (mm)
- D disturbed sample
- Bs bulk sample
- E environmental sample
- N standard penetration test
- N* SPT + sample recovered
- Nc SPT with solid cone
- VS vane shear
- PM pressuremeter
- DP dynamic penetrometer
- WS water sample
- PZ piezometer

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
based on unified classification system

MOISTURE
- D dry
- M moist
- W wet
- Wp plastic limit
- Wl liquid limit

CONSISTENCY/DENSITY INDEX
- VS very soft
- S soft
- F firm
- St stiff
- VSt very stiff
- H hard
- Fb friable
- VL very loose
- L loose
- MD medium dense
- D dense
- VD very dense

B4 VERSION COFBORE P01 14:38:59 29/10/99

Coffey Geosciences Pty. Ltd.
ACN 056 335 516

engineering log - borehole

COFFEY

borehole no: BH9
sheet 1 of 1

office job no: AWL6557/1

client:	WARBURTON CONSTRUCTIONS PTY LTD	hole commenced:	04/10/1999
principal:	PARLE FOODS	hole completed:	04/10/1999
project:	PROPOSED NEW DEVELOPMENT, FARM 1059 WILLBRIGGIE, NSW	logged by:	RB
borehole location:	REFER FIGURE 1	checked by:	

drill model and mounting:	GEMCO HS7	slope:	-90 DEG	R.L. Surface:	NOT MEASURED
hole diameter:	100	bearing:		datum:	

method	penetration 1 2 3 4	support	water	samples, tests, etc	R.L.	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components	moisture condition	consistency/density index	hand penetrometer kPa 100 200 300 400	structure and additional observations
ADV		NIL	D					CL	TOPSOIL: SANDY CLAY; low to medium plasticity, orange, sand fine to coarse grained,	M	St		rootzone/topsoil
				Bs		1, 2, 3		CL-CH	CLAY: medium to high plasticity, yellow, some sand fine to coarse grained,		VSt/H		alluvium
						4			Borehole BH9 Terminated at 4.00 m				
						5, 6, 7, 8							

METHOD
AS auger screwing*
AD auger drilling*
RR roller/tricone
W washbore
CT cable tool
HA hand auger
DT diatube
*bit shown by suffix
B blank bit
V V bit
T TC bit
e.g. ADT

SUPPORT
Nil no support M mud
C casing

PENETRATION
1 2 3 4
little resistance ranging to very slow progress

WATER
X not measured D none observed
water level
water outflow
water inflow

SAMPLES, TESTS, ETC
U undisturbed sample (mm)
D disturbed sample
Bs bulk sample
E environmental sample
N standard penetration test
N* SPT + sample recovered
Nc SPT with solid cone
VS vane shear
PM pressuremeter
DP dynamic penetrometer
WS water sample
PZ piezometer

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
based on unified classification system

MOISTURE
D dry
M moist
W wet
Wp plastic limit
Wl liquid limit

CONSISTENCY/DENSITY INDEX
VS very soft
S soft
F firm
St stiff
VSt very stiff
H hard
Fb friable
VL very loose
L loose
MD medium dense
D dense
VD very dense

COFBORE VERSION B4. 29/10/99 14:39:13 P01

TB7-230

Coffey Geosciences Pty Ltd
ACN 056 335 516

engineering log - borehole

COFFEY

borehole no: BH10
sheet 1 of 1
office job no: AWL6557/1

client:	WARBURTON CONSTRUCTIONS PTY LTD	hole commenced:	04/10/1999
principal:	PARLE FOODS	hole completed:	04/10/1999
project:	PROPOSED NEW DEVELOPMENT, FARM 1059 WILLBRIGGIE, NSW	logged by:	RB
borehole location:	REFER FIGURE 1	checked by:	

drill model and mounting:	GEMCO HS7	slope:	-90 DEG	R.L. Surface:	NOT MEASURED
hole diameter:	100	bearing:		datum:	

method	penetration 1 2 3 4	support	water	samples, tests, etc	R.L.	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics colour, secondary and minor components	moisture condition	consistency/density index	hand penetrometer kPa 100 200 300 400	structure and additional observations
ADV		NIL	D					CL	TOPSOIL: SILTY SANDY CLAY; low to medium plasticity, brown, sand fine to coarse grained,	M	S		rootzone/topsoil
				Bs U50		1		CH	SILTY CLAY: high plasticity, light brown, orange, sand fine to coarse grained,		St		alluvium Shrinkage = 4.5% Swell = 0.0% Shrinkage = 5.1% Swell = 0.0%
				U50		2		CH	SILTY CLAY: high plasticity, yellow, grey, trace sand fine to coarse grained,		VSt		
						3		CH	SILTY CLAY: high plasticity, yellow, orange, grey, some sand fine to coarse grained,		VSt/H		
						4 5 6 7 8			Borehole BH10 Terminated at 4.00 m				

METHOD
AS auger screwing*
AD auger drilling*
RR roller/tricone
W washbore
CT cable tool
HA hand auger
DT diatube
*bit shown by suffix
B blank bit
V V bit
T TC bit
e.g. ADT

SUPPORT
Nil no support
M mud
C casing

PENETRATION
1 2 3 4
little resistance ranging to very slow progress

WATER
not measured
D none observed
water level
water outflow
water inflow

SAMPLES, TESTS, ETC
U undisturbed sample (mm)
D disturbed sample
Bs bulk sample
E environmental sample
N standard penetration test
N* SPT + sample recovered
Nc SPT with solid cone
VS vane shear
PM pressuremeter
DP dynamic penetrometer
WS water sample
PZ piezometer

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
based on unified classification system

MOISTURE
D dry
M moist
W wet
Wp plastic limit
Wl liquid limit

CONSISTENCY/DENSITY INDEX
VS very soft
S soft
F firm
St stiff
VSt very stiff
H hard
Fb friable
VL very loose
L loose
MD medium dense
D dense
VD very dense

Coffey Geosciences Pty Ltd
ACN 056 335 516

engineering log - borehole

COFFEY

borehole no: BH11

sheet 1 of 1

office job no: AWL6557/1

client:	WARBURTON CONSTRUCTIONS PTY LTD	hole commenced:	04/10/1999
principal:	PARLE FOODS	hole completed:	04/10/1999
project:	PROPOSED NEW DEVELOPMENT, FARM 1059 WILLBRIGGIE, NSW	logged by:	RB
borehole location:	REFER FIGURE 1	checked by:	

drill model and mounting: GEMCO HS7 | slope: -90 DEG | R.L. Surface: NOT MEASURED

hole diameter: 100 | bearing: | datum:

method	penetration 1 2 3 4	support	water	samples, tests, etc	R.L.	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components	moisture condition	consistency/density index	hand penetrometer kPa 100 200 300 400	structure and additional observations
ADV		NIL	D					CL	TOPSOIL: SILTY CLAY; medium plasticity, brown, grey, some sand fine to coarse grained.	M	St		rootzone/topsoil
								CH	SILTY CLAY: high plasticity, light brown, orange, some sand fine to coarse grained.				alluvium
						1		CH	SILTY CLAY: high plasticity, yellow, grey, trace sand fine to coarse grained.		VSt		
						2							
						3		CH	SILTY CLAY: high plasticity, yellow, orange, grey, some sand fine to coarse grained.		VSt/H		
						4			Borehole BH11 Terminated at 4.00 m				
						5							
						6							
						7							
						8							

METHOD
AS auger screwing*
AD auger drilling*
RR roller/tricone
W washbore
CT cable tool
HA hand auger
DT diatube
*bit shown by suffix
B blank bit
V V bit
T TC bit
e.g. ADT

SUPPORT
Nil no support M mud
C casing
PENETRATION 1 2 3 4
little resistance ranging to very slow progress
WATER
not measured D none observed
water level
water outflow
water inflow

SAMPLES, TESTS, ETC
U undisturbed sample (mm)
D disturbed sample
Bs bulk sample
E environmental sample
N standard penetration test
N* SPT + sample recovered
Nc SPT with solid cone
VS vane shear
PM pressuremeter
DP dynamic penetrometer
WS water sample
PZ piezometer

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
based on unified classification system

MOISTURE
D dry
M moist
W wet
Wp plastic limit
Wl liquid limit

CONSISTENCY/DENSITY INDEX
VS very soft
S soft
F firm
St stiff
VSt very stiff
H hard
Fb friable
VL very loose
L loose
MD medium dense
D dense
VD very dense

APPENDIX B

Laboratory Test Results

Coffey Geosciences Pty Ltd A.C.N. 056 335 516

Geotechnical | Resources | Environmental | Technical | Project Management

151 Wytarra Drive, North Albury, NSW, 2640
Ph: (02) 6040 3847, Fax: (02) 6040 3861

Coffey

california bearing ratio test results

client :	*Warburton Constructions Pty Ltd*	job no :	*AWL6557/1*
principal :	*Parle Foods*	laboratory :	*ALBURY*
project :	*Proposed New Development*	report date :	*October 19, 1999*
location :	*Farm 1059, Willbriggie, NSW*	test report :	*ab*

test procedure : *AS1289 6.1.1*
laboratory compaction method : *AS1289 5.1.1*

sample number :			*990747*	*990748*		
depth:		m	*0.2 - 0.8*	*0.3 - 0.5*		
location:			*borehole 5 refer Figure 1*	*borehole 7 refer figure 1*		
date sampled:			*04/10/1999*	*04/10/1999*		
date tested:			*18/10/1999*	*18/10/1999*		
material description:			*silty clay; high plasticity, orange, some sand fine to coarse grained.*	*silty clay; medium to high plasticity, orange, yellow, some sand fine to coarse grained.*		
maximum dry density:		t/m^3	*1.48*	*1.54*		
optimum moisture content:		%	*25.5*	*23.5*		
retained on 19mm AS sieve:		%	*0.0*	*0.0*		
+19mm material included:			-	-		
C.B.R. test	before soaking: dry density	t/m^3	*1.48*	*1.55*		
	before soaking: density ratio	%	*100.0*	*100.5*		
	before soaking: moisture content	%	*25.5*	*23.0*		
	before soaking: moisture ratio	%	*100.0*	*98.0*		
	after soaking: dry density	t/m^3	*1.46*	*1.52*		
	after soaking: density ratio	%	*98.5*	*98.5*		
	after soaking: moisture content	%	*29.0*	*26.5*		
	number of days soaked:		*4*	*4*		
	surcharge:	kg	*9.9*	*10.0*		
	moisture content after test %	top 30 mm	*33.0*	*30.0*		
		remaining sample	*29.0*	*26.5*		
	swell after soaking:	%	*1.7*	*1.9*		
	penetration:	mm	*2.5*	*2.5*		
	C.B.R. value:	**%**	***5.0***	***5.0***		

remarks :

19/10/99

Authorised Signature
NATA No 1472

Coffey Geosciences Pty Ltd A.C.N. 056 335 516

Geotechnical Resources Environmental Technical Project Management

151 Wytarra Drive, North Albury, NSW, 2640
Ph: (02) 6040 3847, Fax: (02) 6040 3861

Coffey

test results

client : *Warburton Constructions Pty Ltd*
principal : *Parle Foods*
project : *Proposed New Development, Farm 1059*
location : *Willbriggie, NSW*

job no : *AWL6557/1*
laboratory : *ALBURY*
date : *26/10/99*
test report : *ab*

test procedure : *as per Laboratory Testing in Soil Engineering - CH8 by T.N.W. Ackroyd*

test date : *19/10/99 to 26/10/99*

SAMPLE IDENTIFICATION	REMOULDED DRY DENSITY t/m^3	REMOULDED MOISTURE CONTENT %	FALLING HEAD PERMEABILITY k = cm/sec	FALLING HEAD PERMEABILITY k = m/sec
Sample Number 990759, Borehole 2, 0.5 - 0.8m	*1.50*	*24.0*	8.0×10^{-10}	8.0×10^{-12}

Notes: 1. Specimens remoulded to 98% of Standard Maximum Dry Density and at Standard Optimum Moisture Content
2. Tested with Saline Solution

remarks :

26/10/99

Coffey Geosciences Pty Ltd A.C.N. 056 335 516

Geotechnical | **Resources** | Environmental | **Technical** | Project Management

151 Wytarra Drive, North Albury, NSW, 2640
Ph: (02) 6040 3847, Fax: (02) 6040 3861

Coffey

test results

client :	*Warburton Constructions Pty Ltd*	job no :	*AWL6557/1*
principal :	*Parle Foods*	laboratory :	*ALBURY*
project :	*Proposed New Development*	report date :	*October 29, 1999*
location :	*Farm 1059, Willbriggie, NSW*	test report :	*ad*
test procedure :	*AS1289 3.8.1*	test date :	*11/10/99 & 21/10/99*

SAMPLE IDENTIFICATION	EMERSON DISPESION & SHRINK/SWELL TEST RESULTS
Borehole 2, 0.4 - 2.8m	*Emerson Class Number 6*
Borehole 7, 0.3 - 1.5m	*Emerson Class Number 6*
	**Note: Saline Solution Used, Water Temperature 20°C*
Borehole 1, 0.5 - 0.7m	*Shrinkage = 6.7%* *Swell = 0.0%*
Borehole 1, 1.2 - 1.4m	*Shrinkage = 4.3%* *Swell = 0.0%*
Borehole 10, 0.5 - 0.7m	*Shrinkage = 4.5%* *Swell = 0.0%*
Borehole 10, 1.2 - 1.4m	*Shrinkage = 5.1%* *Swell = 0.0%*

remarks :

DATE 29/10/99 H.

APPENDIX E

Traffic Study – Scott Wilson Nairn Pty Ltd

Scott Wilson Nairn Pty Ltd
Transportation Planners, Engineers and Economists
PO Box 3275 BMDC Belconnen 2617
4/20 Walder Street Belconnen
Australian Capital Territory 2617 Australia

Telephone (02) 6251 7926
Int. Code 61 2
Fax (02) 6251 7927
E-mail rjnpcan@dynamite.com.au

April 17th 2000

Coffey Geosciences Pty. Ltd.
P.O. Box 803
ALBURY NSW 2640

Your Ref. No. AWL6615
Our Ref. No. P2000/69

Attention: Mr. Tony Edwards

Dear Sir,

Re: Parle Foods Development at Griffith – Traffic Study

Please find enclosed the printed sheets (including photographs) of our Traffic Impact Statement for the above project.

We are sending this in `hard copy' as the e-mail was a bit too large to send!

If you have any queries, please do not hesitate to call on (02) 62517926.

Yours faithfully,

J.A. Nairn
SCOTT WILSON NAIRN PTY. LTD.

Encl.

Parle Foods – Traffic Impact Statement

Introduction

Scott Wilson Nairn has prepared this traffic impact report at the request of Coffey Geosciences Pty. Ltd. It examines the traffic impacts of a development to be undertaken by Parle Foods Ltd. on Crawford Road about 12 kilometres South of the City of Griffith. It has been prepared in accordance with Section 2 of the Roads and Traffic Authority "Guide to Traffic Generating Developments".

In preparing this statement we have interviewed officers from the City of Griffith and from the New South Wales Roads and Traffic Authority in Wagga Wagga to ensure that their requirements were fully understood and this report has been prepared in accordance with their requirements.

Basis for the analysis

During 1999 Scott Wilson Nairn (formerly R J Nairn & Partners Pty.Ltd.) carried out a traffic and transport study of Griffith and its hinterland for the City of Griffith. During this study a traffic simulation model was developed and calibrated to predict future traffic flows on the Griffith Street system and assist in preparing a traffic management plan.

This simulation model has been used to assess the traffic and environmental impacts of the agro-industry plant being developed by Parle Foods. Traffic flows are simulated with the new development and compared with the traffic flows without the development.

It is assumed that the employment, which is created by the development is absorbed by the existing population and that there is no short-term increase in population as a direct result of the development.

Proposed changes to roads in the influence area of the development

The above traffic study proposed that, in the longer term, a bypass be sought for Hanwood town as trucks from Bartters and McWilliams plants travel through the town. Trucks from the Parle Foods development will add to this traffic. However, no action has yet been taken. Short term improvements to several intersections were also proposed but none of these are currently in urgent need of attention.

Existing Traffic

An RTA traffic counting station is located at Willbriggie not far from the intersection of Crawford Road and the Kidman Way (Hanwood Road) and RTA reports an AADT of 2,456 vehicles per day in 1997 on the Kidman Way. In recent years it has been growing at about 10% per annum.

Truck traffic generated by the development

Deliveries of raw materials (corn, tomato and peach paste, pickles, capsicum, celery, carrot, rice and onion) will mainly enter Crawford Road from Kooba Station, South along the Kidman Way. They are expected to total 150,000 tonnes per year but be delivered over a 3-month period. They will be carried in 40-tonne road trains and the peak daily traffic this generates will be a maximum of 38 road trains per day.

The deliveries will not be pre-scheduled but will be accepted 24-hours each day and therefore could bunch, but will not exceed 4-5 road trains in the peak hour.

About 5% or 7,500 tonnes of this raw agricultural produce will be delivered from farms at Northtown and Tabbita, West of Griffith, and will travel through the town and is of primary concern to this impact analysis. This traffic will not exceed 2 road trains in the peak hour and will travel along Hillston Road, Kookora Street, Willandra Avenue and Hanwood Road.

The output from the plant will total about 40,000 tonnes per year and will be carried in 20-foot containers on normal semi-trailers from the plant, along Hanwood Road to the rail head via Crossing Street. This traffic will be relatively constant throughout the year, five days per week and average about 8 trucks per day. The alternative location for a rail goods loading yard has now been sold and will not proceed.

General supplies will not cause excessive truck deliveries. Fuel for the plant is piped LPG and electricity and deliveries of cans and packaging do not add much truck traffic.

The residual material from the processing plant will be carted away in the same vehicles that deliver the raw materials, the bulk of this material being husks to be used as fertiliser at Cooma Station.

Commuters and visitor traffic generated by the development

It is proposed that 160 new jobs will be provided by the development. The plant will work 24 hours each day but there will be seasonal peaks in handling deliveries. No accommodation is being provided on site.

The worst case commuter scenario assumes that there will be no bus service to the site and that all employees will travel from Griffith to the site during the normal Griffith traffic peak hour. This is the assumption used for the traffic simulation and intersection analysis.

It is expected that there will be some visitors to the site, including tourists, salesmen and deliveries. These have also been estimated and included in the simulation. There is ample space for commuter and visitor parking on site.

Public Transport

There is no public transport service to the site at present. The analysis shows that there is no adverse effect on public transport modal share due to the development. On the contrary, the development provides an opportunity for a bus company to provide a commuter service from Griffith to the site.

Pedestrians

The site is rural and there are no special pedestrian or cyclists facilities between the site and Griffith. There is not expected to be any pedestrian or cyclist travel demand to or from the site.

Site Access and Intersection Works

All other major intersections in Griffith, which are influenced by the traffic impacts of the development, have been analysed to determine if these impacts are sufficient to create the need for immediate intersection improvement works.

In particular the following intersections, which had earlier been identified as requiring improvement to roundabout standard within the next five years, were fully analysed.

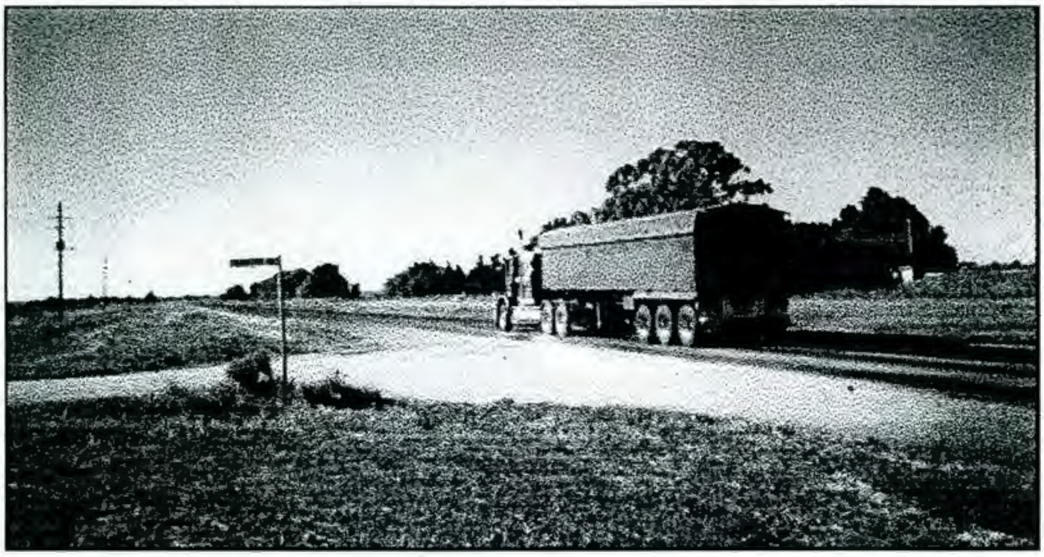
Estimated Degree of Saturation at Intersections in year 2003

Intersection	Before	After
Willandra Av/Kookora Street	0.22	0.23
Murrambidgee Av/Kookora Street	0.20	0.21
Mackay St/Yenda Road	0.33	0.34

Source: TRANSTEP flow predictions and INTANAL analysis

The additional traffic flows at no intersection exceeded 3% of the traffic without the Parle Foods development and no intersection suffered appreciably worse level of service, delays or queue lengths as a result.

The intersection between Crawford Road and MR 321 the Kidman Way is pictured below:-



This intersection must be improved to type AUR right turn treatment with 100 KpH truck acceleration and deceleration lanes from the North and the South. It has been agreed that this intersection and the access road to the site will be designed and constructed by the City of Griffith, who will thereby take responsibility for the safe and efficient design and construction of the intersection.

Internal traffic arrangements

A detailed site layout drawing has been supplied by Parle Foods. An examination of this drawing shows that the internal traffic arrangements are quite adequate for trucks, commuters and visitors and there is ample parking available on site.

Additional Road Maintenance Costs

Apart from the annual cost of maintaining Crawford Road to the site access road from the Kidman Way, the added annual costs of road maintenance on other roads in the network due to increased traffic on them, is estimated to be negligible (about $1,000 per annum).

Motor Vehicle Accidents

The annual value of motor vehicle accidents in Griffith, including the value of time lost by all vehicles delayed by accidents, is expected to increase by about $46,000 as a result of the additional commuter and truck travel generated by the development. Intersection accidents are not expected to increase appreciably (less than $500 extra costs) and the accident increase will be on rural roads.

Hanwood Town

Traffic levels will increase through Hanwood Town, which has already been identified as in eventual need of a bypass route. At present the traffic level, even with the new development, will not approach the normal thresh-hold at which street calming is considered essential to protect pedestrians and residents. However, the pedestrian refuge island in Hanwood should be improved to provide more positive protection.

Noise

The development does not increase the noise level of any further part of the Griffith road network above 68 dBA, which is considered to be the maximum suitable for residential areas. The noise level on about 1.5 kilometres of road is increased into the 63 dBA – 68 dBA range.

Noise levels through Hanwood Town have been investigated in detail. The Hanwood School, the location of which is pictured below, is approximately 50 metres from the road and noise levels in the peak hour will rise to a maximum of 53 dBA, which is considered to be quite adequate for schools.

Noxious Gas Emissions

The traffic impacts from the development have been assessed to ascertain the additional noxious gas emissions generated from transport sources.

The added daily emissions are estimated to be as follows:-

Total Daily Transport Emissions of Griffith Network (Grams)

Emission	Before	After	Difference
Hydro-Carbons	1,361.80	1,373.17	12.63
Carbon Monoxide	8,487.21	8,543.79	56.58
Nitrogen Oxides	2,131.84	2,154.01	22.17
Sulphur Dioxide	49.88	50.34	0.46
Particulates	58.88	59.43	0.55
Lead	3.51	3.54	0.03
Acetaldhy	1.89	1.91	0.02
Acetone	0.07	0.07	0.00
Benzene	4.45	4.48	0.03
Butadyene	0.53	0.54	0.01
Ethyl Benzine	3.53	3.55	0.02
Formaldehyde	4.86	4.91	0.05
Hexane	0.79	0.79	0.00
Meth Eth K	0.07	0.07	0.00
PAH	0.04	0.04	0.00
Toluene	9.46	9.53	0.07
Xylene	4.67	4.70	0.04

Source: Griffith TRANSTEP model

These added transport emissions are located in areas where emission intensities are low and the increased emission intensities are not sufficient to present any known risk to health. The greenhouse (Carbon Dioxide) emissions from transport sources increase by 104 Kilograms daily.

Carriage of Hazardous Goods

The only hazardous chemical identified to be in use by the development is acid for pH control of the landscape works. This will be transported from Sydney and need not travel on urban streets. It does not present any serious hazard to residents or road users.

Dust

The only dust hazards will arise on the site itself until the internal part of the approach road is sealed. It is at present gravelled and does not present a dust hazard but it will need to be maintained to reduce future dust risk.

Conclusions

While the food processing plant generates considerable truck traffic, most of this traffic approaches from the South of Crawford Road where it does not cause severe traffic impact problems.

That generated traffic, which passes through Hanwood and Griffith, has been comprehensively analysed and produces negligible adverse effects. No intersections in Griffith require accelerated improvements. Noise levels and noxious gas emissions are not brought up to hazardous levels. Vehicular accident costs will continue to grow commensurate with the development but there is no increase in accident hazards, which is directly attributable to the development.

APPENDIX F

Flora and Fauna Study

ETTAMOGAH RESEARCH CONSULTANTS

PROPOSED PARLE FOOD PROCESSING PLANT DEVELOPMENT WILLBRIGGIE via GRIFFITH, NSW

FLORA AND FAUNA ASSESSMENT

MARCH 2000

Craig Grabham
Damian Michael

PROPOSED PARLE FOOD PROCESSING PLANT DEVELOPMENT

WILLBRIGGIE via GRIFFITH, NSW

FLORA AND FAUNA ASSESSMENT

March 2000

Ettamogah Research Consultants

Craig Grabham
Damian Michael

Ettamogah Research Consultants
PO Box 5021, Murray Region MSC, Lavington NSW 2708
Phone: 02 60259269 or 0412722814 Fax: 02 60259322 or email erc_@primus.com.au

Table of Contents

Appendices

List of Figures

List of Tables

1. Introduction

A flora and fauna assessment was conducted by Ettamogah Research Consultants at Willbriggie via Griffith, NSW, to assess the potential impacts of a proposed food processing plant on native flora and fauna. The assessment was carried out in order to satisfy the requirements as set out by the News South Wales National Parks and Wildlife Service and The Department of Urban Affairs and Planning in regards to flora and fauna assessment, with respect to the *Environmental Planning and Assessment Act 1979*, as modified by the NSW *Threatened Species Conservation Act 1995*.

The principal operation of the proposed development is the processing and packaging of regionally produced fruit and vegetables for markets within Australia and to a lesser degree overseas. The proposed plant infrastructure will include:

- One freezer storage shed and one dry goods and packaging shed;
- One food processing factory (already constructed);
- External product handling hardstand areas;
- A weighbridge;
- Administration building;
- A main internal access road off Crawford road; and
- Water storage dams/ponds, including the recently constructed freshwater dam.

The aims of the flora and fauna assessment are:

- To identify and describe threatened flora species and other native flora species and vegetation communities present on the subject site and assess their conservation significance;
- To identify and describe the threatened fauna species and other native fauna species and habitats which are present, or which may occur on the subject site and surrounds, and assess their conservation significance;
- To identify potential impacts to be imposed upon any threatened species or other native flora and fauna and the general environment;
- Assess the significance of potential impacts arising from the proposed development on any threatened flora and fauna as well as other native flora and fauna which may occur at the site and with respect to Section 5A of the NSW *Environmental and Planning Assessment Act 1979 (EP&A Act 1979)*; as modified by the NSW *Threatened Species Conservation Act 1995 (TSC Act 1995)*; and
- To provide recommendations based on these findings, that will mitigate the effects of the proposed work on the native flora, fauna, their habitats and the general environment.

Ettamogah Research Consultants was engaged in this consultation as of the 10th of March 2000 by Coffey Geosciences. This was consequently after the construction of the large shed (presumably the food processing factory), freshwater storage dam and implementation of several roads within the study area. Ettamogah research Consultants does not claim responsibility to any impacts upon native flora and fauna prior to this engagement.

2. Qualifications and skills of the consultant

Craig Grabham has a Bachelor of Applied Science in Parks, Recreation and Heritage. He currently holds licences for conducting flora and fauna studies with the NSW NPWS and the Animal Care and Ethics Committee of Charles Sturt University. He has conducted flora and fauna assessments in a variety of environs in south-eastern Australia.

Damian Michael has a Bachelor of Applied Science in Parks, Recreation and Heritage. He has completed a range of flora and fauna assessments for Parks Victoria, Gunninah Environmental Consultants and The Johnstone Centre of Charles Sturt University.

3. Site Location and Description

The proposed site for development is located on farm lot 1059 at Willbriggie, approximately 10km south of the centre of Griffith. The study area is approximately 178ha. Principal access to the site is via Main Road 321, which runs from Darlington Point through to Griffith (figure 1 location map).

The study area in the past has been used as a farm for principally the growing of rice. The area has been laser levelled because of this in order to facilitate irrigation usage. Several old abandoned farm buildings remain on the property in the south-east portion of the study area.

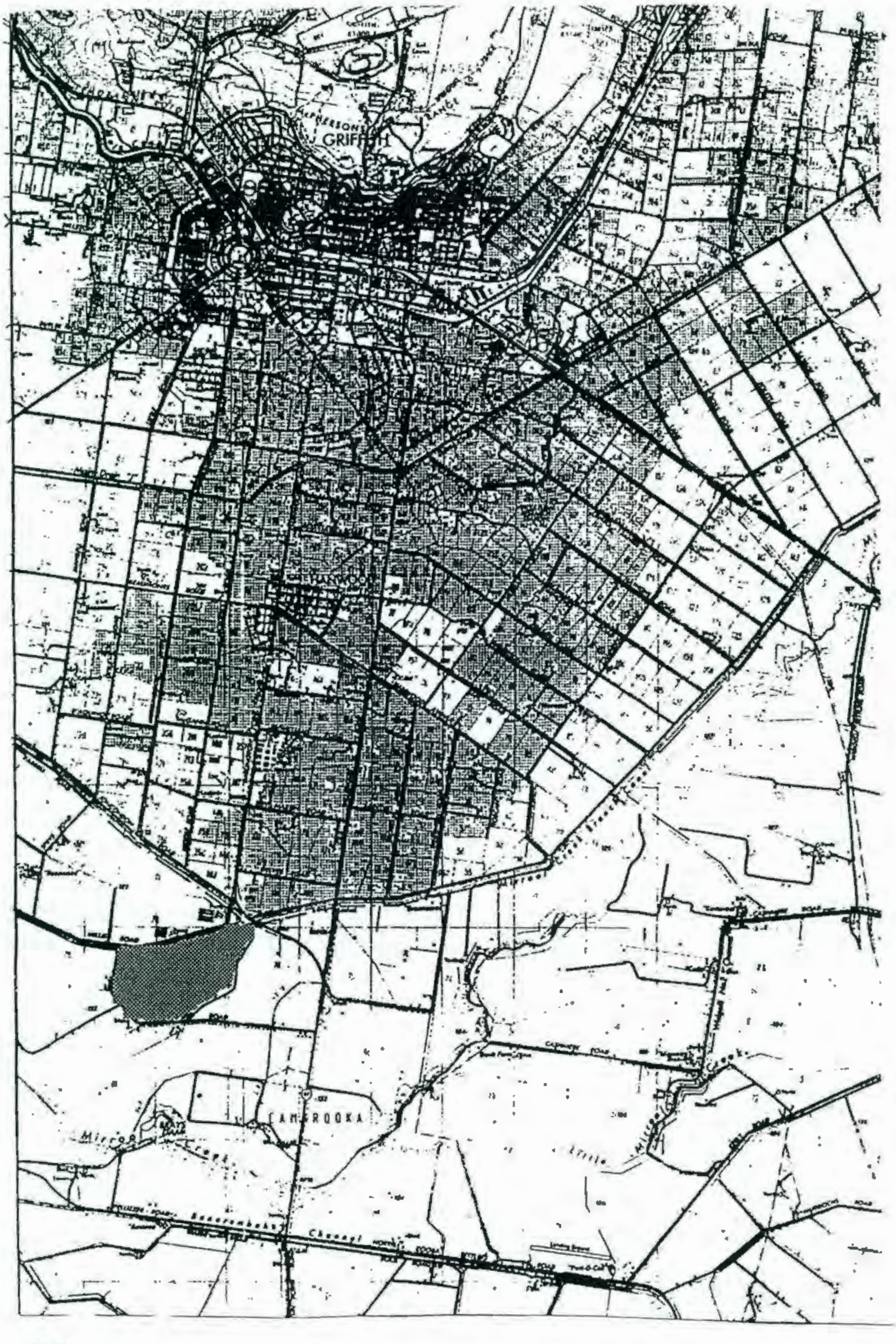
The only remaining natural feature is a low-lying swampy area of approximately 4ha, located in the central area of the site. Although largely unmodified this area, like the remaining area of the site, is dominated by weeds. This area has essentially served as a drainage basin for surface water overflows during storm periods prior to cultivation of the area. Almost the entire area has been overcome with weeds typically associated with rice cultivation. Some dead remnants can be found in the swamp area. Minor revegetation works have been undertaken along the irrigation channels found around the boundaries and in a small section of the study area.

4. Methodology

Information was collected on those threatened species and other species known to occur in the Griffith region. Information sources used in order to obtain an accurate inventory of threatened species and other species in the area include:

- NSW NPWS Wildlife Database Atlas
- Griffith City Council
- Murrumbidgee Irrigation, Griffith
- Murrumbidgee Field Naturalists
- Birds Australia, Database Atlas
- NSW Department of Agriculture
- Rare or Threatened Plant Species Database (ROTAP).
- Other relevant literature.

Figure 1 Location Map



Denotes relative location of Lot 1059, DP751686, Part 77

Coffey Geosciences Pty Ltd ACN 056 335 516		Geotechnical | Resources | Environmental | Technical | Project Management	
Drawn	MH	PARLE FOODS PTY LTD PROJECT OVERVIEW PROPOSED FOOD PROCESSING PLANT FARM 1059, DP751686, PART 77, WILLBRIGGIE, NSW	Drawing no: FIGURE 1
Approved	AE		
Date	30/11/99		
Scale	N.T.S		Job no: AWL6615/1

4.1 Time Frame and Potential Limitations

The fauna survey was conducted on the 23rd of March 2000. The weather and the timing of the study during late summer probably reduced the ability to detect the presence of some native biota, because climatic conditions and season particularly affect the movements and activity patterns of both native flora and fauna alike. The majority of introduced pasture species have already seeded at this time of the year making it difficult to determine the exact extent of weed invasion upon the site and the total number of weed species found at the site. Likewise most native flowering plants would also already have flowered. Time constraints and other limitation were also placed upon the assessment. Ideally the assessment should have been conducted during the initial stages of the proposal in order to minimise potential impacts of the development. Despite these potential limitations and taking into consideration the nature of the proposal and condition of the site the survey effort and duration were likely to be extensive enough to reduce the influence of these factors on the results obtained.

4.2 Flora

To determine the vegetation communities and associated habitat types occurring at the site two methods were used:

- Aerial photograph interpretation; and
- Field surveys of the vegetation of the area.

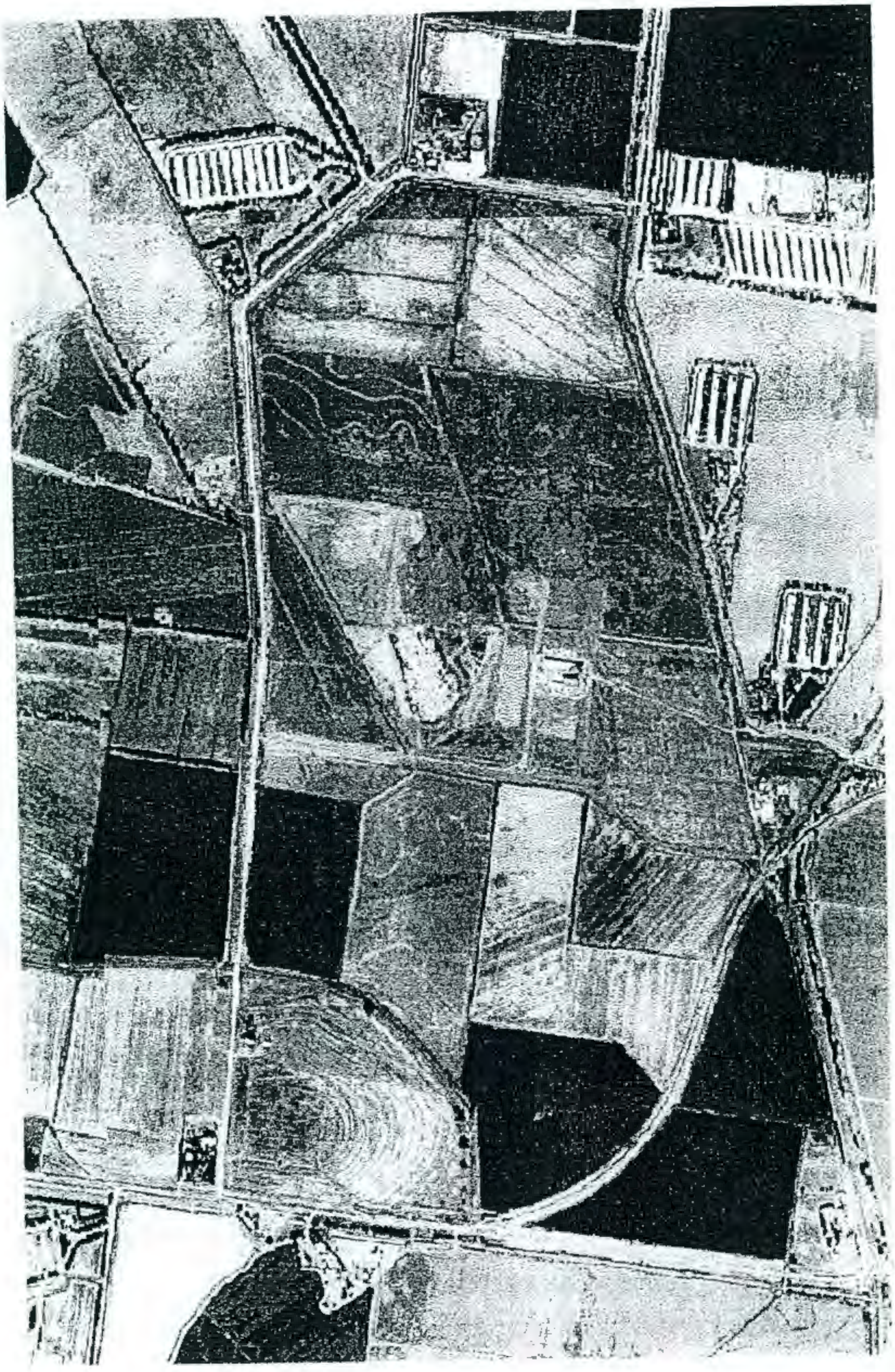
Prior to undertaking detailed ground surveys, mapping of basic vegetation communities was undertaken by aerial photograph interpretation (figure 2 aerial photograph of site) involving several steps:

- Undisciplined pattern typing involving the division of landscape into component parts by delineation of boundaries. Areas are examined to show the same basic pattern;
- Establishing relationships involving the comparison of areas for similarities of pattern. Each pattern area is compared to all others to determine if any are essentially the same. Diagnostic factors include colour tone, texture and topography; and
- Each pattern is then assigned a code, now classified as vegetation types. These vegetation types were then checked against field guides and other relevant literature for the region.

Field surveys of the vegetation of the area of the proposed development were then conducted in order to ground truth and verify the selection of vegetation types determined from the aerial photograph. Sample sites were chosen with the aim of representing the range of vegetation communities and visually different habitats eg. irrigation channels, drains, depressions etc. These sites were then surveyed for the presence and absence of floral species and suitable habitat characteristics such as availability of foraging substrate, suitable shelter in the form of hollows, feed trees etc. Other factors taken into consideration included the possible association with threatened fauna and flora species.

A broad survey was conducted of the vegetation situated along the boundaries outside of the study area. This involved recording some flora species, vegetation communities and suitable habitat characteristics such as availability of foraging substrate, suitable hollows, feed trees etc. The vegetation

Figure 2 Aerial Photograph Of Study Site



types/communities for the study site and surrounds were classified according to Specht's classification system 1981.

Field guides used to identify flora specimens included, Greig (1999) Field Guide to Australian Wildflowers, Cronin 1998 Key Guide To Australian Wildflowers, Costermans (1998) Native Trees and Shrubs Of South-Eastern Australia. Marriott, N. & Marriott, J. (1998) Grassland Plants of South-Eastern Australia, Auld, B.A. & Medd, R.W. (1997) Weeds, An illustrated botanical guide to the weeds of Australia, Brooker, M.I.H. & Kleinig, D.A. (1999) Field Guide to Eucalypts, Volume 1 South-eastern Australia (second edition).

4.3 Fauna

In order to determine if the threatened species were present at the site specific methodologies were used to target threatened species and habitat characteristics of these species during the course of the field survey. These techniques were used to maximise results considering the season and time limitations imposed upon the survey.

Throughout the survey particular attention was paid to the presence of threatened fauna, which could potentially be in the region. The NSW National Parks & Wildlife Service Wildlife Atlas and current records from the Murrumbidgee Field Naturalists were reviewed as part of this process. Habitat and other resources, which could be used by rare or threatened species, were also identified.

Birds

Diurnal Surveying and Opportunistic Sampling

Surveys of diurnal bird species were undertaken whilst conducting vegetation surveys of the site. Opportunistic sampling also includes indirect searches for birds, such as searches for whitewash and regurgitation pellets of owls, particularly in close proximity to mature trees with large hollows. Sampling of nocturnal birds is also undertaken when spotlighting for amphibians.

Mammals

Diurnal Searches

Searches for indirect evidence to suggest the presence of a species, including scats and examination of burrows, tracks and diggings were also conducted during vegetation surveys of the study site. Nocturnal searches were also undertaken whilst conducting amphibian spotlighting searches of the study area.

Reptiles and Amphibians

Diurnal searches for reptiles were undertaken across the study area while undertaking other activities. Searches were made beneath ground litter, such as scrap metal and sheets of iron, fallen timber, leaf litter, decorticated bark stones and tufts of vegetation. These searches covered the entire area of the study site.

Nocturnal searches for amphibians were conducted within the study area. Searches involved spotlighting and quiet listening to identify calls and locations along irrigation channels around the perimeter of the study area and the large dam located near the centre of the study area.

5. Results

5.1 New South Wales Threatened Species

The following threatened species list is compiled from the NSW NPWS Wildlife Atlas 10km by 10km search centred on the following co-ordinates, Zone 55 Eastings 401000 to 411000 and Northings 6205000 to 6215000. Threatened species found in the region as a result of previous field studies conducted by the Murrumbidgee Field Naturalists were also taken into consideration. As a result the following species (table 1) were considered to possibly occur in and around the region of the study area, and so were specifically considered during the study design and implementation.

None of the listed species of threatened flora and fauna identified from the various database sources were recorded on the study site during the current field investigations. It is *very unlikely* that any of these threatened flora and fauna species would occur within the study area.

5.2 Flora of the study area

The area surveyed encompassed a number of old terraced rice fields and a recently dredged irrigation channel which ran along the North, West and Southern edges of the site. Introduced plant species reached maximum diversity either side of the irrigation channel, where also a number of native Chenopod species were found. Overstorey species were present only along the fence line bordering the site and near a run down shed within the site. These trees consisted of scattered native Eucalypts, Acacias and introduced Willow species. A full flora species list can be found in appendix 1.

The flora within the site was dominated by tall growing species from the Asteraceae family and includes *Conyza albida*, *Lactuca serriola*, *Pichris echiodes*, *Aster subulatus* and *Cirsium vulgare*. The combination of these plants growing in a thick sward offers very little in the way of habitat for native animals. The structural diversity of the site is very low, consisting of only one stratum. Most avifauna, especially passerines are therefore restricted to the perimeter of the site where nesting materials, roosts and food can be found within the scattered line of trees. Structural and species diversity is greater at the perimeter and reflects this by supporting more birds. More vegetated layers rather than flora species diversity is seen to correlate with a higher bird diversity (Ford 1989; Recher, Lunney & Dunn 1996). Only one species of avifauna was found utilising the heavily infested area, this being a White-fronted Chat. It was likely that the bird was utilising this section of area in association with the large dam recently constructed near the centre of the site.

Species	Survey	Legal Status and/or Risk Code	Likelihood to occur at the site
Lomandra patens	NP	3RCa	No
Litoria raniformis Southern Bell Frog	NP	Endangered (Schedule 1-part1)	Unlikely
Burhinus grallarius *Bush Stone-curlew*	NP	Endangered (Schedule 1-part1)	No
Pachycephala fogularis Red-lored Whistler	NP MF	Endangered (Schedule 1-part1)	No
Pedionomus torquatus Plains Wanderer	NP	Endangered (Schedule 1-part1)	No
Leipoa ocellata Malleefowl	NP OS	Endangered * (Schedule 1-part1)	No
Xanthomyza phrygia Regent Honeyeater	NP	Endangered * (Schedule 1-part1)	No
Calyptorhynchu lathami Glossy Black-Cockatoo Riverina population	NP MF	Endangered (Schedule 1-part2)	No
Limosa limosa Black-tailed Godwit	NP MF	Vulnerable (Schedule 2)	No
Pandion haliatus Osprey	NP	Vulnerable (Schedule 2)	No
Falco hypoleucos Grey Falcon	NP MF	Vulnerable (Schedule 2)	Unlikely
Grus rubicundus Brolga	NP MF	Vulnerable (Schedule 2)	No
Rostratula benghalensis Painted Snipe	NP MF	Vulnerable (Schedule 2)	No
Botaurus poiciloptilus Australasian Bittern	NP MF	Vulnerable (Schedule 2)	No
Anseranas semipalmate Magpie Goose	NP MF	Vulnerable (Schedule 2)	No
Strictonetta naevosa Freckled Duck	NP MF	Vulnerable (Schedule 2)	Unlikely
Oxyura australis Blue-billed Duck	NP MF	Vulnerable (Schedule 2)	Unlikely
Cacatua leadbeateri Major Mitchell Cockatoo	NP MF	Vulnerable (Schedule 2)	Unlikely
Calyptorhynchus lathami Glossy Black-Cockatoo	NP MF	Vulnerable (Schedule 2)	No
Neophema pulchella Turquoise Parrot	NP	Vulnerable (Schedule 2)	No
Polytelis swainsonii Superb Parrot	NP MF	Vulnerable (Schedule 2)	No
Ninox connivens Barking Owl	NP	Vulnerable (Schedule 2)	Unlikely
Drymodes brunneopygia Southern Scrub-robin	NP OS	Vulnerable (Schedule 2)	No
Hylacola cauta Shy Heathwren	NP	Vulnerable (Schedule 2)	No
Certhionyx variegatus Pied Honeyeater	NP	Vulnerable (Schedule 2)	No

Grantiella picta Painted Honeyeater	NP MF	Vulnerable (Schedule 2)	No
Cinclosoma castanotus Chestnut Quail-thrush	NP	Vulnerable (Schedule 2)	No
Pachycephala inornata Gilbert's Whistler	NP	Vulnerable (Schedule 2)	No
Lathamus discolor Swift Parrot	NP	Vulnerable * (Schedule 2)	No
Nyctophilus timoriensis Greater Long-eared Bat	NP	Vulnerable (Schedule 2)	No

Table 1: Threatened Flora and Fauna

Legal Status: This identifies the legal status of the species within NSW, under the Threatened Species Conservation Act 1995 or the National Parks and Wildlife Act 1974 (* denotes species that are listed under the Commonwealth's Endangered Species Protection Act, 1992).
ROTAP Risk Code: refers to the conservation status code for rare or Threatened Australian Plants (Briggs and Leigh 1996).
3RCa
3 Species in Australia with a geographic range of greater than 100km,
R Rare: taxon which is rare in Australia and hence usually the world, but which currently does not have any identifiable threats. May be represented by a large population in a very restricted area or by smaller populations spread over a wide range or some intermediate combination of distribution pattern.
C Reserved, has at least one population within a National park, conservation reserve, area dedicated for protected flora. The taxon may or may not be considered adequately conserved within the reserve(s)
Size class of reserved populations (a) 1000 plants or more are known to occur within a conservation reserve(s)
Survey NP – NPWS Wildlife Atlas Database
MF – Murrumbidgee Field Naturalists
OS – other sources **Morcombe, M. (1986).** ***The great Australian birdfinder***
Likely to occur at the site – No (no suitable habitat on site, or surrounding site) **Unlikely** (some suitable habitat in region and surrounding areas of the site) **Likely** (recorded in the region, close to the site, suitable habitat on site), **Yes** (recorded at site)

5.3 Fauna of the study area

A total of 20 vertebrate fauna species were recorded in the study area including all species recorded during surveying times and incidental observations. Of these three were introduced species. The majority of these species are typical of those found in cultivated landscapes of the area, largely comprising of a single stratum, which in turn provides very little suitable habitat for native species. The majority of species found within the study area are relatively tolerant to disturbances. A full species list can be found in appendix 2.

Additional species have been recorded in the Griffith region as a result of previous studies and database searches (NSW NPWS, Ettamogah Research Consultants and Murrumbidgee Field Naturalists). These records are from an extensive area and although it is possible that some of the more mobile species could use the subject site on occasions, it is very unlikely that any species would solely rely on the resources provided by the site for their continued existence. This conclusion is to the fact that less disturbed habitat within the region of the study area is available and more than ample landscape replicates of the resources offered by the study area are also available in the immediate region.

Birds

A total of 15 native species and two introduced species were recorded at the study site. A full species list can be found in appendix 2.

Generally larger and more aggressive wide- ranging birds, which are relatively tolerant to disturbances were typically recorded on the site. These species may forage over the site on occasions and include the Eastern Rosella, Magpie –lark, Willy Wagtail, Australian Magpie, Australian Raven and the Galah.

It is likely that the irrigation channels bordering the entire site do provide feeding opportunities for a number of bird species. Even though at the time the surveys were conducted the channels had been recently dredged, removing most of the vegetation. These channels still however supported large numbers of Spotted Marsh Frog *Lymnodynastes tasmaniensis* and Yabbies, which are staple food items for many largely aquatic bird species including Ibis, White-faced Heron, Egrets and Spoonbills.

It is most likely that a number of common bird species from the region may frequent the site on occasions, particularly during different seasons and when different plant species are in flower.
A total of 27 threatened bird species as listed under the *TSC Act 1995* were recorded in previous studies from the region, but none were recorded during this investigation of the study area, or have been recorded within the study area previously. Although several species have the potential to occur within the study area on occasions it is considered very *'unlikely'* that these species are solely dependent upon the resources within the study area for their survival. These species are discussed further in section 5.3.

Mammals

Only a single Rabbit *Oryctolagus cuniculus* was recorded during the current field investigations. No other mammal species were recorded during the current survey of the study area. Likewise very little suitable habitat was recorded for native mammal species within the study area at the time of the field investigation.

No evidence was found to suggest that any threatened mammal species occurred within the site at the time of the field investigation. It is considered *'unlikely'* that any would occur on the site, with the exception of the more mobile, widely ranging microchiropteran bat species which may occur within the study area on an occasional basis.

Reptiles

No reptile species were recorded during the current survey of the study site, neither was suitable habitat found for reptiles. No evidence was found to suggest that any threatened mammal species occurred within the study area at the time of the field investigation. It is considered *'unlikely'* that any would occur within the study area.

Amphibians

Two amphibian species were frequently recorded throughout the entire survey. Both species were heard calling during the day whilst conducting vegetation surveys and at night when conducting spotlighting surveys. Both species are identified as common and can be found throughout most of eastern Australia.

The Spotted Marsh Frog *Lymnodynastes tasmaniensis*, was recorded frequently in and around the irrigation channels and the large dam near the centre of the site. It was recorded so frequently that in excess of 100 individuals would have been recorded within both areas. It is a very adaptable species and is often the first frog to take advantage of new dams, ditches and water-covered areas on disturbed ground (Cogger 2000 and Robinson 1998). It can be found in woodland, shrubland and grassland from the east coast through to the interior. It is usually found under cover near water by day. After rain, it breeds among the shallow grassy borders of both temperate and permanent watercourses. (Cogger 2000 and Robinson 1998).

The Plain's Froglet, *Crinia parinsignifera*, was also recorded throughout the study area, but not as frequently as *Lymnodynastes tasmaniensis*. It is usually found in areas of woodland, which are covered with water, open areas and disturbed sites (Cogger 2000 and Robinson 1998). It calls from grasses within and fringing temporarily inundated areas, usually after rain. It can be heard calling year round, often during the day (Cogger 2000 and Robinson 1998).

Litoria raniformis, Green or Warty Swamp Frog or Southern Bell Frog is distributed across the south-eastern slopes and plains of NSW, across all of Victoria to southeast South Australia and Tasmania (Cogger 2000). It is usually found in permanent lagoons, lakes, ponds and dams, especially those with bulrush and emergent vegetation. It is often found under debris on low, oft-flooded river flats, being frequently active by day (Cogger 2000 and Robinson 1998). It breeds during the summer months with the males calling whilst floating in the water from August to April (Cogger 2000 and Robinson 1998). The large dam recently constructed near the centre of the site did provide some habitat for the above mentioned species. The dam however has very little emergent vegetation and vegetation around the banks. The surrounding irrigation channels had also been recently dredged. Given the nature and condition of the study area in relation to it providing suitable resources for *Litoria raniformis*, it is very unlikely that it would be found within the study area.

5.3 Flora and Fauna of Conservation Significance

Falco hypoleucos Grey Falcon

The Grey Falcon is also a vulnerable bird that is found over open country and wooded areas of tropical and temperate Australia (Olsen et al. 1993; Higgins & Davies 1996). Predominantly occurs in arid to semi-arid zones which have a mean annual rainfall <500 mm. It is also found near and over swamps and waterholes. The breeding range has contracted since 1950s due to clearing and farming in the semi-arid zone and from over-grazing in the arid zone. Estimated total population is 1000 pairs and probably fewer than 5000 individuals. Within NSW it is sparse within the Murray-Darling Basin, with records from Fivebough Swamp and Tuckerbil

Swamp in Leeton (Taylor & Glazebrook 1998) and the Brobenah Hills southeast of Leeton (Murrumbidgee Field Naturalists 1999d). It is not likely that there would be any *'significant effect'* on this species as a result of the proposal, even if it did occasionally occur within the study area.

Strictonetta naevosa Freckled Duck

It has been recorded from wetlands across southern Australia with the major concentrations in the Coopers Creek and Bulloo River catchments. Outside this area, breeding also records include the Murray-Darling catchment, notably those along the Paroo and Lachlan rivers, as well as swamps within the Millicent Basin of South Australia and Victoria. During extensive inland droughts, permanent wetlands in the Murray River Basin, south-eastern Queensland, eastern New South Wales and southern South Australia can become important refuge areas during inland drought conditions (Marchant and Higgins, 1990). In inland eastern Australia, Freckled Ducks breed in freshwater wetlands thickly vegetated with Lignum *Muehlenbeckia cunninghamii*, within which the birds build their nests (Braithwaite1976). It is very unlikely that the Freckled Duck would rely solely upon the resources offered by the study area for it to survive. It may in the future use the recently constructed dam of the study area for a temporary foraging site or a refuge. However even if it did occur within the study area it is unlikely that the proposed development would have *'significant effect'* upon this species.

Oxyura australis Blue-billed Duck

This species can be found on terrestrial wetlands of southeast and southwest Australia. It prefers deep water in large, permanent wetlands, especially lakes, swamps and sewage ponds (Higgins & Davies 1996). The bird is regarded as vulnerable due to freshwater habitats being destroyed or modified by drainage, clearing, grazing, increased salinity and groundwater extraction (Higgins & Davies 1996). In New South Wales it is widespread, but mostly found within the Murray-Darling Basin. It has been observed frequently at Fivebough Swamp near Leeton (Taylor & Glazebrook 1998; Murrumbidgee Field Naturalists 1999e; 1999f) and at Nericon Swamp and Campbells Swamp (64+ birds) within the Lake Wyangan Wetlands, Griffith (Murrumbidgee Field Naturalists 1999c). It may in the future use the recently constructed dam of the study area for a temporary foraging site or a refuge. However even if it did occur within the study area it is unlikely that the proposed development would have *'significant effect'* upon this species.

Ninox connivens Barking Owl

Found sparsely distributed through temperate and semi-arid regions from Cooktown, Qld, to Flinders Ranges, S. A., extending inland to the Lake Eyre, Bulloo and Murray Darling Basins. The present general distribution is as above but local declines or extinctions have been recorded in the Herbert River district, Qld (Young and de Lai 1997) and through much of New South Wales (Debus 1997), Victoria (Silveira 1997) and South Australia (Parker 1988; Higgins 1999) as well as in south-west Australia (Johnstone and Storr 1998). Population in Victoria estimated at 50 pairs (Silveira *et al* 1997). The southern subspecies of Barking Owl *N. connivens connivens*, occurs primarily in dry sclerophyll woodland, nesting in large hollows in live eucalypts, often near open country (Higgins 1999; NSW NPWS 1999). Much of the habitat of the southern subspecies of Barking Owl has been cleared (Silveira 1997; Higgins 1999; NSW NPWS; 1999) and forestry practices, particularly those that include the felling of old-growth forests or over-mature trees, further threaten the species (Kavanagh *et al* 1995b). On private land, much of the remaining habitat is fragmented and subject to further clearing, firewood collection and grazing, and there has been little regeneration (Barrett *et al* 1994; Robinson and Traill 1996; Debus 1997; NSW NPWS 1999). It is not likely that there would be any *'significant effect'* on this species as a result of the proposal, even if it did occasionally occur on the subject site.

6. Potential Impacts of the Proposed Development

The suite of survey techniques used in this study are believed to have revealed the presence of the majority of species present within the study site during the time of the survey, except for the possible limitations as described earlier. None of the flora or fauna species recorded during the survey are considered rare or threatened as listed under the *Threatened Species Act 1995*.

In general terms, the removal of this vegetation is not regarded as of particular consequence, because of its disturbed and degraded state, lack of significant resources and habitat features required by native flora and fauna and its relatively small size. Disturbances associated with this proposal will almost entirely be limited to previously cultivated areas. Given the nature of the proposed development and condition of the study area and the proposed future revegetation of the site it is not likely that the proposal will involve a significant loss of vegetation in either local or regional terms.

It is *very unlikely* that a *'significant component of habitat'* for any of the native flora and fauna found within the region (including threatened species) will be affected. The proposed works will affect some species. Yet it is *very unlikely* that the proposed works will have a *'significant effect'* upon the survival of any of the native species mentioned in this report or those that may otherwise use the study site as part of their overall habitat area.

Although the removal of vegetation from the study site will not constitute a significant loss of vegetation in local or regional terms, the proposed development should be conducted in a manner, which minimises or ideally avoids the imposition of adverse impacts on any native revegetation within the study area.

It is more that likely that once the proposed works have been completed and the study area has been revegetated, a higher proportion of native species and probably a greater composition will be encouraged back into the area. The site may eventually be used as a wildlife corridor, temporary refuge, as a foraging area and possibly as a breeding site for a variety of native fauna.

7. Significance of potential impacts on flora and flora

It has been determined by Ettamogah Research Consultants that the proposed development is "*unlikely to have a significant effect on threatened species, populations or ecological communities, or their habitats*". However the eight factors of Section 5A must be taken into account by the consent or determining authority when considering a development proposal or development application, particularly in administering Sections 78, 79 and 112 of the EP&A Act.
A formal section 5A Assessment of Significance, pursuant to the EP&A Act, is therefore not required for this proposal. However, the eight factors in section 5A have been considered with

respect to those threatened biota and their habitats that could be present within the study area. The assessment below indicates that the proposed development is *'unlikely'* to impose a *'significant effect'* upon any such biota or their habitats and those species that may have been present or likely to occur within the study area. Therefore a Species Impact Statement is not required.

With respect to s.5A of the Environmental Planning and Assessment Act 1979 and in concurrence with the findings and recommendations of this report:

Part 1. No evidence for the presence of a *'viable local population'* occurring within the study area exists and there is no evidence that any such population in the vicinity of the study area would be resident on or dependent on the resources of the study site for their survival. Consequently, there is no likelihood that the proposed development would render any such populations, if they existed *'at risk of extinction'*.

Part 2. No evidence exists for the presence of *'an endangered population'* occurring within the study area. Consequently, there is no likelihood that the proposed development can be regarded as likely to involve any such populations *'likely to be significantly compromised'* even if individuals of that population use the study area.

Part 3. Given the nature and condition of the site, and the context of the proposed development, the proposal will not involve *'a significant area of known habitat'* for any biota *'being modified or removed'*.

Part 4. Given the location and state of the site, the proposed development will uot involve *'an area of known habitat'* becoming *'isolated from currently interconnecting or proximate areas of habitat'*.

Part 5. No *'critical habitat'* as declared within NSW under the register of critical habitat will be affected by the proposed development.

Part 6. Whilst many *'threatened species, populations or ecological communities, or there habitats are not adequately represented in conservation reserves or other similar protected areas'*, the proposed subdivision of the site is of no relevance in this regard.

Part 7. The proposed development is not *'of a class of development or activity that is recognised as a threatening process'*, pursuant to the *TSC Act 1995*. Clearing of native vegetation may constitute in some cases a *'threatening process'*. However the proposed development is still not considered a *'threatening process'* since no further clearing of native vegetation of the study site is necessary.

Part 8. No *'threatened species population or ecological community is at the limit of its known distribution'* on or in the vicinity of the study site.

8. Final Recommendations

Considering the nature of the proposed works and the condition of the site the following recommendations should be implemented prior to construction, during constructions and post construction phases. These recommendations should be implemented to ensure that any adverse impacts upon threatened species and other native flora and fauna that may occur in the area and their habitats would be absolutely minimal.

Specific Recommendations

- A landscape buffer zone at a width of no less than 20 meters consisting of local endemic native species should be established around the site. Endemic plant species should be used to provide habitat features for native fauna and to supplement the local and regional genetic resource. Ideally species to be used are included in appendix 3. It is important to ensure overstorey, understorey and ground-layer species are all included in revegetation programs to address the decline of vegetation communities. All layers are vital (Stelling 1996). Structural and floristic diversity will in turn provide for greater faunal species diversity as opposed to a structurally simple area of vegetation;
- The existing ephemeral swamp area and large freshwater catchment dam and other proposed stormwater catchment zones (including ponds/dams), drainage lines and flow areas should be rehabilitated in a manner as to provide riparian zone habitat. Revegetation should be undertaken to promote structural diversity. These sites should ideally replicate naturally occurring riparian zones which once would have existed on the site prior to development;
- The proposed woodlot, which will be planted onsite in order to capture effluent runoff, should consist of local and regional endemic species of riparian zone habitats. Again the plantation should consist of different layers of vegetation in order to promote structural diversity; and
- Suitable corridors of endemic vegetation should be planted in order to act as wildlife corridors between the landscape bnffer zone, proposed woodlot plantation and the existing and proposed water bodies of the site. This will in turn encourage and facilitate the movement of native fauna throughout the site.

Prior to Construction Works the following recommendations should be undertaken:

- A site rehabilitation plan should be prepared prior to any more works to be conducted (including the above mentioned recommendations) in order to document all impact amelioration measures and also to provide response protocols for problems, which may arise; and
- A weed species control/removal program should be implemented for the entire study site, specifically focussing upon appropriate weed removal and further weed invasion (especially noxious weeds) during the construction stage.

During Construction Works the following recommendations should be undertaken:

- Ensure all developments and associated activities are planned, overseen, and monitored by shire employees well versed in environmental issues;

- Retention, revegetation and stabilisation of the drainage lines and dam sites should be conducted. This may constitute part of the landscape design of the proposed developments;
- Any clearing of native vegetation should be conducted within the guidelines as stated in the *Native Vegetation Conservation Act 1997* and the Department of Land and Water Conservation;
- Any noxious weed and other weed material encountered, should be destroyed and/or removed from the site using appropriate methods to ensure weeds do not spread to other sites, especially in regards to invasion of drainage lines and water bodies;
- Sediment and erosion control structures, which conform with the relevant Environmental Protection Authority and or Department of Land and Water Conservation guidelines should be installed and appropriately maintained; and
- Exposed surface soil should be stabilised as soon as possible to avoid potential erosion (by mulching, covering or replanting with native species).

Post Construction Works the following recommendations should be undertaken:
- Promote ecologically sound bush fire control practices while not compromising the protection of lives and property. Consider bush fire hazard when designing planting patterns, such as breaks in the vegetation to retard the spread of fire. Consider planting indigenous fire retardant species;
- Reduce or avoid the disturbance of dam sites and drainage lines. Encourage the existing dams to be developed into waterholes in conjunction with revegetation works to encourage wildlife and discourage wildlife movement across roads;
- Any wastes associated with the proposed works should be appropriately managed to prevent the discharge of pollutants downstream or associated areas of vegetation;
- Ongoing monitoring should be conducted of
    - Water flows, surface and ground water quality
    - Noise
    - Dust and
    - Gaseous emissions.

In no way are the proposed works to be carried out without, or in any way limited to the above recommendations. These recommendations should be followed to ensure that *'no significant impact'* upon any threatened species or habitats, which may occur at the site, will transpire.

Bibliography

Auld, B.A. & Medd, R.W. (1997). *Weeds, An illustrated botanical guide to the weeds of Australia.* Inkata Press, Australia.

Barrett, G. W., Ford, H. A. and Recher, H. F. 1994. Conservation of woodland birds in a fragmented rural landscape. In Garnett, S. & Crowley, G. (ed) Action Plan For Australian Birds: The Barking Owl (ed) URL://www.tasweb.co..au/recovery/

Braithwaite, L.W. 1976. Notes on the breeding of the Freckled Duck in the Lachlan River Valley. In Garnett, S. & Crowley, G. (ed) Action Plan For Australian Birds: The Freckled Duck (ed) URL://www.tasweb.com.au/recovery/

Brooker, M.I.H. & Kleinig, D.A. (1999) *Field Guide to Eucalypts, Volume 1 South-eastern Australia (second edition).*Bloomings Books, Victoria.

Churchill (1998) *Australian Bats.* Reed New Holland, Australia.

Cogger, H. (2000) *Reptiles & Amphibians of Australia.* Reed Books, Chatswood.

Costermans, L. (1998) *Native Trees and Shrubs of South-Eastern Australia, Covering Areas of New South Wales, Victoria and South Australia.* Lansdowne Publishing Pty Ltd, Australia.

Cronin, L., (1998). *Key Guide to Australian Wildflowers.* Reed New Holland Press, Australia.

Debus, S. J. S. 1997. The Barking Owl in New South Wales. In Garnett, S. & Crowley, G. (ed) Action Plan For Australian Birds: The Barking Owl (ed) URL://www.tasweb.co..au/recovery/

Ford, H.A. (1989) *Ecology of birds: an Australian perspective.* Surrey Beatty & Sons Pty Ltd, Chipping Norton, NSW 2170.

Greig, D., (1999). *Filed Guide to Australian Wildflowers.* New Holland Press, Australia.

Harden, G. (ed). 1990. *Flora of New South Wales Volume 1.* NSW University Press, Kensington.
1991. *Flora of New South Wales Volume 2.* NSW University Press, Kensington.
1992. *Flora of New South Wales Volume 3.* NSW University Press, Kensington.
1993. *Flora of New South Wales Volume 4.* NSW University Press, Kensington.

Higgins, P. J. (ed.) 1999. *Handbook of Australian, New Zealand and Antarctic Birds. Vol. 4. Parrots to Dollarbird* In Garnett, S. & Crowley, G. (ed) Action Plan For Australian Birds: The Barking Owl (ed) URL://www.tasweb.co..au/recovery/

Johnstone, R. E. and Storr, G. M. 1998. *Handbook of Western Australian Birds. Vol. 1. Non-passerines (Emu to Dollarbird).* In Garnett, S. & Crowley, G. (ed) Action Plan For Australian Birds: The Barking Owl (ed) URL://www.tasweb.co..au/recovery/

Kavanagh, R. P., Debus, S. J. S., Tweedie, T. and Webster, R. 1995. Distribution of nocturnal forest birds and mammals in north-eastern New South Wales: relationships with environmental variables and management history. In Kavanagh, R. P., Debus, S. J. S., Rose, A. B. and Turner, R. J. 1995a. Notes on the diet and habitat of the Barking Owl *Ninox connivens* in New South Wales. In Garnett, S. & Crowley, G. (ed) Action Plan For Australian Birds: The Barking Owl (ed) URL://www.tasweb.co..au/recovery/

Kavanagh, R. P., Debus, S. J. S., Tweedie, T. and Webster, R. 1995b. Distribution of nocturnal forest birds and mammals in north-eastern New South Wales: relationships with environmental variables and management history. In Garnett, S. & Crowley, G. (ed) Action Plan For Australian Birds: The Barking Owl (ed)

Marchant, S. and Higgins, P. J. (eds.) 1990. *The Handbook of Australian, New Zealand and Antarctic Birds* In Garnett, S. & Crowley, G. (ed) Action Plan For Australian Birds: The Freckled Duck (ed) URL://www.tasweb.com.au/recovery/

Marriott, N. & Marriott, J. (1998) *Grassland Plants of South-Eastern Australia.* Bloomings Books, Victoria. N.B. Taxonomic order and scientific names follow Cunningham, G.M., Mulham, W.E., Milthorpe, P.L. & Leigh, J.H. (1981) *Plants of Western New South Wales.*

Morcombe, M. (1986). *The great Australian birdfinder.* Lansdowne Press, Dee Why West.

Murrumbidgee Field Naturalists (1999c) *The Lake Wyangan Wetlands* *http://www.angelfire.com/mn/fieldnats/index.html.*

Murrumbidgee Field Naturalists (1999d) *The Brobenah Hills http://www.angelfire.com/mn/fieldnats/index.html.*

Murrumbidgee Field Naturalists (1999e) *Murrumbidgee Field Naturalists Inc – Fivebough Swamp-waterbird species http://www.angelfire.com/mn/fieldnats/index.html.*

Murrumbidgee Field Naturalists (1999f) *Murrumbidgee Field Naturalists Inc – Tuckerbil Swamp-waterbird species. http://www.angelfire.com/mn/fieldnats/index.html*

NSW NPWS 1999. Draft Barking Owl (*Ninox connivens*) Recovery Plan. In Garnett, S. & Crowley, G. (ed) Action Plan For Australian Birds: The Barking Owl (ed) URL://www.tasweb.co..au/recovery/

NSW National Parks & Wildlife Service (1997) *Species list – Cocoparra National Park.* http://www/npws.nsw.gov.au/cgi-bin/species.pl?park=cen01.

Olsen, P., Crome, F., Olsen, J. (1993). *Birds of prey & ground birds of Australia.* Angus & Robertson, Sydney.

Pizzey, G., Knight, F. (1997) *The field guide to the birds of Australia.* Angus & Robertson, Sydney.

Parker, S. A. 1988. Records of the Barking Owl from South Australia. In Garnett, S. & Crowley, G. (ed) Action Plan For Australian Birds: The Barking Owl (ed) URL://www.tasweb.co..au/recovery/

Recher, H.F., Lunney, D. & Dunn, I. (1996) *A natural legacy: ecology in Australia.* 2nd edn.SNP Printing, Singapore.

Robinson, D. and Traill, B. J. 1996. Conserving woodland birds in the wheat and sheep belts of southern Australia. In Garnett, S. & Crowley, G. (ed) Action Plan For Australian Birds: The Barking Owl (ed) URL://www.tasweb.co..au/recovery/

Robinson, M. (1998) *A Field Guide to frogs of Australia.* Australian Museum/Reed Books.

Schodde, R. and Mason, I. J. 1997. Aves (Columbidae to Coraciidae). *Zoological Catalogue of Australia. Vol. 37.2.* W. W. K. Houston and A. Wells (eds). In Garnett, S. & Crowley, G. (ed) Action Plan For Australian Birds: The Barking Owl (ed) URL://www.tasweb.co..au/recovery/

Silveira, C. E. 1997. Targeted assessments of key threatened vertebrate fauna in relation to the North-east and Benalla-Mansfield Forest Management Area (NE FMA), Victoria: Barking Owl *Ninox connivens.* In

Garnett, S. & Crowley, G. (ed) Action Plan For Australian Birds: The Barking Owl (ed) URL://www.tasweb.co..au/recovery/

Silveira, C. E., Yen, A. L., Bennett, A. F., Brown, G. W., Hinkley, S. D., Loyn, R. H., Lumsden, L. F. and Smith, W. 1997. Fauna of the Box-Ironbark study area. In Garnett, S. & Crowley, G. (ed) Action Plan For Australian Birds: The Barking Owl (ed) URL://www.tasweb.co..au/recovery/

Simpson, K. & Day, N. (1993) *Field Guide To The Birds Of Australia.* Penguin Books, Australia.

Stelling, F. (1996) *Roadside Vegetation Assessment and Management Guidelines,* Olympic Highway Committee.

Strahan, R. (1995) *The Mammals of Australia.* Reed Books, Chatswood.

Swan, G., (1995). *A photographic guide to snakes and other reptiles of Australia.* New Holland Publishers, Sydney.

Taylor, I.R. & Glazebrook, H. (1998) *Fivebough and Tuckerbill Swamps. A review of their history, conservation values and future management options.* The Johnstone Centre, Charles Sturt University, Albury.

Triggs, B. (1996) *Tracks, Scats and Other Traces: A Field Guide to Australian Mammals.* Oxford University Press. Melbourne.

Wolff, M.A. (1999) *Winning the War on Weeds: The essential gardener's guide to weed identification and control.* Kangaroo Press, Australia.

Young, J. and de Lai, L. 1997. Population decline of predatory birds coincident with the introduction of Klerat rodenticide in north Queensland. In Garnett, S. & Crowley, G. (ed) Action Plan For Australian Birds: The Barking Owl (ed).URL://www.tasweb.co..au/recovery/

Appendix 1 Flora Species List

* Denotes introduced species
# Declared noxious

Asparagaceae	
**Asparagus officinalis*	Asparagus
Asteraceae	
**Arctotheca calendula*	Capeweed
**Aster subulatus*	Bushy Starwort
**Carthamus lanatus*	Saffron Thistle
**Cirsium vulgare*	Spear Thistle
**Chichorium intybus*	Chickory
Cotula australis	Common Water Buttons
**Conyza albida*	Tall Fleabane
**Conyza bonariensis*	Flax-leaf Fleabane
**Hypochoeris radicata*	Catsear
**Lactuca saligna*	Willow-leaf Prickly Lettuce
**Lactuca serriola*	Prickly Lettuce
**Picris echoides*	Ox Tongue
**Silybum marianum*	Varigated Thistle
**Sonchus oleraceus*	Sowthistle
**Tragopogon porrifolius*	Salisfy
*#*Xanthium spinosum*	Bathurst Burr
Boraginaceae	
**Echium plantagineum*	Paterson's Curse
Brassicaceae	
**Brassica tournefortii*	Wild Turnip
**Sinapsis arvenensis*	Charlock
Casuarinaceae	
Casuarina stricta	Drooping She-oak
Chenopodiaceae	
Atriplex semibaccata	Berry Saltbush
Babbagia acroptera	Water Weed
**Chenopodium album*	Fathen
**Chenopodium murale*	Green Fathen
Enchylaena tomentosa	Ruby Saltbush
Maireana declavens	Black Cottonbush
**Sclerolaena muricata*	Black Roly Poly

Convolvulaceae	
**Convolvulus arvensis*	Field Bindweed
Convolvulus erubescens	Australian Bindweed
Cucurbitaceae	
**Cucumis myriocarpus*	Paddy Melon
Cyperaceae	
**Cyperus eragrostis*	Umbrella Sedge
Fabaceae	
**Medicago sativa*	Lucerne
**Medicago truncatula*	Barrel Medic
**Melilotis alba*	Bokhara Clover
**Trifolium repens*	White Clover
**Trifolium subterraneum*	Subterranean Clover
Haloragaceae	
Myriophyllum propinquum	Common Water-milfoil
Juncaceae	
**Juncus acutus*	Spiny Rush
Juncus usitatus	Common Rush
Juncus ingens Giant Rush	
Lamiaceae	
*#*Marrubium vulgare*	Horehound
**Salvia verbenaca*	Wild Sage
Malvaceae	
**Malva parviflora*	Small-flowered Mallow
Mimosaceae	
Acacia pendula	Weeping Myall
Myrtaceae	
Eucalyptus cladocalyx	Sugar Gum
Eucalyptus largiflorens	Black Box
Eucalyptus populnea	Bimble Box
Oxalidaceae	
Oxalis exilis	Wood Sorrel
Poaceae	
**Agrostis avenacea*	Blown Grass
**Avena fatua*	Wild Oats
**Chloris virgata*	Feathertop Rhodes Grass
**Echinochloa crus-galli*	Barnyard Grass

**Hordeum leporinum*	Barley Grass
Panicum effusum	Hairy panic
**Paspalidium constrictum*	Box Grass
**Paspalum dialatum*	Paspalum
**Pennistum clandestinum*	Kikuyu
Phragmites australis	Common Reed
Polemoniaceae	
**Plantago lanceolata*	Ribwort
Polygonaceae	
Polygonum aviculare	Knotweed
**Rumex acestosella*	Sheep Sorrel
**Rumex crispus*	Curled Dock
Salicaceae	
**Salix babylonica*	Weeping Willow
**Salix fragilis*	Crack Willow
Solanaceae	
**Solanum elaeagnifolium*	Silverleaf Nightshade
**Solanum nigrum*	Blackberry nightshade
Typhaceae	
Typha domingensis	Narrow-leaf Cumbungi
Umbelliferae	
**Foeniculum vulgare*	Fennel
Urticaceae	
**Urtica urens*	Small Nettle
Verbanaceae	
**Verbena bonariensis*	Purpletop
Zygophllaceae	
**Tribulus terrestris*	Caltrop

Appendix 2 – Fauna Species List

*Denotes introduced species

Aves

Ardea novaehollandiae	White-faced Heron
Threskiornis molucca	White Ibis
Anas superciliosa	Pacific Black Duck
Anas gracilis	Grey Teal
Falco cenchroides	Nankeen Kestrel
Ocyphaps lophotes	Crested Pigeon
Eolophus roseicapillus	Galah
Platycercus eximius	Eastern Rosella
Malurus cyaneus	Superb Fairy-wren
Epthianura albifrons	White-fronted Chat
Grallina cyanoleuca	Magpie -lark
Rhipidura leucophrys	Willy Wagtail
Gymnorhina tibicen	Australian Magpie
Corvus coronoides	Australian Raven
**Passer domesticus*	House Sparrow
Taeniopygia guttata	Zebra Finch
Hirundo neoxena	Welcome Swallow
**Sturnus vulgaris*	Common Starling

Mammalia

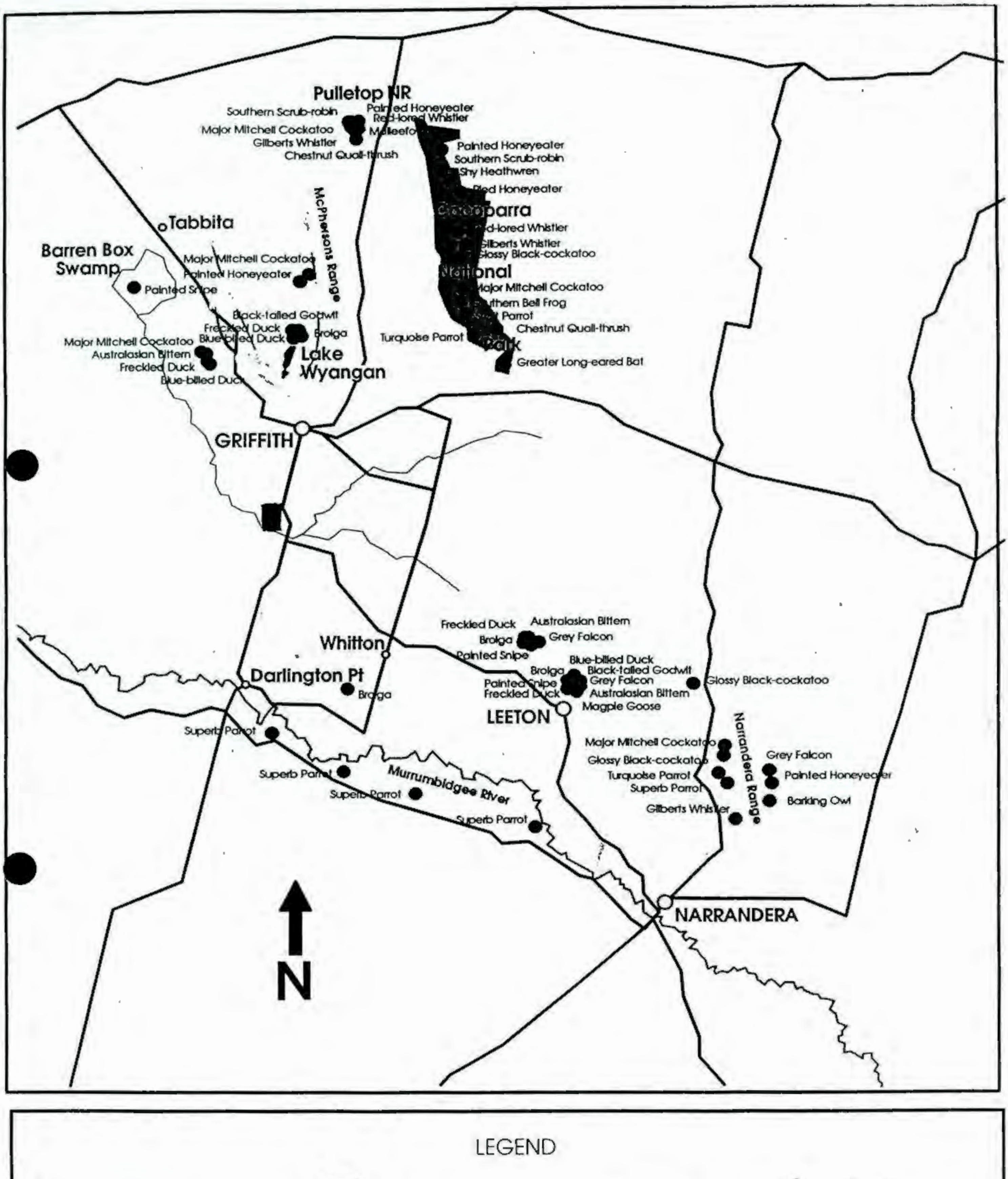
**Oryctolagus cuniculus*	Rabbit

Amphibia

Lymnodynastes tasmaniensis	Spotted Marsh Frog
Crinia parinsignifera	Plain's Froglet

Appendix 3 – Flora Species to be used as part of the revegetation works and woodlot plantations.

Appendix 4 – Threatened Fauna Locations Found in the Griffith Region



APPENDIX G

Noise Impact Statement – Noise and Sound Services

Noise and Sound Services

Noise Impact Statement Parle Foods, Willbriggie

Prepared for
Coffey Geoscience Pty Limited
P. O. Box 3330

ALBURY DC.
NSW 2640

May 2000

Report No nss20109 – Final

NOISE AND SOUND SERVICES
Specialists in Noise and Vibration Assessments Control and Training
Spectrum House, 1, Elegans Avenue, St Ives, NSW 2075
Tel: (02) 9449 6499. Fax: (02) 9402 5849. Mob: 0411 648153
E-mail scannell@rivernet.com.au WorkCover Accredited Trainer No. 86/676/602531
ABN : 7277 134 9599

CONTENTS

SUMMARY

This Noise Impact Statement considers the development of a food processing plant proposed by Parle Foods Pty Ltd at Lot 1059, DP 751686, Pt 77 Millis Road, Willbriggie, near Griffith, NSW.

The proposed development is surrounded by existing farms ranging in distance from 800 metres to 1500 metres. The proposed development includes a cold storage structure, a processing plant facility and an administration building with potential noise sources such as cooling towers, compressors, evaporators, boilers, canning lines and processing lines. In addition there will be mobile plant ie forklifts, trucks, B-doubles and road trains.

Noise criteria provided by the Environment Protection Authority, NSW (EPA) have been considered. These are the EPA Environmental Noise Control Manual (1994) and the Industrial Noise Policy (2000). The assessment procedure covers both controlling intrusive noise impacts and maintaining noise level amenity.

The existing acoustical climate has been assessed using noise loggers at four different locations around the proposed development. The existing background noise levels (L_{A90}) were found to be:- less than 30 dBA to 35 dBA at night, less than 30 dBA to 37 dBA in the evening and less than 30 dBA to 37 dBA in the day time. The existing ambient noise levels (L_{Aeq}) were found to be:- 43 dBA to 50 dBA at night, 41 dBA to 51 dBA in the evening and 49 dBA to 55 dBA in the day time.

Noise levels (L_{Aeq}) were measured from existing sources and range from 65 dBA to 82 dBA at a distance of 7 metres. Mobile plant range from 82 dBA (L_{Aeq}) for a large forklift to 89 dBA (L_{AE}) for a B-double drive pass. (Road trains were estimated at 91 dBA (L_{AE})).

Noise goals (L_{Aeq}) at the nearest residential properties have been set in accordance with EPA criteria. These range from 33 dBA to 39 dBA at night, 32 dBA to 36 dBA in the evening and 35 dBA to 42 dBA in the day time.

Acoustical modelling for the proposed development has been carried out. This uses methods given in the International Standard ISO 9613-2 (1996).

The EPA noise criteria will be met for the continuous noise from the proposed development with the possible exception of minor exceedances at the northern residences (Bartters Farms). Hence no noise impact is predicted from stationary plant.

The road train, B-double and truck noise will not exceed the EPA Road Traffic Criteria. However, it is expected to cause a night time noise impact at one residential property, with exceedances of the EPA industrial criterion by 5 dBA to 6 dBA and regular maximum noise levels 25 dBA to 26 dBA above the night time background level. These exceedances will only regularly occur during four months of the year and the level of impact will need to be balanced against the social and economic benefits derived from the proposed development.

1. INTRODUCTION

Noise and Sound Services was requested by Coffey Geoscience Pty Ltd, Albury, to carry out a Noise Impact Statement (NIS) for a proposed food processing plant for Parle Foods Pty Ltd. This NIS is in line with the requirements of the Department of Urban Affairs and Planning (letter ref S9901625 dated 28.2.00) and the Environment Protection Authority (EPA) (letter ref: GF22/GFF2317 dated 28.2.00). This NIS is part of the Environmental Impact Statement (EIS) for the development.

2. SITE AND DEVELOPMENT DESCRIPTION

This section describes the location site for the development and provides a detailed description of the proposed working activity of the development.

2.1 Site Description

It is proposed to construct a food processing plant at Lot 1059, DP 751686, Pt 77 Millis Road, Willbriggie, near Griffith, NSW. This is to replace and expand upon the two existing factory sites in Griffith, these are a Paste Plant at 42 – 44 Bridge Road and a Vegetable Processing and Canning Factory at 644 Mackay Avenue.

The area for the proposed development is a quiet rural area and is surrounded by farms and farmland as shown on the site plan (Figure 1). Many of the farms are 'Bartters' chicken farms. The neighbouring residential properties are also shown in Figure 1. Approximate distances from the proposed development and these residences are shown in Table 1 below:-

TABLE 1. APPROXIMATE DISTANCES FROM NEIGHBOURING RESIDENCES TO THE PROPOSED DEVELOPMENT.

Neighbouring Residence (See Figure 1)	Approximate Distance from the Proposed Development (metres)
Bartters Farm No 13	800
Bartters Farm No 14	800
Bartters Farm No 53	1400
Ross Mantarro Farm	1500
Bartters Farm No 63	1500
Bartters Farm No 1061	1300
Roy Dussin Farm 1060	1000
Dick Thompson Farm 1054	1500

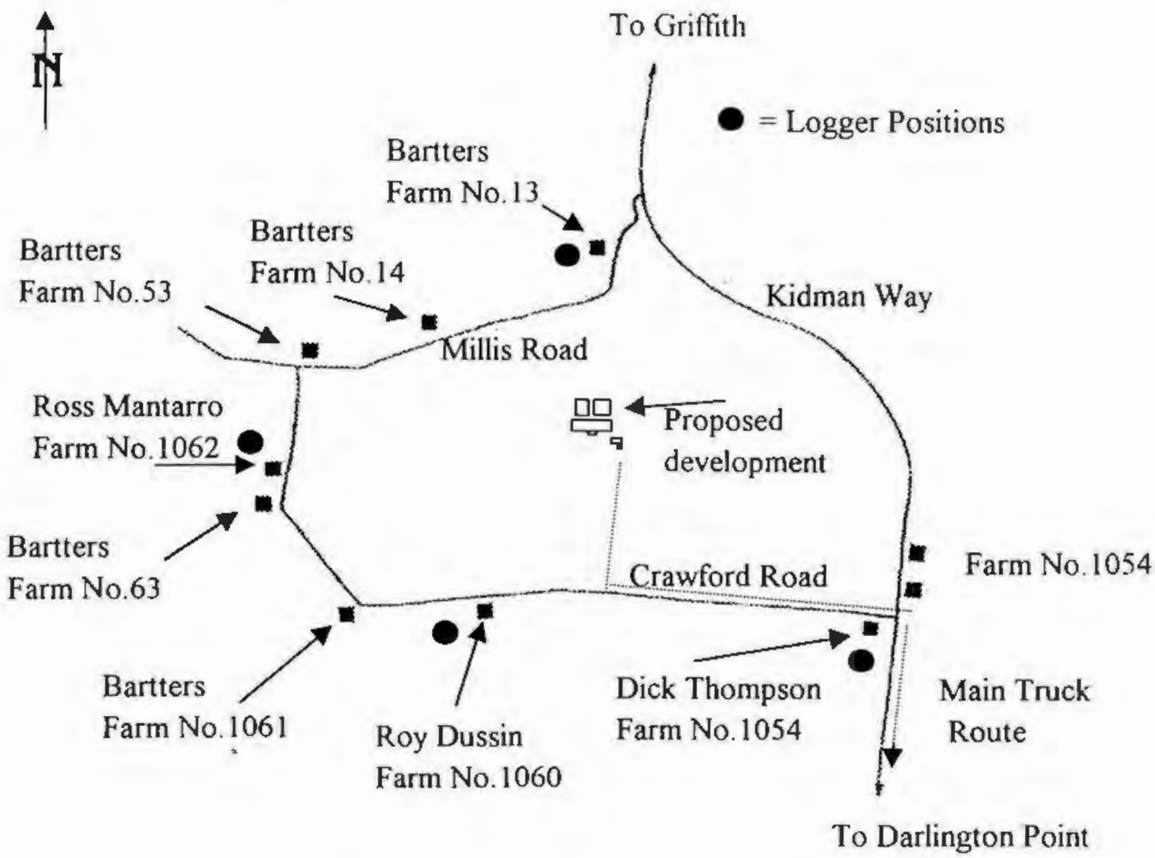


Figure 1. Site Plan. Background Noise Surveys were carried out at The Dick Thompson Farm, The Roy Dussin Farm, The Ross Mantarro Farm and The Bartters Farm Number 13. (Not to Scale.)

2.2 Development Description

The proposed development is a food processing plant by Parle Foods Pty Ltd at farm 1059 Willbriggie, NSW. The proposed development consists of a processing plant, a cold storage structure, and a dry storage structure all without windows, and an administration building.

2.2.1 Cold Storage Structure

The cold storage structure will comprise of a semi-enclosed shed with thermal insulation to the walls and roof. Located on the eastern side of the building will be two air/fan ducts, cooling towers and a compressor room. A two-bay loading dock is located on the western side of the shed at the southern end. The dimensions are approximately 66 m by 104 m as shown in Figure 2 with a height of 8.4 m to the gutter and 12.1 m at the roof apex.

2.2.2 *Dry Storage Structure*

The dry storage structure facility will consist of an enclosed colorbond shed with a loading dock at the southeastern corner. This shed will house the canning line and storage area for finished canned produce. The dimensions are approximately 80 m by 100 m as shown in Figure 2 with a height of 8.4 m to the gutter and 12.1 m at the roof apex.

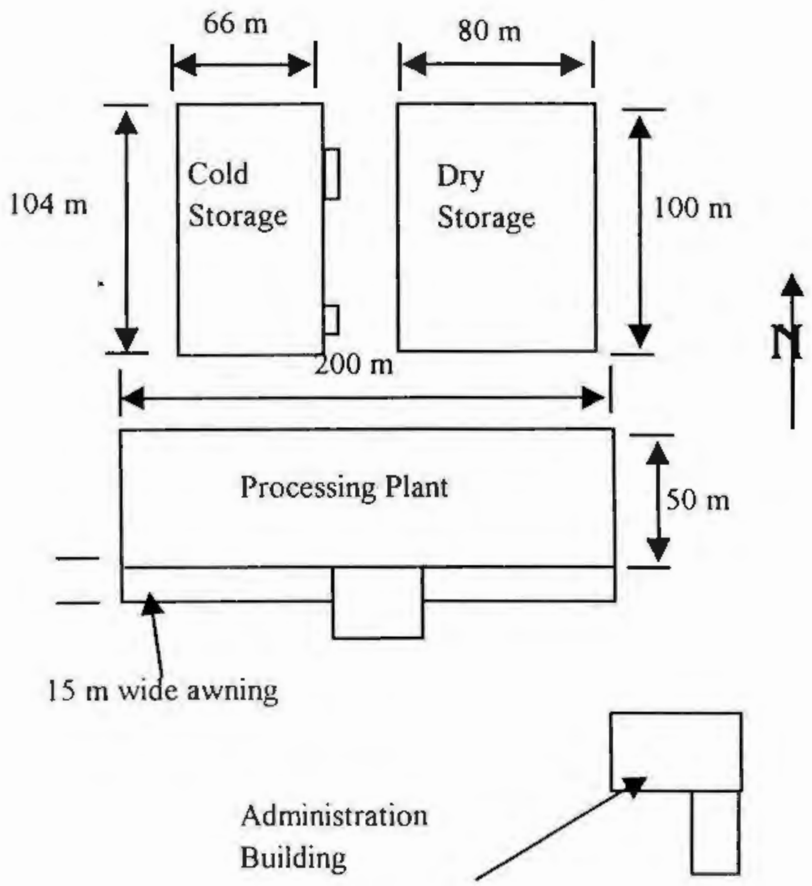


Figure 2. Site Plan of the Proposed Development. (Not to Scale.)

2.2.3 Processing Plant

The processing plant facility will consist of an enclosed colorbond shed with a 15 metre wide awning along the southern side of the building. This will house all the processing equipment and accept deliveries of raw produce. Initial raw material handling and sorting will be done outside under the awning. The remaining equipment including blast tunnels will be inside the shed. There will be three boilers (5000 kW, 10000 kW and 15000 kW) which will be housed in a colorbond-clad room located in the middle of the southern side of the shed. A roller door on the southern side will give access to the room. Evaporators and cooling towers will be located under the awning on the southern side of the development. The overall dimensions of the processing plant are approximately 50 m by 200 m with a 15 m by 200 m awning as shown in Figure 2 with a height of 8.4 m to the gutter and 12.8 m at the roof apex. Figure 3 shows a plan with the position of the potential noise sources identified.

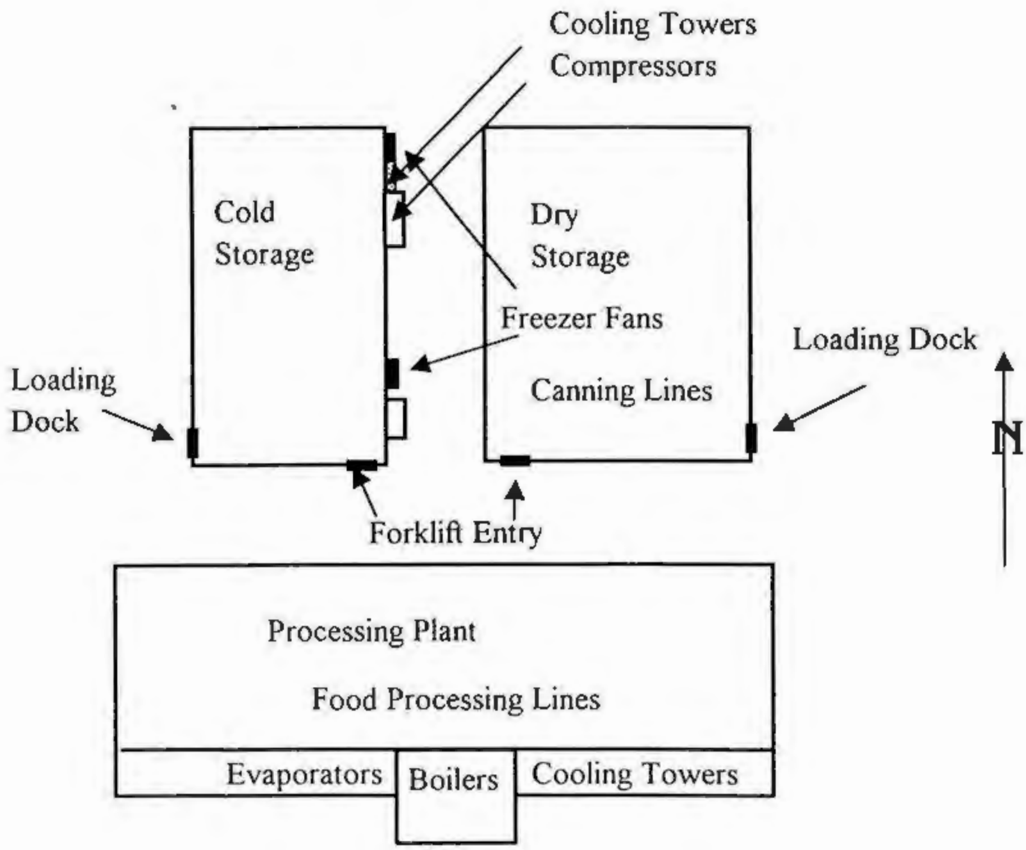


Figure 3. Site Plan of the Proposed Development with Potential Noise Source Identification. (Not to Scale.)

2.2.4 Mobile Plant Movements

The majority of the raw product delivered to the proposed plant will be during the main production period from January to April every year. Deliveries during this time will be 24 hours per day and 7 days per week. Virtually all in-coming deliveries will be by road trains, a total of 3000 during this period. The majority of trucks and road trains will come from the Darlington Point direction (south). The remaining trucks will come from the north. All vehicles will enter and leave the plant via Crawford Road and Kidman Way passing within 85 metres of the Dick Thompson Farm. The road trains are likely to arrive on a consistent basis over the 24-hour period depending upon harvesting operations. This gives an average rate of 1.1 road trains per hour including night time over a 16 to 17 week period every year.

Semi-trailers or B-doubles will transport out-going produce between the hours of 8 am and 5 pm, 5 days per week, 52 weeks per year. A total of 2000 truck movements based on semi-trailers.

There will also be occasional courier truck deliveries and forklifts operating between the three sheds.

3. CRITERIA

Noise criteria are provided by the Environment Protection Authority, NSW (EPA) which are generally in line with criteria given in other States of Australia and many Countries of the World. This includes the EPA Environmental Noise Control Manual (1994) and the Industrial Noise Policy (2000). These cover noise in urban, suburban and rural areas. Although specific local conditions can affect the criteria, convincing justification must be given for any variation to EPA guidelines.

3.1 EPA Environmental Noise Control Manual, Chapter 24

Chapter 24 of the EPA Environmental Noise Control Manual provides details for approval of new works on scheduled premises. This includes site details, times of operation, noise level predictions, noise control measures and assessments of noise impact, all of which are included in this statement. Chapter 24 also mentions that background noise levels (L_{A90}) are to be taken over a period of at least 20 minutes. However in line with more current guidelines (eg the EPA's Industrial Noise Policy – 2000) background noise levels are to be taken over a period of 15 minutes. In practice the difference would not be significant. Where sites contain areas which are particularly undulating and may affect noise propagation Chapter 24 recommends that a noise contour plan is prepared. This site is not particularly undulating and the topography will not have a particular affect on noise propagation. Hence noise contours are not considered to be required, although the effects of temperature inversions, air and ground absorption have been taken into account in the noise modelling (see section 6 of this NIS).

3.2 Industrial Noise Policy

The assessment procedure for industrial noise sources given in the EPA's Industrial Noise Policy (2000) has two components:-

- **Controlling intrusive noise impacts; and**
- **Maintaining noise level amenity;**

In assessing the noise impact of industrial or commercial noise sources all components must be taken into account for residential receivers, but, in most cases, only one will become the limiting criterion. The project-specific noise goals reflect the most stringent noise level requirement. It is derived from intrusive and amenity criteria and this is used to set a benchmark against which noise impacts and the need for noise mitigation are assessed.

3.2.1 Intrusive Noise Impacts

The Environment Protection Authority, NSW (EPA) in their Industrial Noise Policy (2000) states that:- *'The intrusiveness of an industrial noise source may generally be considered acceptable if the equivalent continuous (energy-average) A-weighted level of noise from the source (represented by the L_{Aeq} descriptor) measured over a 15 minute period, does not exceed the background noise level measured in the absence of the source by more than 5 dB.'* Thus, when considering the environmental consequence of noise from a specific source, any increase above the background sound pressure level, which exceeds 5 dB, may be offensive.

The perception of noise and its level of offensiveness depends greatly on the broader situation within which it occurs. Noise that might intrude into a resting or sleeping place may be found offensive whereas the same noise occurring in a market place or noisy working area may pass unnoticed. The concept of *'background + 5 dB'* derives from this consideration.

The EPA state that where the existing background noise level at the receptor is less than 30 dBA, as may occur in a quiet suburban or rural area, then 30 dBA should be assumed to be the existing background noise level.

Where the noise source contains characteristics such as prominent tonal components, impulsiveness, intermittency, irregularity or dominant low-frequency content adjustments to the measured level are applied to allow for the increase in the annoyance value.

3.2.2 Protecting Noise Amenity

In the EPA's Industrial Noise Policy it is stated that *'To limit continuing increases in noise levels, the maximum ambient noise level within an area from industrial noise sources should not normally exceed the acceptable noise levels specified in Table 2.1."*

The relevant parts of the EPA recommended levels are given in Table 2 below:-

TABLE 2 – RECOMMENDED NOISE LEVELS FROM INDUSTRIAL NOISE SOURCES.

Type of Receiver	Indicative Noise Amenity Area	Time of Day	Recommended L_{Aeq} Noise Level (dBA)	
			Acceptable	Extreme
Residence	Rural	Day Evening Night	50 45 40	55 50 45
Residence	Suburban	Day Evening Night	55 45 40	60 50 45
Residence	Urban	Day Evening Night	60 50 45	65 55 50
Residence	Urban/Industrial Interface – for existing situations only	Day Evening Night	65 55 50	70 60 55
Commercial premises	All	When in use	65	70
Industrial premises	All	When in use	70	75

Hence the acceptable noise level ANL (L_{Aeq}) for rural areas is **50 dBA** day time; **45 dBA** evening time and **40 dBA** night time. Day time is defined as 07:00 to 18:00 hours, evening is 18:00 to 22:00 hours and Night time is defined as 22:00 hours to 07:00 hours. Modifications are made to the ANL to account for the existing level of industrial noise. These are shown in Table 3 below:-

TABLE 3. MODIFICATIONS TO THE ACCEPTABLE NOISE LEVEL TO ACCOUNT FOR THE EXISTING LEVEL OF INDUSTRIAL NOISE.

Total existing L_{Aeq} noise level from Industrial sources, dBA	Maximum L_{Aeq} noise level from new sources alone, dBA
Acceptable noise level plus 2	Existing noise level minus 10
Acceptable noise level plus 1	Acceptable noise level minus 8
Acceptable noise level	Acceptable noise level minus 8
Acceptable noise level minus 1	Acceptable noise level minus 6
Acceptable noise level minus 2	Acceptable noise level minus 4
Acceptable noise level minus 3	Acceptable noise level minus 3
Acceptable noise level minus 4	Acceptable noise level minus 2
Acceptable noise level minus 5	Acceptable noise level minus 2
Acceptable noise level minus 6	Acceptable noise level minus 1
Acceptable noise level minus 6	Acceptable noise level

3.2.3 Modifying Factor Adjustments

Where a noise source contains certain characteristics, such as tonality, impulsiveness, intermittency, irregularity or dominant low-frequency content, there is evidence to suggest that it can cause greater annoyance than other noise at the same sound pressure level. A correction should be applied to both the intrusive and the amenity measurement before a comparison is made with the criteria. An abbreviated version of the correction factors is shown in Table 4 below:-

TABLE 4 – MODIFYING FACTOR CORRECTIONS

Factor	Assessment/ Measurement	When to Apply	Correction	Comments
Tonal Noise	One-third octave band or narrow band analysis	Level of one third octave band exceeds the level of the adjacent bands by 5 dB or more (above 400 Hz)	+ 5 dB	Narrow band frequency analysis may be required to precisely detect occurrence
Low frequency noise	Measurement of C-weighted and A-weighted Level	Measure/assess C and A-weighted levels over same time period. Correction to be applied if the difference between the two is 15 dB or more	+ 5 dB	C-weighted is designed to be more responsive to low frequency noise
Impulsive noise	Time weighting fast and impulse	If the difference in the A weighted maximum levels between 'fast' and 'impulse' are greater than 2 dB	Apply the difference in measured levels as the correction up to a maximum of 5 dB	Impulse time weighting is characterised by a short rise time (35msec) compared to 125msec for 'fast'.
Intermittent Noise	Subjectively Assessed	Level varies by more than 5 dB	+ 5 dB	Adjustment to be applied for night time only

3.3 EPA Criteria for Road Traffic Noise

The EPA has produced criteria for road traffic noise *'Environmental Criteria for Road Traffic Noise'* (May 1999). This provides criteria for land use developments with potential to create additional traffic on local roads. Here the criteria is 55 $L_{Aeq, 1hr}$ for day time (7:00 hours until 22:00 hours) and 50 $L_{Aeq, 1hr}$ for night time (22:00 hours until 07:00 hours). Although maximum noise level criteria are not given for sleep disturbance, the EPA document adds that "Maximum noise levels during each hour of the night time period should be assessed and reported to give an indication of the likelihood of awakening reactions".

4. NOISE MEASUREMENTS

Measurements were taken of:-

- the existing background noise levels using four noise loggers for a two week period from Wednesday 12 April 2000 until Wednesday 26 April 2000; and
- the major existing noise sources on Wednesday 12 and Wednesday 26 April 2000.

4.1 Existing Background and Ambient Noise Measurements

This section describes the instrumentation used for the existing background and ambient noise measurements, the measurement procedure and the results. The measurement locations are shown in Figure 1 and were chosen to be representative of the four directions for the proposed development where existing residential properties are situated.

4.1.1 *Instrumentation*

The instrumentation used during the noise survey consisted of four 'Acoustic Research Laboratories Pty Ltd' - Type 1 Environmental Noise Loggers.

These loggers conform to Australian Standard 1259 "Acoustics - Sound Level Meters", (1982) as a type 1 precision sound level meter and has an accuracy suitable for field use.

The loggers calibration was checked before and after the measurement period with a Brüel and Kjær acoustical calibrator model 4230. No significant system drift occurred over the measurement periods.

4.1.2 *Measurement Procedure*

The measurements commenced on Wednesday 12 April 2000 and finished on Wednesday 26 April 2000. The full results are shown in graphical form in Appendix A. The 'fast' time weighting and 'A' frequency weighting were used. All measurements were taken at a height of approximately 1.2 metres. The results are necessarily a "snapshot" of the noise levels on the particular days of the survey. Noise levels can vary with time due to different weather or traffic conditions, also low level measurements can be affected by animal or insect noises. However, during the noise survey it was understood that the noise levels were typical.

4.1.3 Measurement Results

The assessment background noise level ABL (L_{A90}) is determined by the tenth percentile method for each period (ie day, evening and night) for each day is shown in Tables 5 to 8 below. The rating background noise levels RBL (L_{A90}) over the monitoring period found from the median ABL value for the day time, evening time, and night time respectively is shown in Table 9. The full statistical noise measurement results are shown in graphical form in Appendix A. The weather (recorded with a metrological logger) was dry with the exception of Friday 14 April and Sunday 16 April 2000 which had reasonably constant precipitation. These dates have been excluded from the overall results (RBL's). The wind at the microphone positions was below 5 metres per second for the measurement period.

TABLE 5 – EXISTING NOISE LEVELS – Location 1 Bartters Farm No 13.

Date	Time of Day	Assessment Background Noise Levels (L_{A90})	Existing Ambient Noise Levels (L_{Aeq})
12/04/00	Day	42	54
12/04/00	Evening	33	45
12-13/04/00	Night	34	48
13/04/00	Day	42	53
13/04/00	Evening	35	46
13.14/04/00	Night	33	47
14/04/00	Day	45	55
14/04/00	Evening	36	47
14-15/04/00	Night	34	47
15/04/00	Day	37	54
15/04/00	Evening	38	46
15-16/04/00	Night	35	46
16/04/00	Day	38	55
16/04/00	Evening	38	43
16-17/04/00	Night	37	48
17/04/00	Day	37	56
17/04/00	Evening	39	48
17-8/04/00	Night	38	50
18/04/00	Day	36	62
18/04/00	Evening	37	49
18-19/04/00	Night	36	50
19/04/00	Day	35	55
19/04/00	Evening	37	47
19-20/04/00	Night	35	51
20/04/00	Day	38	51
20/04/00	Evening	34	51
20-21/04/00	Night	31	48
21/04/00	Day	40	52
21/04/00	Evening	34	55
21-22/04/00	Night	39	49
22/04/00	Day	37	51
22/04/00	Evening	39	45
22-23/04/00	Night	39	49
23/04/00	Day	35	52
23/04/00	Evening	37	44
23-24/04/00	Night	37	50
24/04/00	Day	39	51
24/04/00	Evening	39	44
24-25/04/00	Night	38	49
25/04/00	Day	36	51
25/04/00	Evening	36	49
25-26/04/00	Night	34	51
26/04/00	Day	39	54

TABLE 6 – EXISTING NOISE LEVELS – Location 2 Ross Mantarro Farm 1062

Date	Time of Day	Assessment Background Noise Levels (L_{A90})	Existing Ambient Noise Levels (L_{Aeq})
12/04/00	Day	33	42
12/04/00	Evening	31	43
12-13/04/00	Night	32	55
13/04/00	Day	34	51
13/04/00	Evening	30	41
13.14/04/00	Night	28	45
14/04/00	Day	31	53
14/04/00	Evening	29	59
14-15/04/00	Night	26	39
15/04/00	Day	28	50
15/04/00	Evening	32	42
15-16/04/00	Night	32	41
16/04/00	Day	29	50
16/04/00	Evening	29	49
16-17/04/00	Night	29	48
17/04/00	Day	31	50
17/04/00	Evening	31	51
17-8/04/00	Night	29	50
18/04/00	Day	29	51
18/04/00	Evening	30	45
18-19/04/00	Night	29	53
19/04/00	Day	30	52
19/04/00	Evening	30	51
19-20/04/00	Night	30	45
20/04/00	Day	29	50
20/04/00	Evening	28	51
20-21/04/00	Night	28	38
21/04/00	Day	33	68
21/04/00	Evening	32	41
21-22/04/00	Night	30	44
22/04/00	Day	33	47
22/04/00	Evening	32	55
22-23/04/00	Night	30	42
23/04/00	Day	30	46
23/04/00	Evening	32	53
23-24/04/00	Night	31	46
24/04/00	Day	31	46
24/04/00	Evening	32	51
24-25/04/00	Night	31	40
25/04/00	Day	30	47
25/04/00	Evening	33	57
25-26/04/00	Night	31	48
26/04/00	Day	31	51

TABLE 7 – EXISTING NOISE LEVELS – Location 3 Roy Dussin Farm 1060

Date	Time of Day	Assessment Background Noise Levels (L_{A90})	Existing Ambient Noise Levels (L_{Aeq})
12/04/00	Day	34	47
12/04/00	Evening	32	38
12-13/04/00	Night	33	43
13/04/00	Day	35	50
13/04/00	Evening	33	38
13.14/04/00	Night	32	41
14/04/00	Day	37	56
14/04/00	Evening	33	42
14-15/04/00	Night	31	42
15/04/00	Day	31	49
15/04/00	Evening	35	41
15-16/04/00	Night	29	42
16/04/00	Day	34	53
16/04/00	Evening	33	39
16-17/04/00	Night	31	42
17/04/00	Day	32	47
17/04/00	Evening	30	38
17-8/04/00	Night	30	43
18/04/00	Day	31	48
18/04/00	Evening	30	37
18-19/04/00	Night	29	38
19/04/00	Day	29	48
19/04/00	Evening	29	41
19-20/04/00	Night	30	43
20/04/00	Day	32	45
20/04/00	Evening	30	49
20-21/04/00	Night	28	43
21/04/00	Day	32	46
21/04/00	Evening	29	34
21-22/04/00	Night	28	44
22/04/00	Day	29	45
22/04/00	Evening	28	40
22-23/04/00	Night	27	39
23/04/00	Day	29	45
23/04/00	Evening	28	42
23-24/04/00	Night	27	41
24/04/00	Day	29	45
24/04/00	Evening	28	35
24-25/04/00	Night	28	47
25/04/00	Day	30	47
25/04/00	Evening	29	37
25-26/04/00	Night	30	44
26/04/00	Day	33	49

TABLE 8 – EXISTING NOISE LEVELS – Location 4 Dick Thompson Farm 1054

Date	Time of Day	Assessment Background Noise Levels (L_{A90})	Existing Ambient Noise Levels (L_{Aeq})
12/04/00	Day	43	54
12/04/00	Evening	29	51
12-13/04/00	Night	29	50
13/04/00	Day	42	55
13/04/00	Evening	35	51
13.14/04/00	Night	31	49
14/04/00	Day	43	56
14/04/00	Evening	33	50
14-15/04/00	Night	30	48
15/04/00	Day	34	54
15/04/00	Evening	36	51
15-16/04/00	Night	30	48
16/04/00	Day	38	55
16/04/00	Evening	33	50
16-17/04/00	Night	31	49
17/04/00	Day	34	54
17/04/00	Evening	32	54
17-8/04/00	Night	27	51
18/04/00	Day	35	53
18/04/00	Evening	31	52
18-19/04/00	Night	27	51
19/04/00	Day	36	54
19/04/00	Evening	30	53
19-20/04/00	Night	28	52
20/04/00	Day	36	54
20/04/00	Evening	30	52
20-21/04/00	Night	25	51
21/04/00	Day	37	59
21/04/00	Evening	28	45
21-22/04/00	Night	26	47
22/04/00	Day	34	52
22/04/00	Evening	27	49
22-23/04/00	Night	26	49
23/04/00	Day	32	52
23/04/00	Evening	27	47
23-24/04/00	Night	26	47
24/04/00	Day	33	53
24/04/00	Evening	27	49
24-25/04/00	Night	26	49
25/04/00	Day	40	53
25/04/00	Evening	28	52
25-26/04/00	Night	27	52
26/04/00	Day	39	55

Notes all levels rounded to the nearest whole decibel

TABLE 9 – SUMMARY OF EXISTING NOISE LEVELS – All Locations

Location	Time of Day	Rating Background Noise Levels (L_{A90})	Log Average Existing Ambient Noise Levels (L_{Aeq})
Bartters Farm No 13	Day	37	54
Bartters Farm No 13	Evening	37	47
Bartters Farm No 13	Night	35	49
Ross Mantarro Farm	Day	30	50
Ross Mantarro Farm	Evening	31	51
Ross Mantarro Farm	Night	30	47
Roy Dussin Farm 1060	Day	31	49
Roy Dussin Farm 1060	Evening	30	41
Roy Dussin Farm 1060	Night	30	43
Dick Thompson Farm 1054	Day	36	55
Dick Thompson Farm 1054	Evening	30	51
Dick Thompson Farm 1054	Night	30	50

4.2 Noise Source Measurements

4.2.1 Instrumentation

The instrumentation used during the noise source survey consisted of a Brüel and Kjær sound level meter model 2260 (serial no. 2063202). This meter conforms to Australian Standard 1259 "Acoustics - Sound Level Meters", (1982) as a type 1 precision sound level meter and has an accuracy suitable for both field and laboratory use.

The meter calibration was checked before and after the measurement period with a Brüel and Kjær acoustical calibrator model 4231. No significant system drift occurred over the measurement periods.

The sound level meter and calibrator have been checked, adjusted and aligned to conform to the Brüel and Kjær factory specifications and issued with a conformance certificate (December 1998). The internal test equipment used is traceable to the National Measurement Laboratory at C.S.I.R.O., Lindfield, NSW, Australia.

4.2.2 Measured Noise Levels

The main measurements were carried out on Wednesday 12 and 26 April 2000. The results are shown in Table 10 below. All measurements were taken in terms of 15 minute, octave band (except were noted) and 'A' frequency weighted energy average (L_{Aeq}) sound pressure level. The results are necessarily a "snapshot" of the noise levels on the particular days of the survey. Noise levels can vary with time due to operating under different loads and conditions, product being handled, manufactured or processed, ageing of machine components and when other changes are made. However, during the noise survey the machines were understood to be operated under normal loads and speed conditions.

TABLE 10 – NOISE MEASUREMENT RESULTS

Plant at 7 metres	Octave Band Centre Frequency (Hz)									Overall 'A' Weighted
	31	63	125	250	500	1 k	2 k	4 k	8 k	
Compressor	72	79	77	78	79	75	75	67	56	81
Cooling Towers	70	75	77	74	74	68	64	58	50	74
Freezer Fan	71	72	74	71	72	64	60	54	46	71
Boiler	70	68	70	66	64	62	51	46	39	65
Evaporator	75	76	74	72	74	72	67	65	59	76
Corn processing	Not Available									82
Truck	92	87	83	79	82	83	80	75	78	87*
B Doubles	94	89	83	78	84	88	78	73	70	89*
Road Train	96	91	85	81	85	90	80	75	72	91*
Large Forklift	Not Available									82

Notes:

- *These measurements are sound exposure level (L_{AE}) the Road Train is estimated from B Double measurements;*
- *All measurements are rounded to the nearest whole decibel;*
- *Sound power levels are approximately the levels at 7 m plus 25 dB.*

5. NOISE GOALS

It is important to note that the goals given below are for the noise level solely from the factory in question and do not include extraneous noise from other sources.

5.1 Intrusive Noise Goals

For intrusive noise the goal is 5 dB plus the background noise level (L_{A90}). Hence for the first location, Bartters Farm No 13, the L_{Aeq} goal is **42 dBA day time, 42 dBA evening time** and **40 dBA night time**. For the second location, Ross Mantarro Farm, the L_{Aeq} goal is **35 dBA day time, 36 dBA evening time** and **35 dBA night time**. For the third location Roy Dussin Farm 1060 the L_{Aeq} goal is **36 dBA day time, 35 dBA evening time** and **35 dBA night time**. For the fourth location Dick Thompson Farm 1054 the L_{Aeq} goal is **41 dBA day time, 35 dBA evening time** and **35 dBA night time**.

5.2 Noise Amenity Goals

For the amenity noise the goal is dependent upon the existing ambient noise level (L_{Aeq}). Hence for the first location, Bartters Farm No 13, the existing ambient is above the acceptable EPA noise level (see Table 2) hence the L_{Aeq} goal is 10 dBA below the existing noise levels (see Table 3) ie **44 dBA day time, 32 dBA evening time** and **39 dBA night time**.

For the second location, Ross Mantarro Farm, the existing ambient meets the EPA acceptable level for day time and hence the goal is 8 dB below the acceptable level of 50 dBA. For the evening and night time the existing level is above the acceptable EPA noise level hence the L_{Aeq} goal is 10 dBA below the existing noise levels. The goals are **42 dBA day time, 41 dBA evening time** and **37 dBA night time**.

For the third location Roy Dussin Farm 1060 the existing ambient is below the EPA acceptable noise level for day time and evening time by 1 dB and 4 dB respectively. Hence the goals are the acceptable level (50 dBA) minus 8 dB for day time and the acceptable level (45 dBA) minus 2 dB for evening level. The existing night time level is 3 dB above the EPA acceptable level hence the goal is the existing level minus 10 dB. The L_{Aeq} goals are **42 dBA day time, 43 dBA evening time** and **33 dBA night time**.

For the fourth location Dick Thompson Farm 1054 the existing ambient is above the acceptable EPA noise level (see Table 2). Hence the L_{Aeq} goal is 10 dBA below the existing noise levels ie **45 dBA day time, 41 dBA evening time** and **40 dBA night time**.

5.3 Overall Project Specific Noise Goals

In summary, the project specific noise goals are as shown for each location in Tables 11 to 14 below:-

Note: The goals in bold apply.

TABLE 11 – NOISE GOALS FOR LOCATION 1 – BARTTERS FARM NO 13.

Period	Intrusive Criterion	Amenity Criterion
Day	**42 dB $L_{Aeq, 15\ minutes}$ (37 + 5)**	44 dB $L_{Aeq, Days}$
Evening	42 dB $L_{Aeq, 15\ minutes}$ (37 + 5)	**32 dB $L_{Aeq, Evening}$**
Night	40 dB $L_{Aeq, 15\ minutes}$ (35 + 5)	**39 dB $L_{Aeq, Night}$**

TABLE 12 – NOISE GOALS FOR LOCATION 2 – ROSS MANTARRO FARM.

Period	Intrusive Criterion	Amenity Criterion
Day	**35 dB $L_{Aeq, 15\ minutes}$ (30 + 5)**	42 dB $L_{Aeq, Days}$
Evening	**36 dB $L_{Aeq, 15\ minutes}$ (31 + 5)**	41 dB $L_{Aeq, Evening}$
Night	**35 dB $L_{Aeq,15\ minutes}$ (30 + 5)**	37 dB $L_{Aeq, Night}$

TABLE 13 – NOISE GOALS FOR LOCATION 3 – ROY DUSSIN FARM 1060.

Period	Intrusive Criterion	Amenity Criterion
Day	**36 dB $L_{Aeq, 15\ minutes}$ (31 + 5)**	42 dB $L_{Aeq, Days}$
Evening	**35 dB $L_{Aeq, 15\ minutes}$ (30 + 5)**	43 dB $L_{Aeq, Evening}$
Night	35 dB $L_{Aeq, 15\ minutes}$ (30 + 5)	**33 dB $L_{Aeq, Night}$**

TABLE 14 – NOISE GOALS FOR LOCATION 4 – DICK THOMPSON FARM 1054

Period	Intrusive Criterion	Amenity Criterion
Day	**41 dB $L_{Aeq,\ 15\ minutes}$ (34 + 5)**	45 dB $L_{Aeq,\ Days}$
Evening	**35 dB $L_{Aeq,\ 15\ minutes}$ (35 + 5)**	41 dB $L_{Aeq,\ Evening}$
Night	**35 dB $L_{Aeq,\ 15\ minutes}$ (34 + 5)**	40 dB $L_{Aeq,\ Night}$

6. NOISE MODELLING AND ASSESSMENT

This section provides details of the noise modelling procedure and gives an assessment of the noise levels.

6.1 Noise Modelling Specifications

The source noise has been modelled using the International Standard ISO 9613-2 (1996(E)) '*Acoustic – Attenuation of sound during propagation outdoors Part 2 General method of calculation*'. This Standard specifies methods for the description of noise outdoors in community environments. The method described in the Standard is general in the sense that it may be applied to a wide variety of noise sources, and covers the major mechanism of attenuation. The method allows for downwind propagation conditions namely:-

- wind direction within an angle of ± 45° of the direction connecting the centre of the dominant sound source and the centre of the specified receiver region with the wind blowing from source to receiver, and

- wind speed between approximately 1 m/s and 5 m/s measured at a height of 3 m to 11 m above the ground.

In addition, an estimation of the noise increase due to temperature inversions has been included. This is taken from the EPA Industrial Noise Policy Appendix D assuming a winter temperature of 12° C and humidity of 85%. From a knowledge of the Griffith area, significant temperature inversions are likely approximately 25 winter nights per year.

6.2 Basic Noise Modelling Equations

The equivalent continuous downwind sound pressure level (L_{Aeq}) at each receiver point has been calculated for each point source using the equation below:-

$$\mathbf{L_{Aeq} = L_w + D_c} - A$$

Where:

L_w is the sound power level of the noise source;

D_c is directivity correction; and

A is the attenuation that occurs during the propagation from source to receiver.

The attenuation term A in the equation above is given by:-

$$A = A_{div} + A_{atm} + A_{gr} + A_{bar} + A_{misc}$$

Where:

A_{div} is the attenuation due to geometric divergence;
A_{atm} is the attenuation due to atmospheric absorption;
A_{gr} is the attenuation due to the ground effects;
A_{bar} is the attenuation due to a barrier; and
A_{misc} is the attenuation due to miscellaneous other effects.

The last term generally refers to miscellaneous propagation through foliage, industrial sites and areas of houses. As none of these miscellaneous terms are applicable for the site in question this factor is not used in this NIS.

6.3 Assessment

The assessment results for constant operation of the proposed plant are shown in Tables 15 to 19 and Figures 4 to 8. There will be an increase in these noise levels by approximately 2 dBA when the forklifts are in regular use. This will mainly affect the southern area.

TABLE 15 – PREDICTED NOISE LEVELS AT THE NEAREST NORTHERN RESIDENCES.

Time of Day	Noise Goal	Predicted Level		Exceedance	
		Without Temp Inversion	With Temp Inversion	Without Temp Inversion	With Temp Inversion
Day	42	35	N/A	-	-
Evening	32	35	N/A	3	-
Night	39	35	40	-	1

TABLE 16 – PREDICTED NOISE LEVELS AT THE NEAREST WESTERN RESIDENCES.

Time of Day	Noise Goal	Predicted Level		Exceedance	
		Without Temp Inversion	With Temp Inversion	Without Temp Inversion	With Temp Inversion
Day	35	22	N/A	-	-
Evening	36	22	N/A	-	-
Night	35	22	26	-	-

TABLE 17 – PREDICTED NOISE LEVELS AT THE NEAREST SOUTHERN RESIDENCES.

Time of Day	Noise Goal	Predicted Level		Exceedance	
		Without Temp Inversion	With Temp Inversion	Without Temp Inversion	With Temp Inversion
Day	36	29	N/A	-	-
Evening	35	29	N/A	-	-
Night	35	29	34	-	-

TABLE 18 – PREDICTED NOISE LEVELS AT THE NEAREST SOUTHEASTERN RESIDENCES.

Time of Day	Noise Goal	Predicted Level		Exceedance	
		Without Temp Inversion	With Temp Inversion	Without Temp Inversion	With Temp Inversion
Day	41	25	N/A	-	-
Evening	35	25	N/A	-	-
Night	35	25	29	-	-

TABLE 19 – PREDICTED NOISE LEVELS AT THE NEAREST SOUTHEASTERN RESIDENCES FOR ROAD TRAINS.

Time of Day	Noise Goals		Predicted Level ($L_{Aeq,15\ min}$) or ($L_{Aeq,\ 1\ hour}$)		Exceedance* (two road trains in any 15 minute period, four trains in any one hour)	
	Ind.	Traf.	Without Temp Inversion	With Temp Inversion	Without Temp Inversion	With Temp Inversion
Day	41	55	40	N/A	-	-
Evening	35	N/A	40	N/A	5	-
Night	35	50	40	41	5	6

*No exceedance of the Traffic Noise Goals is predicted.

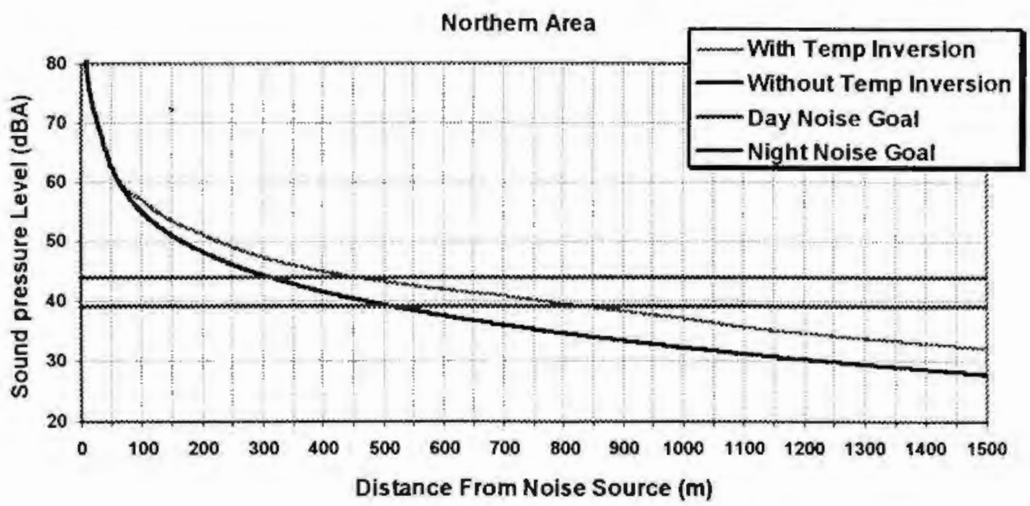


Figure 4. The Noise Level Reduction with Distance in the Northern Direction compared to the Day Time and Night Time Noise Goals.

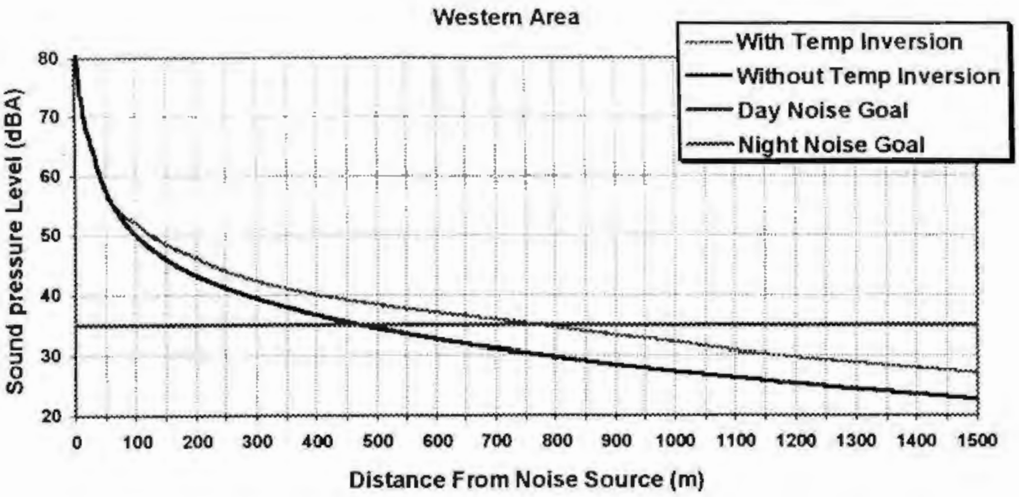


Figure 5. The Noise Level Reduction with Distance in the Western Direction compared to the Day Time and Night Time Noise Goals. (35 dBA for both).

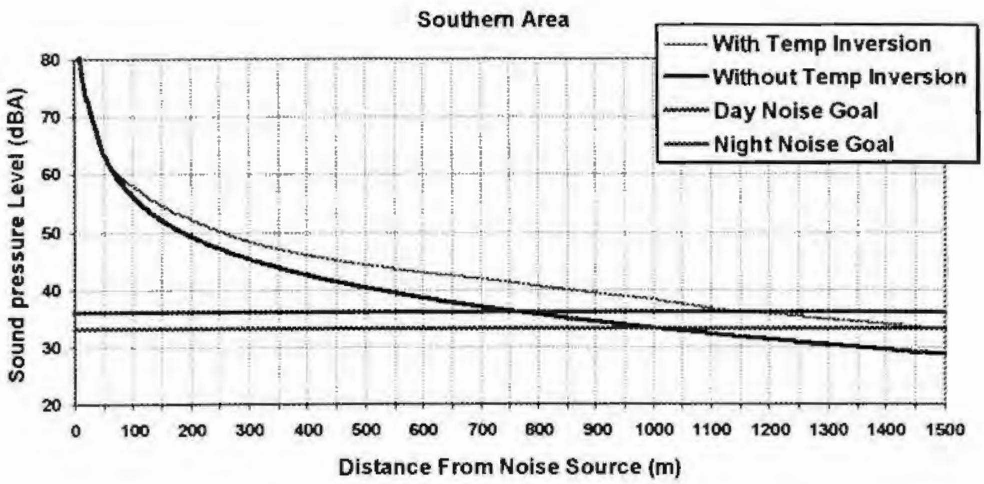


Figure 6. The Noise Level Reduction with Distance in the Southern Direction compared to the Day Time and Night Time Noise Goals.

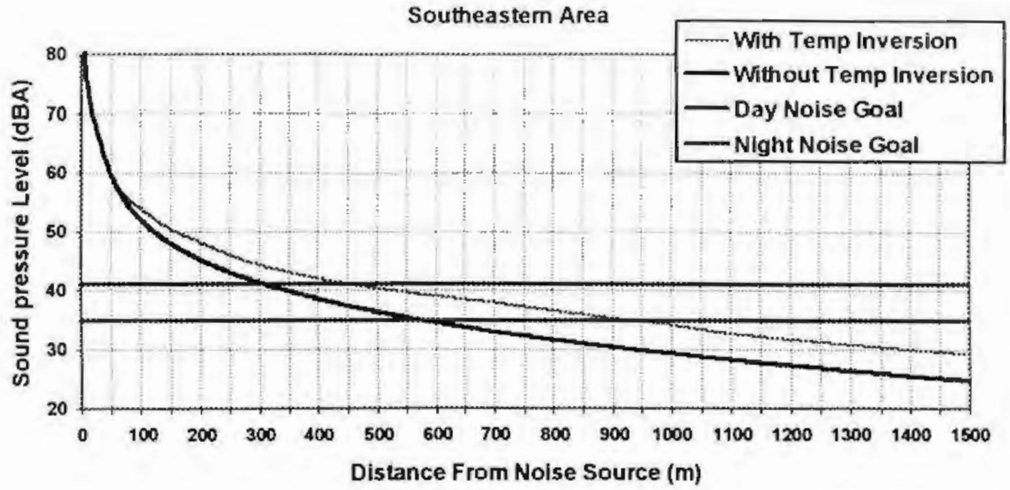


Figure 7. The Noise Level Reduction with Distance in the Southeastern Direction compared to the Day Time and Night Time Noise Goals.

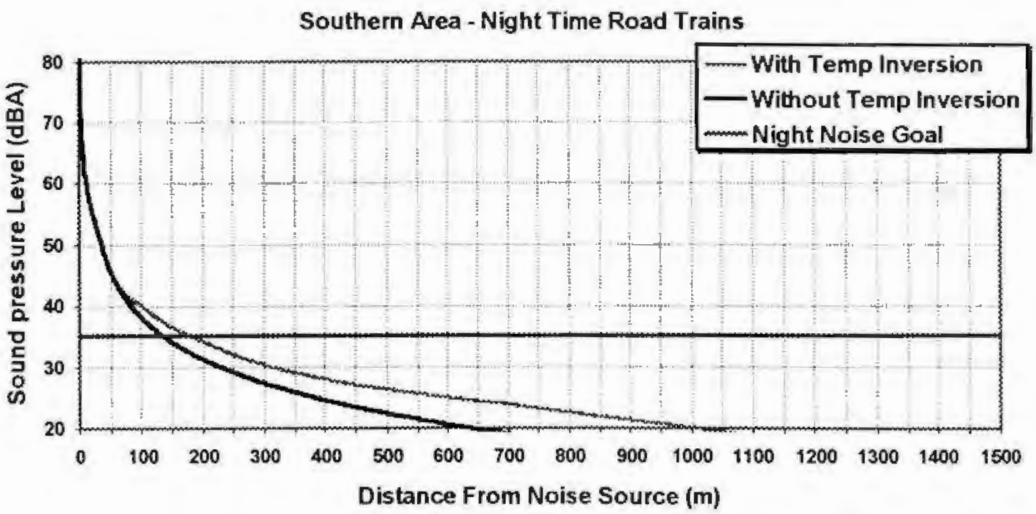


Figure 8. The Noise Level Reduction with Distance in the Southeastern Direction for Road Trains compared to the Day Time and Night Time Noise Goals.

7. CONCLUSIONS

It can be seen from the assessment results that the EPA noise criteria will generally be met for the continuous noise from the proposed development. Minor exceedances are expected at the northern residences (Bartters Farms), These are for the evening time by 3 dBA to 5 dBA and night time, during temperature inversions by 1 dBA and up to 3 dBA when in rare cases forklifts are in regular use. The impact is expected to be negligible due to the very stringent evening criterion (32 dBA), the marginal exceedance (3 dBA) and irregular occurrence of the worst case night time noise.

The effect of the road trains is expected to cause a night time noise impact at, at least one residential property, with exceedances of the EPA industrial noise criterion by 5 dBA to 6 dBA although the EPA traffic noise criteria will not be exceeded. This assumes no more than two road trains (or B- double) pass by in any 15-minute period and four road trains in any hour. The maximum noise level will exceed the background by 25 to 26 dBA which could cause some sleep disturbance. These exceedances will only regularly occur during four months of the year and the level of impact will need to be balanced against the social and economic benefits derived from the proposed development.

Date	Prepared by:	Status
3 May 2000	Ken Scannell MSc MAAS MIOA MAES	Draft
8 May 2000	Ken Scannell MSc MAAS MIOA MAES	Final

APPENDIX A

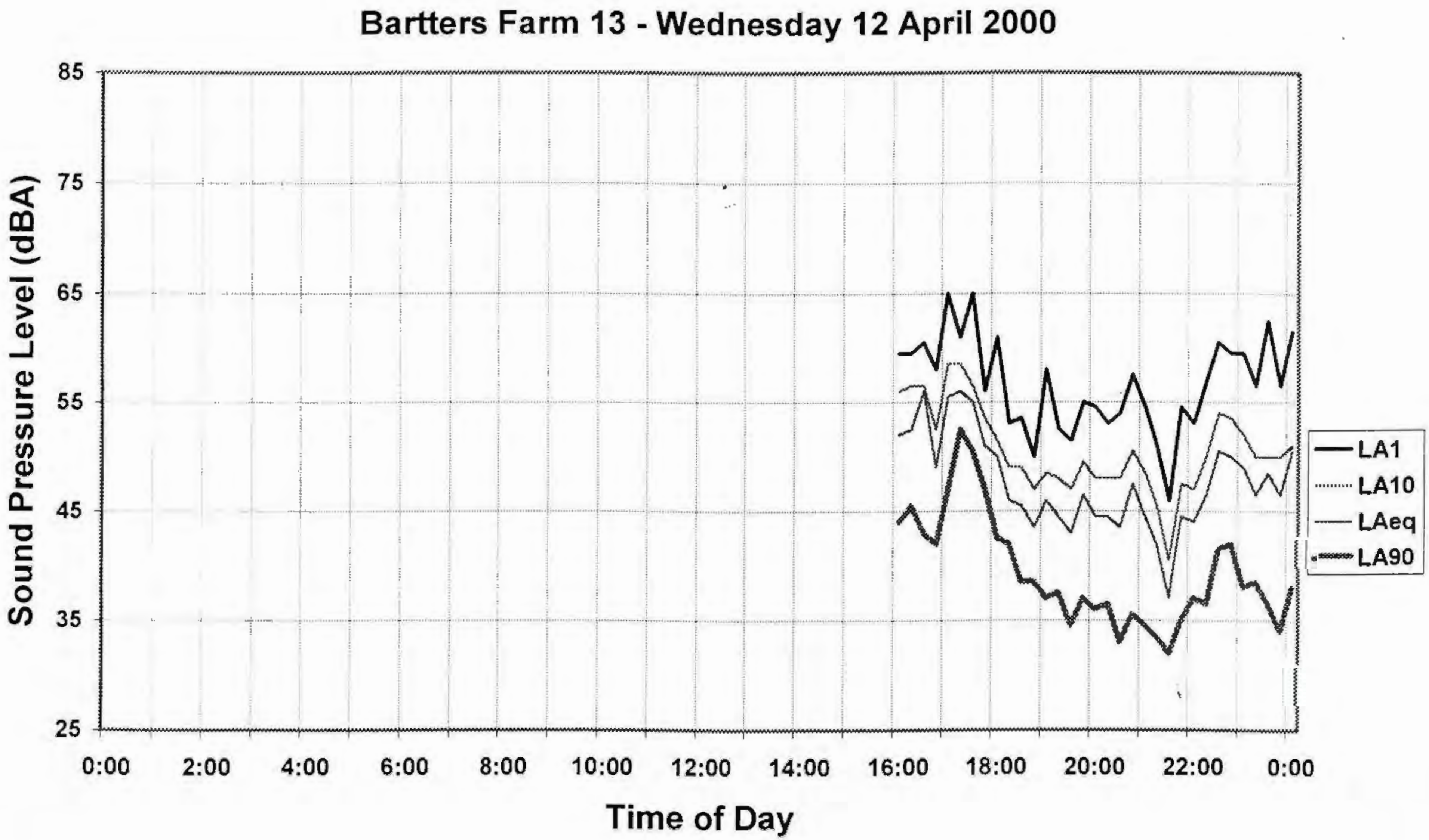
Existing Ambient and Background Noise Level Results

Bartters Farm 13
Wednesday 12 April 2000 to Wednesday 26 April 2000

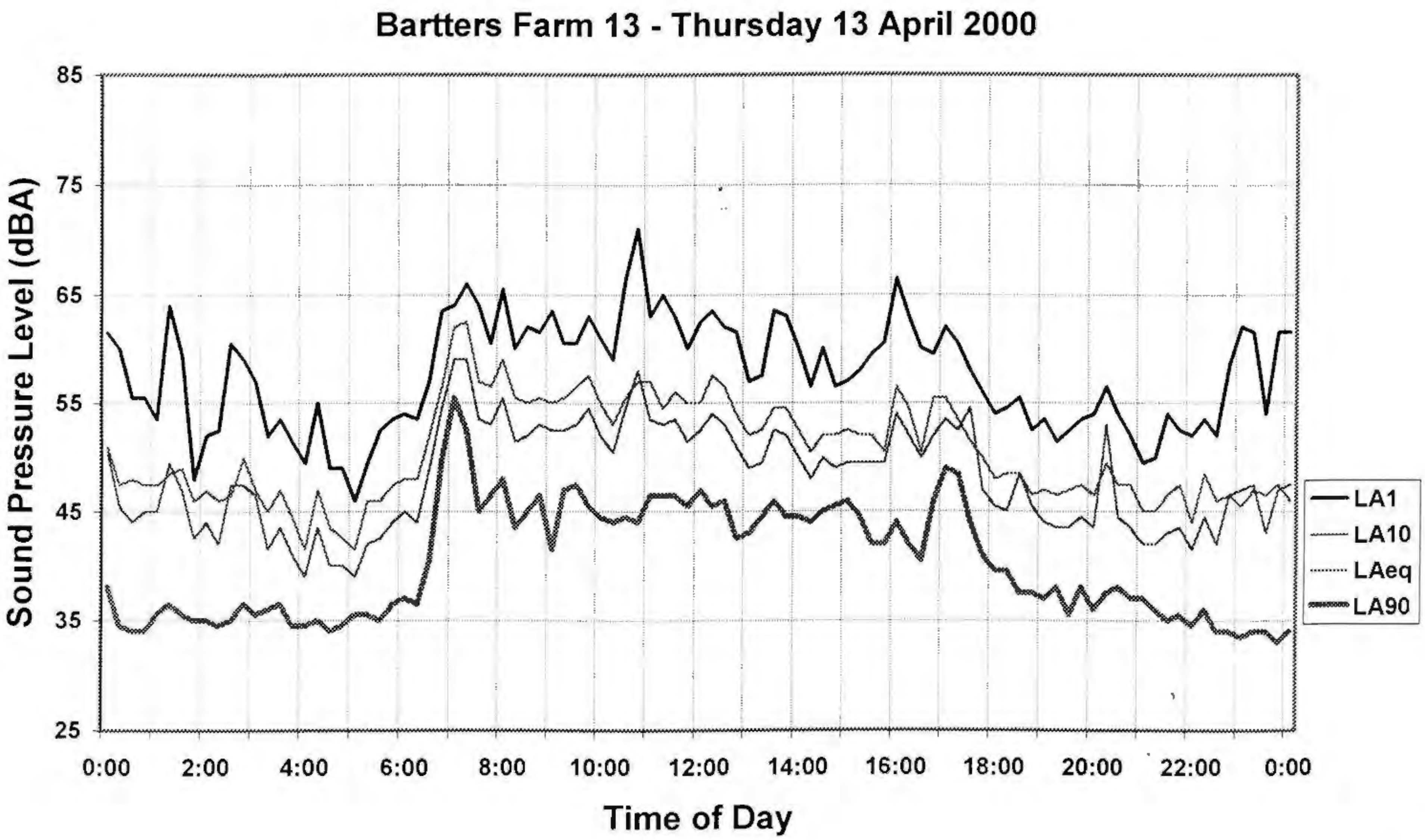
Ross Mantarro Farm 1062
Wednesday 12 April 2000 to Wednesday 26 April 2000

Roy Dussin Farm 1060
Wednesday 12 April 2000 to Wednesday 26 April 2000

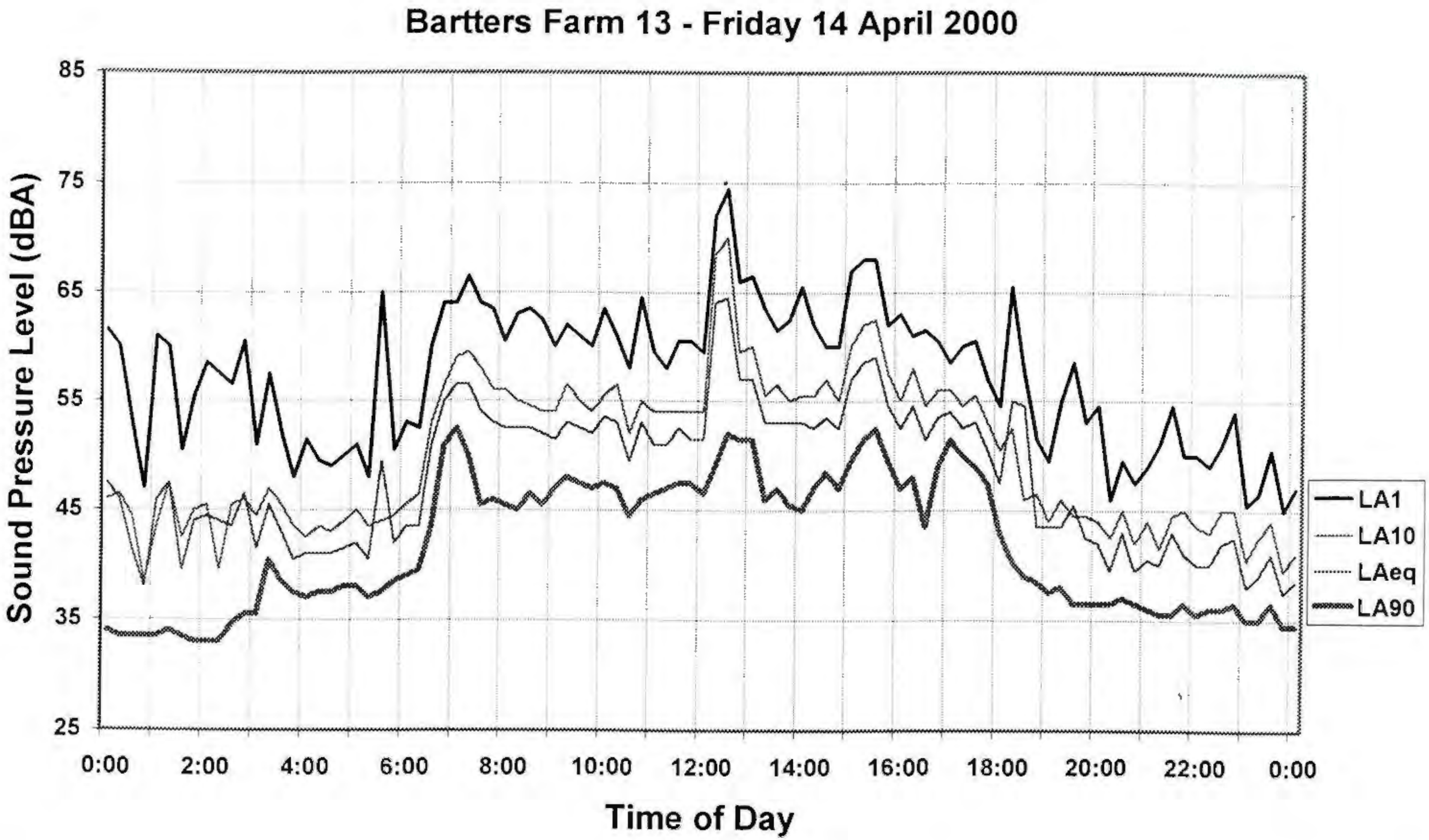
Dick Thompson Farm 1054
Wednesday 12 April 2000 to Wednesday 26 April 2000



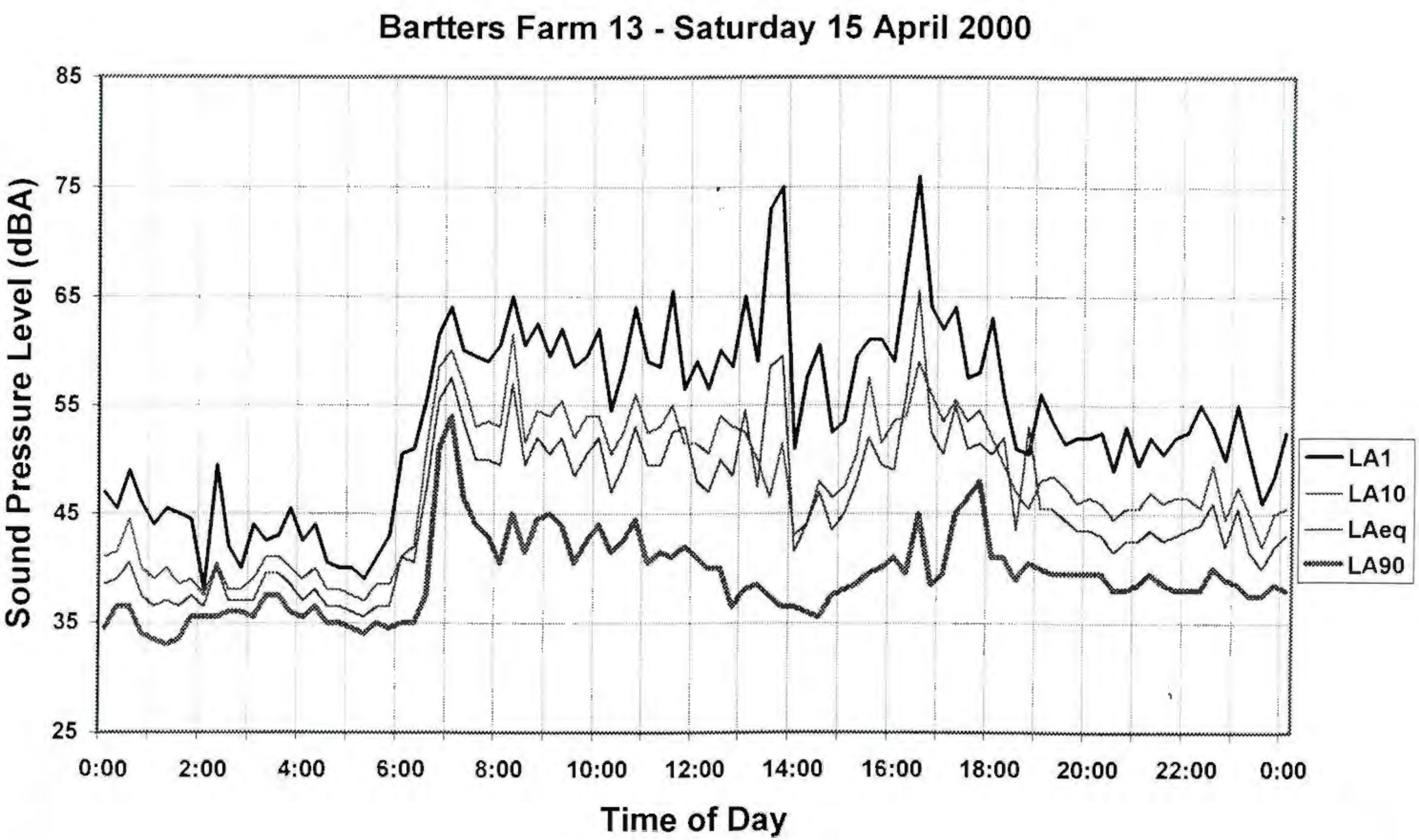
Bartters Farm 13 - Wednesday 12 April 2000
Sound Pressure Level (dBA)
85
75
65
55
45
35
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day
LA1
LA10
LAeq
LA90



Bartters Farm 13 - Thursday 13 April 2000
Sound Pressure Level (dBA)
85
75
65
55
45
35
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day
LA1
LA10
LAeq
LA90

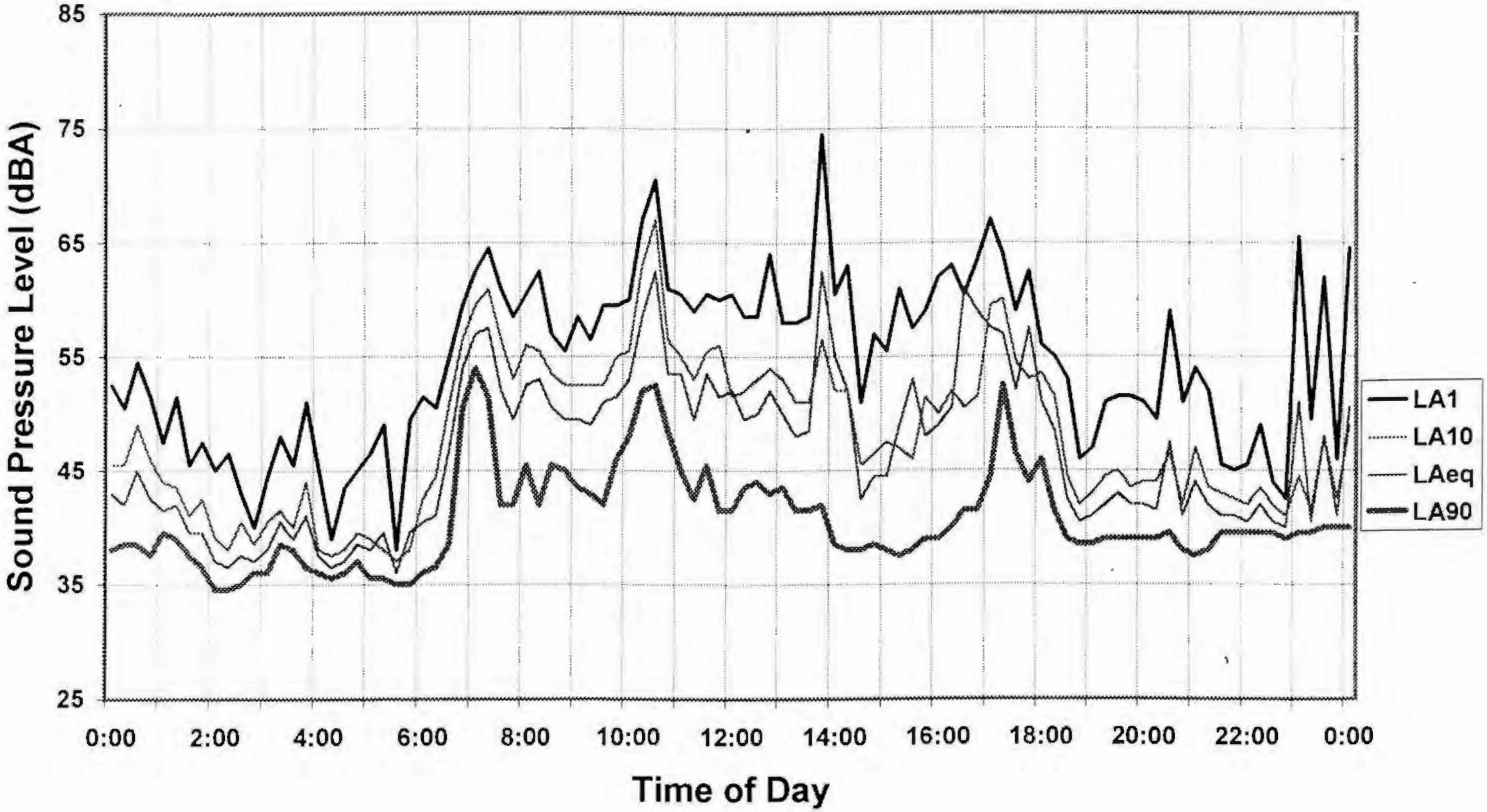


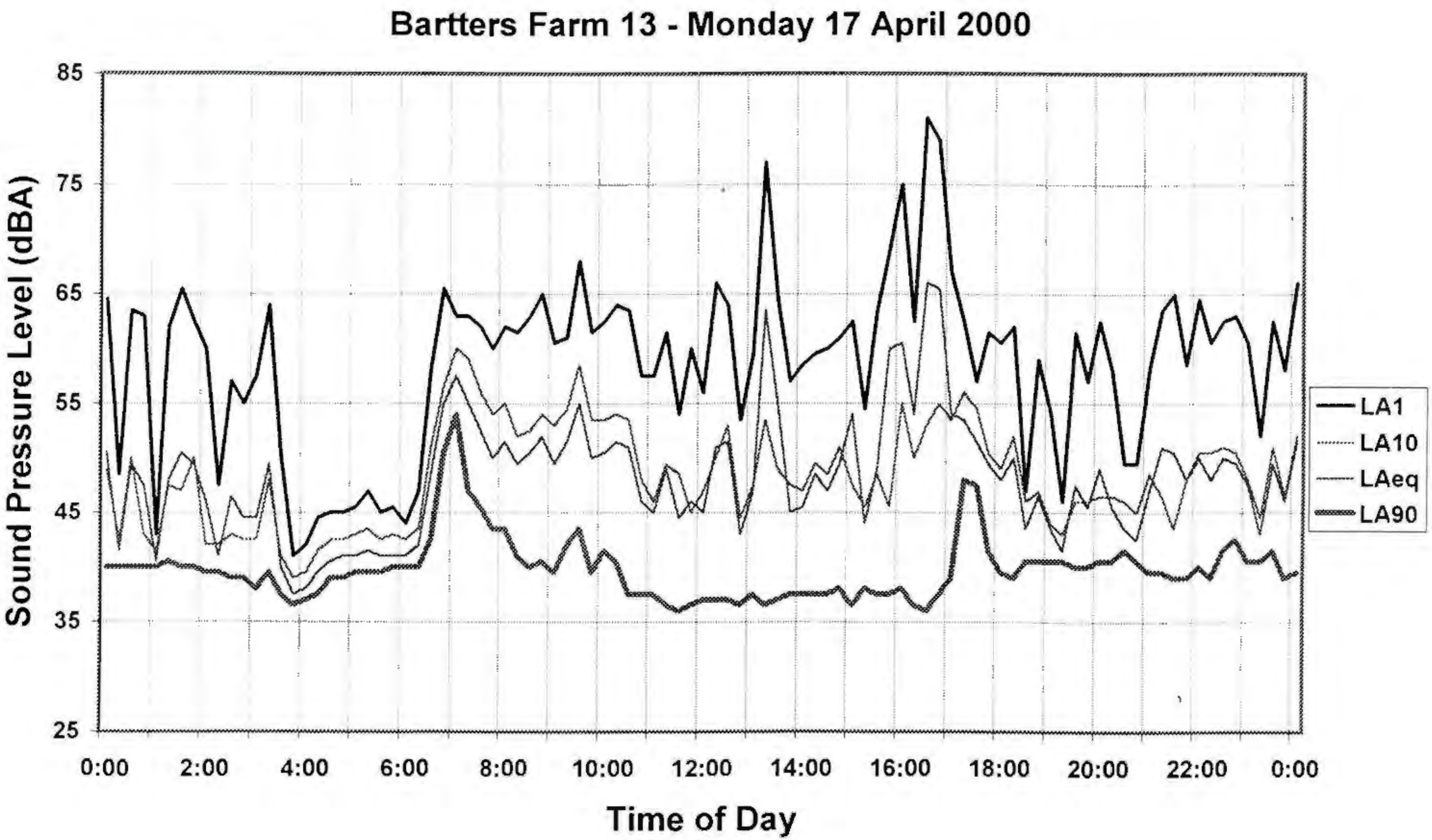
Bartters Farm 13 - Friday 14 April 2000
Sound Pressure Level (dBA)
85
75
65
55
45
35
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day
LA1
LA10
LAeq
LA90



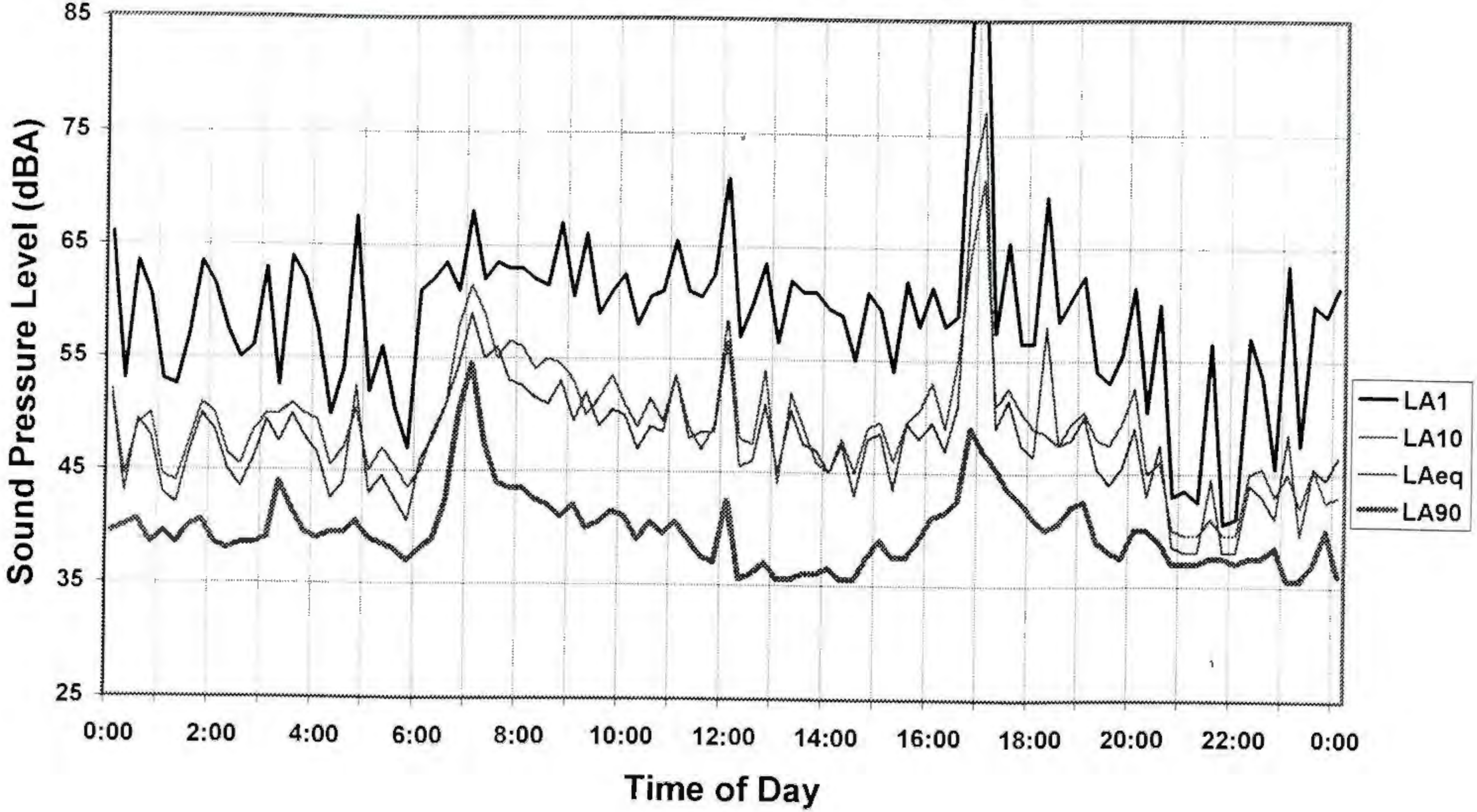
Bartters Farm 13 - Saturday 15 April 2000
Sound Pressure Level (dBA)
85
75
65
55
45
35
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day
LA1
LA10
LAeq
LA90

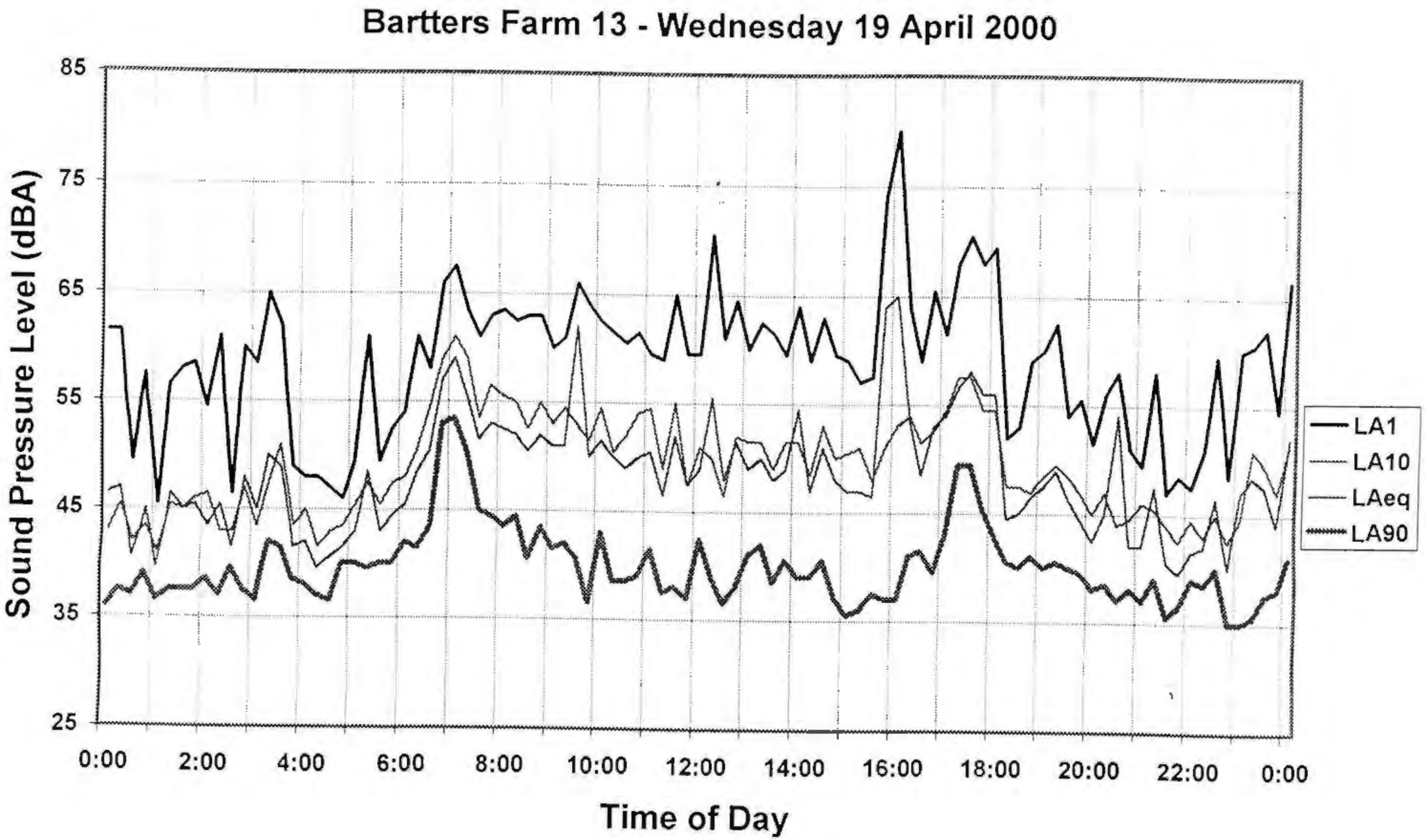
Bartters Farm 13 - Sunday 16 April 2000

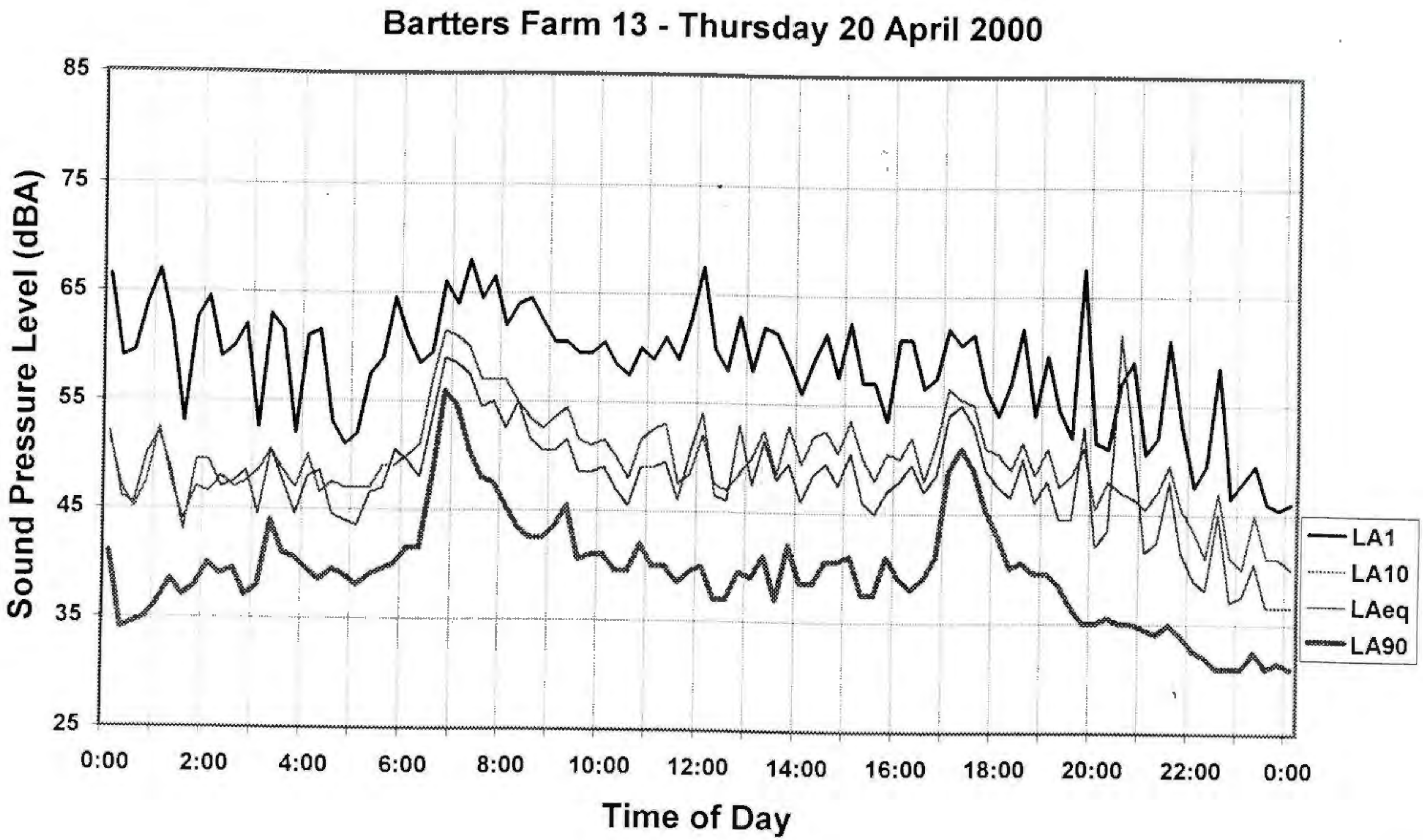



Bartters Farm 13 - Monday 17 April 2000
Sound Pressure Level (dBA)
85
75
65
55
45
35
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day
LA1
LA10
LAeq
LA90

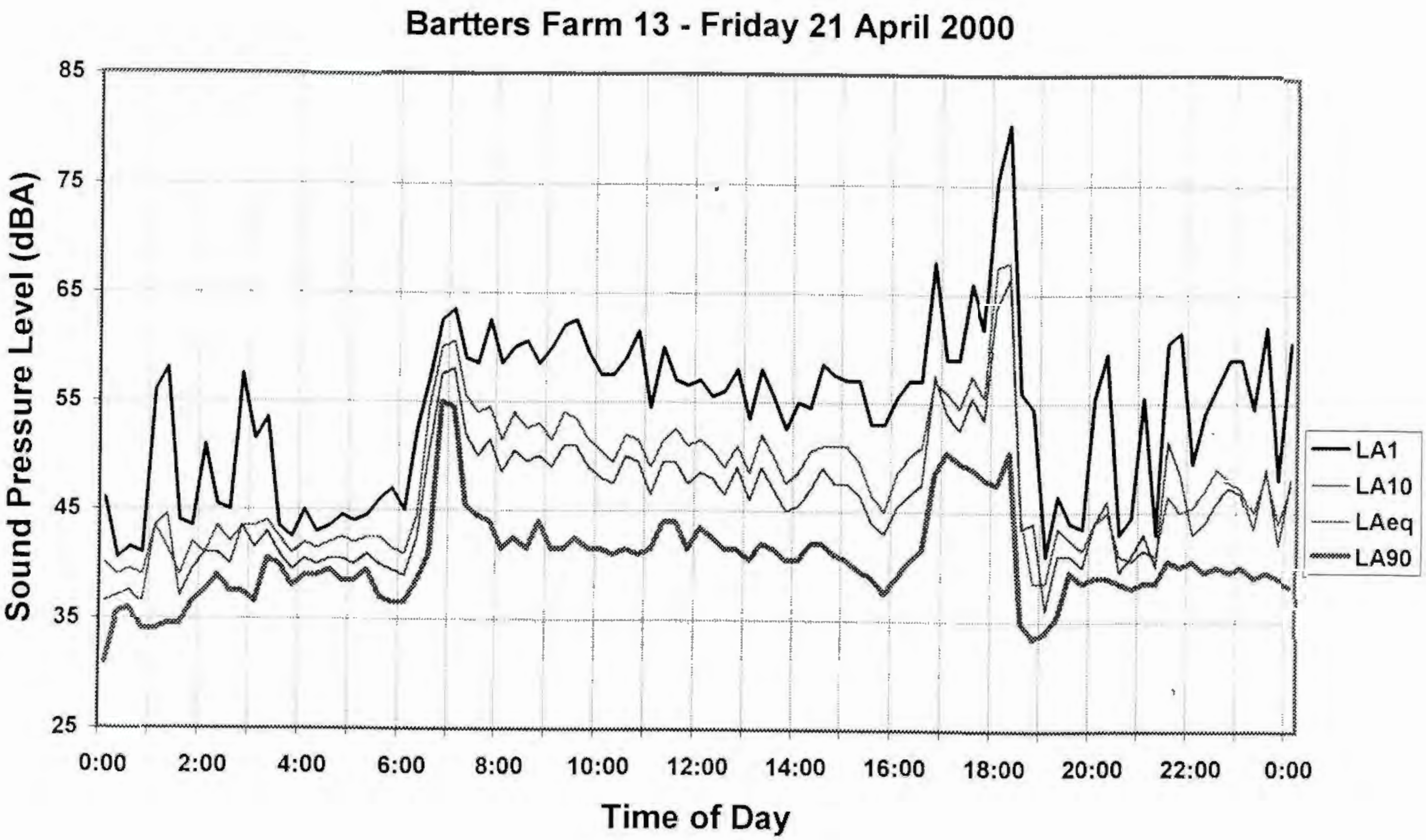
Bartters Farm 13 - Tuesday 18 April 2000



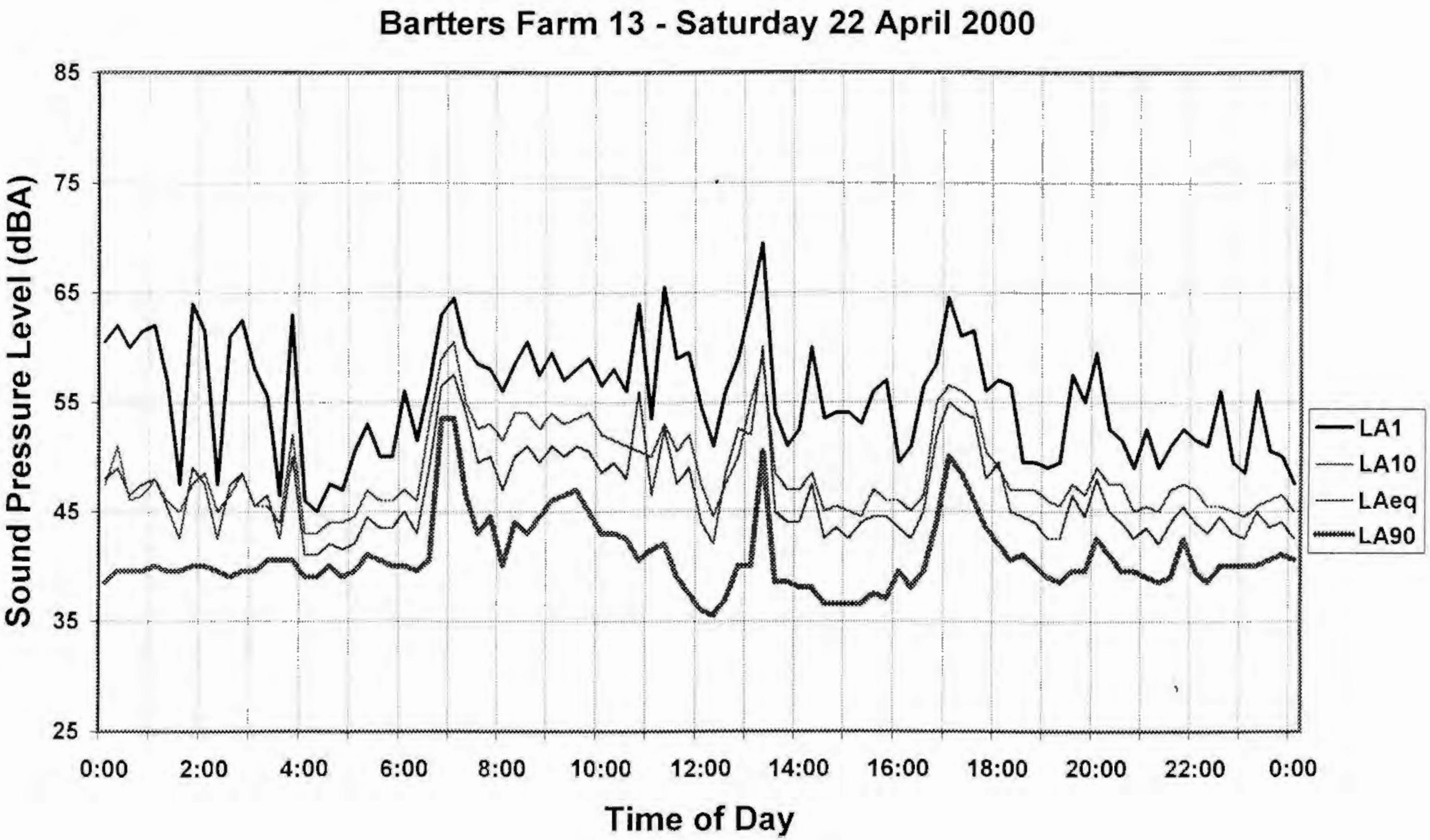

Bartters Farm 13 - Wednesday 19 April 2000
Sound Pressure Level (dBA)
85
75
65
55
45
35
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day
LA1
LA10
LAeq
LA90



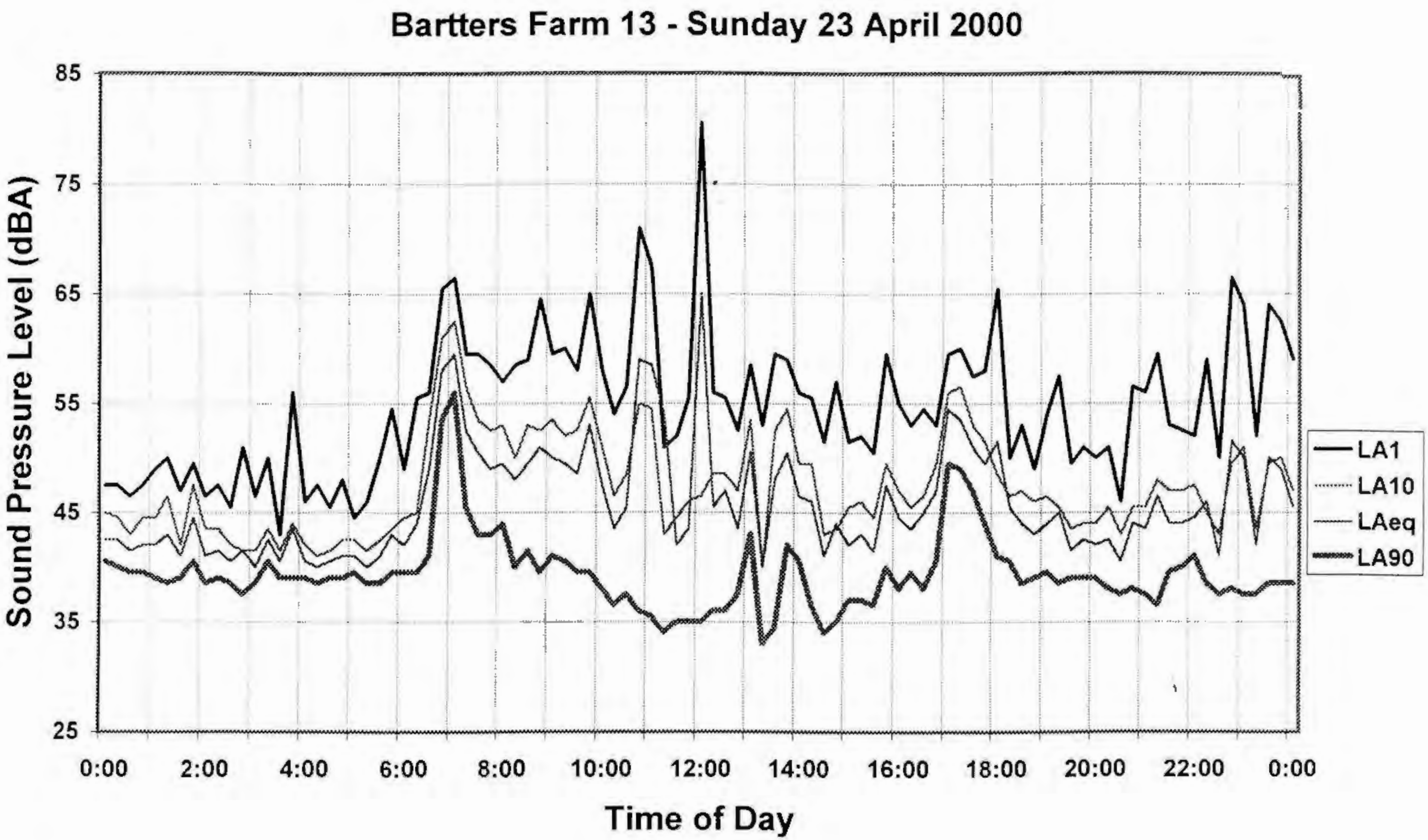
Bartters Farm 13 - Thursday 20 April 2000
Sound Pressure Level (dBA)
85
75
65
55
45
35
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day
LA1
LA10
LAeq
LA90

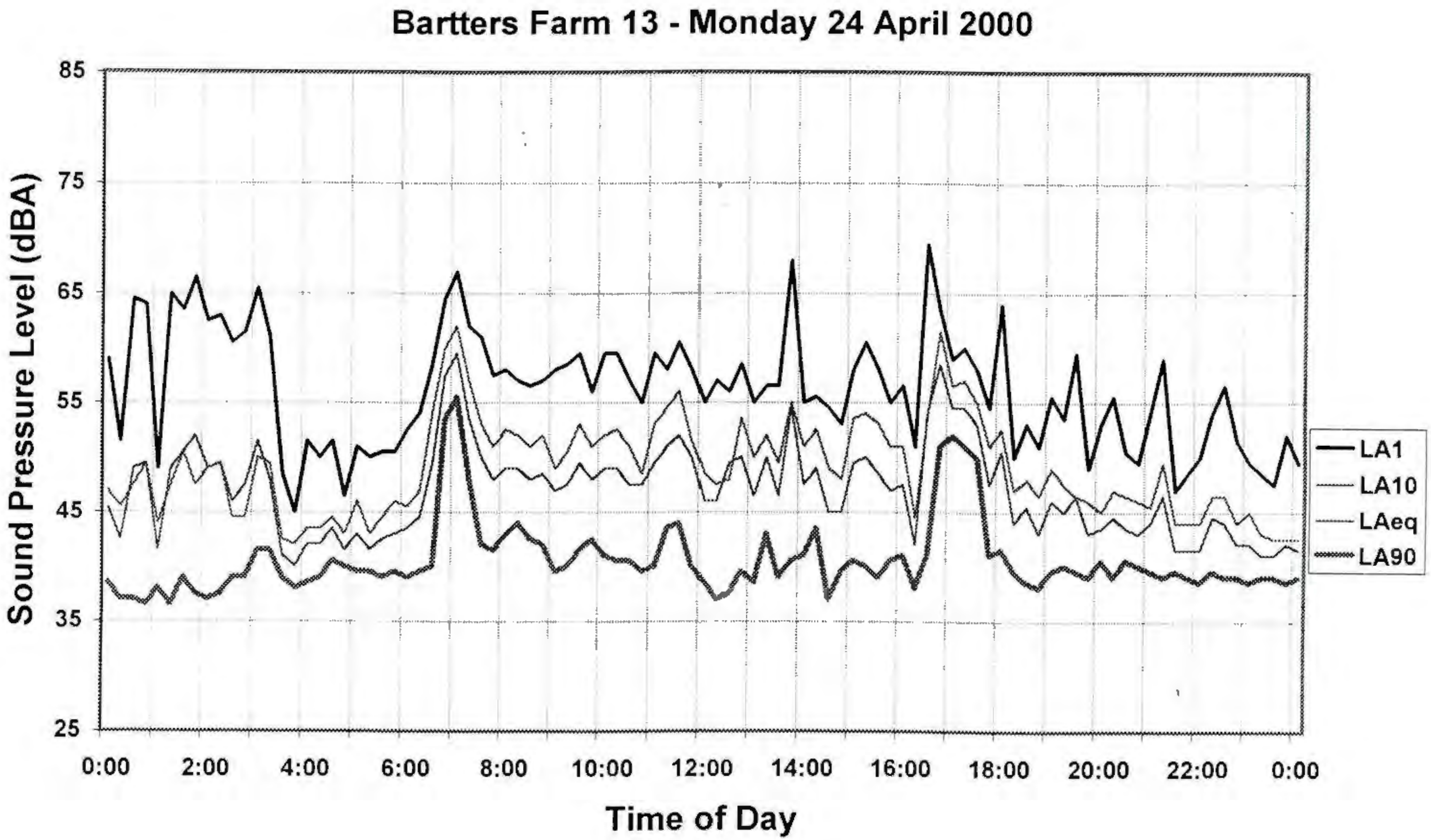


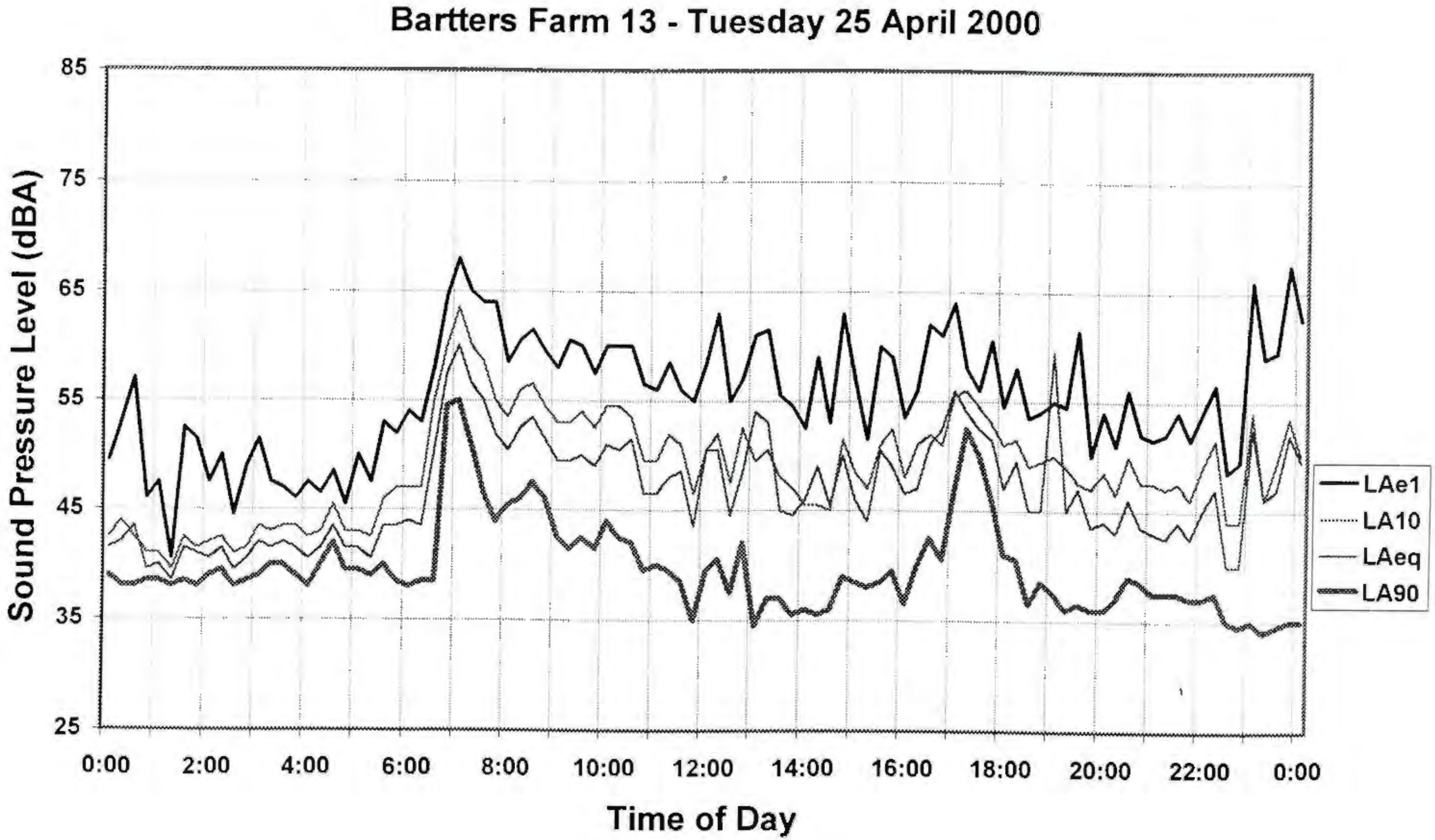
Bartters Farm 13 - Friday 21 April 2000
Sound Pressure Level (dBA)
85
75
65
55
45
35
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day
LA1
LA10
LAeq
LA90

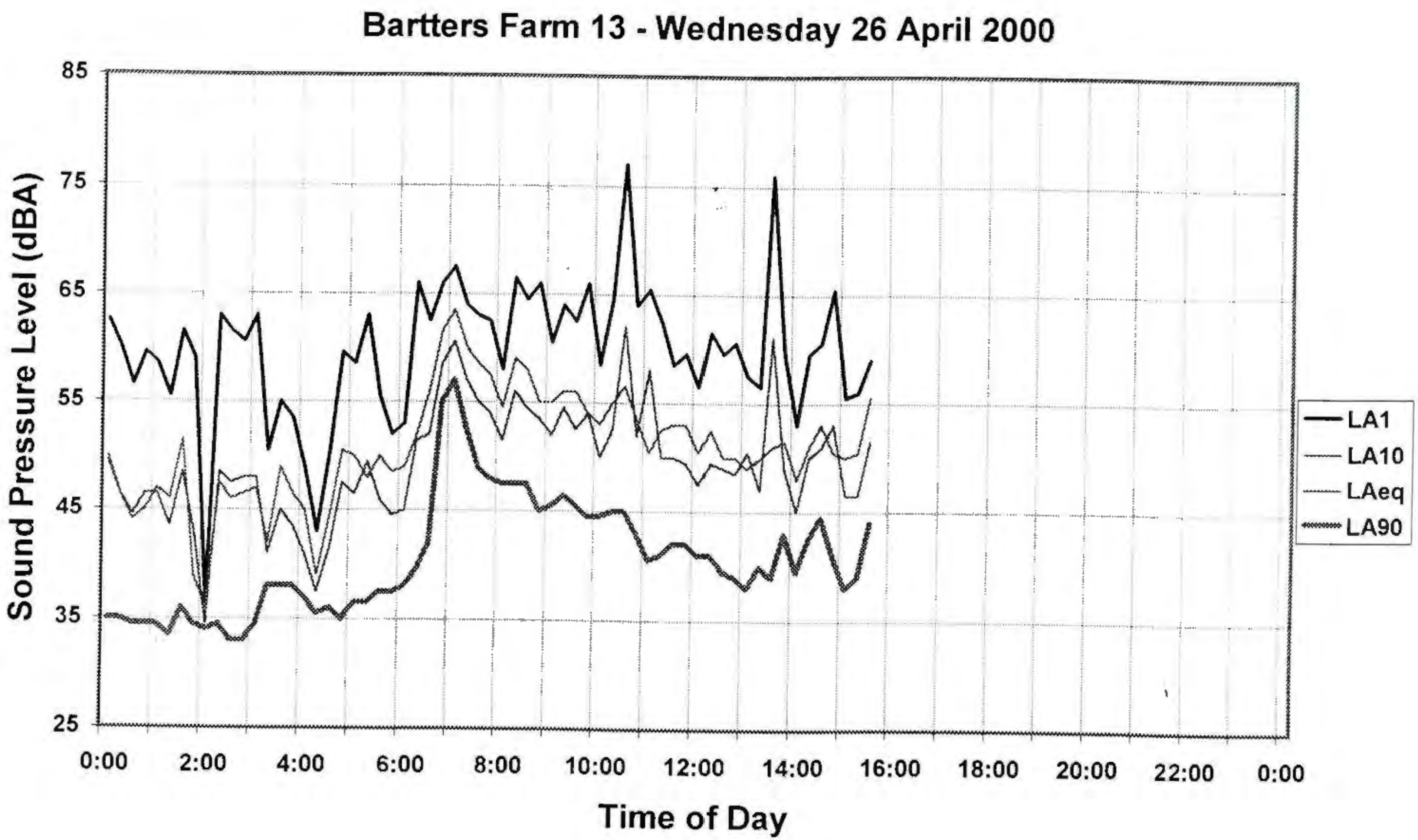


Bartters Farm 13 - Saturday 22 April 2000
Sound Pressure Level (dBA)
85
75
65
55
45
35
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day
LA1
LA10
LAeq
LA90


Bartters Farm 13 - Sunday 23 April 2000
Sound Pressure Level (dBA)
85
75
65
55
45
35
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day
LA1
LA10
LAeq
LA90

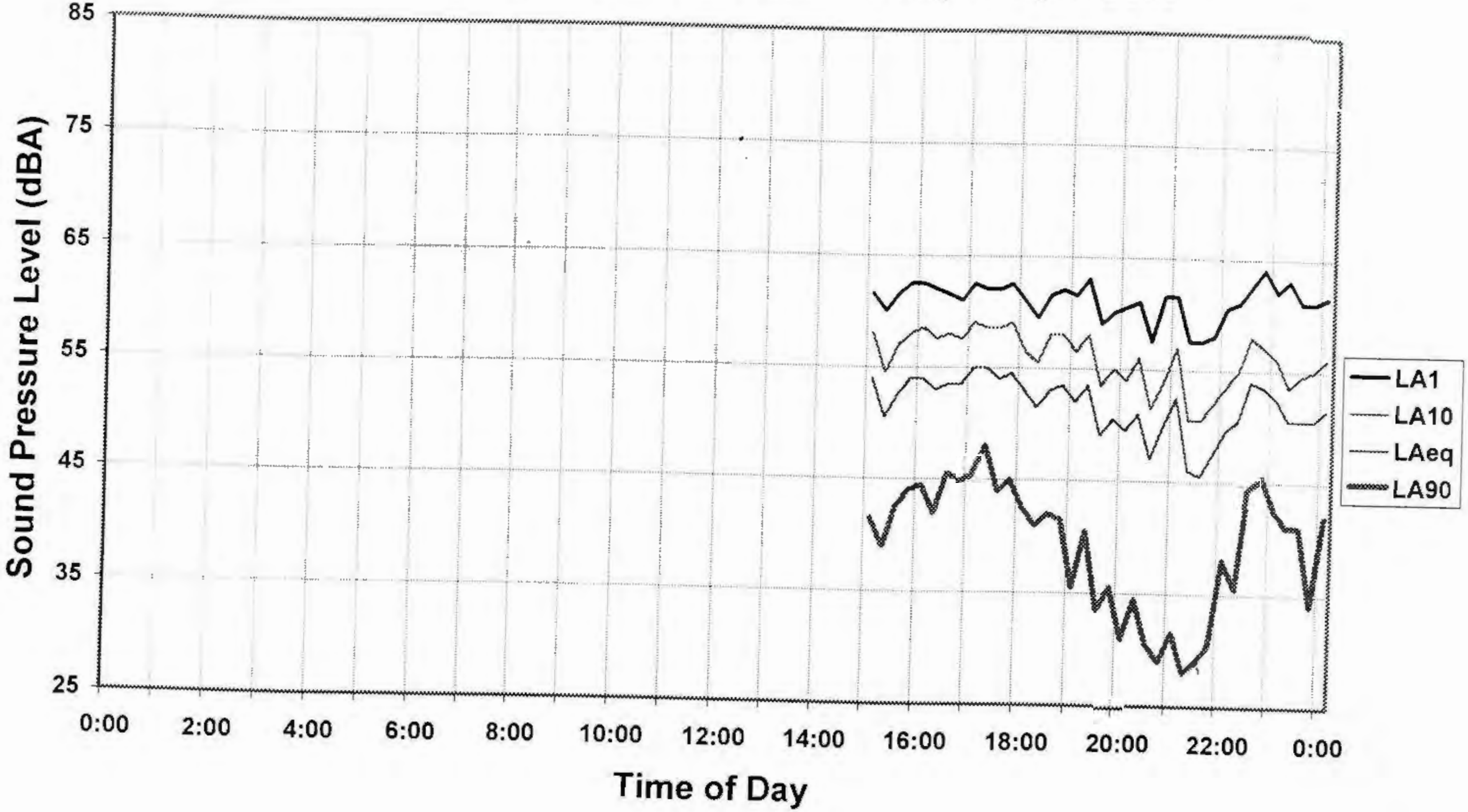

Bartters Farm 13 - Monday 24 April 2000
Sound Pressure Level (dBA)
85
75
65
55
45
35
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day
LA1
LA10
LAeq
LA90


Bartters Farm 13 - Tuesday 25 April 2000
Sound Pressure Level (dBA)
85
75
65
55
45
35
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day
LAe1
LA10
LAeq
LA90

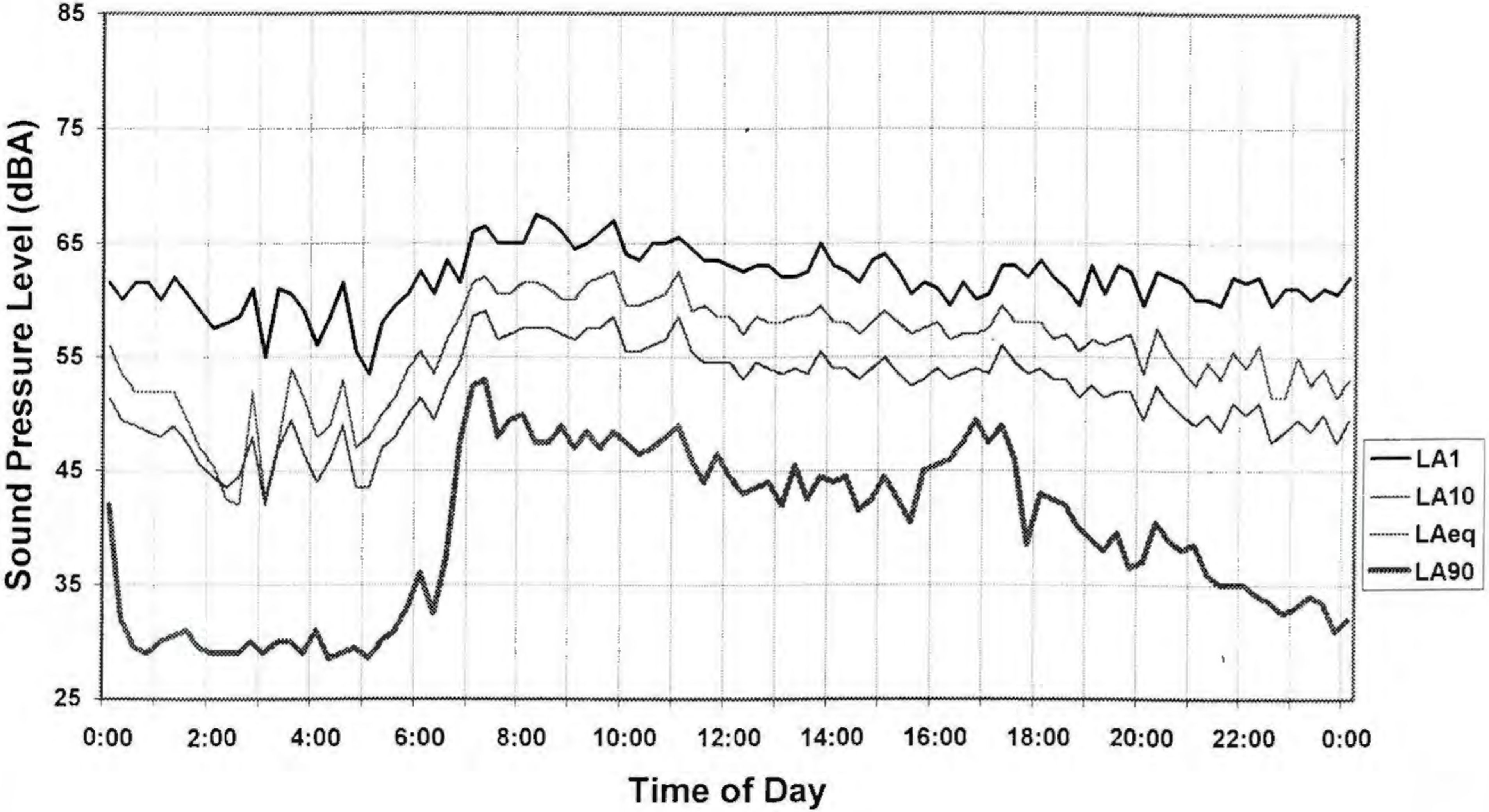


Bartters Farm 13 - Wednesday 26 April 2000
Sound Pressure Level (dBA)
85
75
65
55
45
35
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day
LA1
LA10
LAeq
LA90

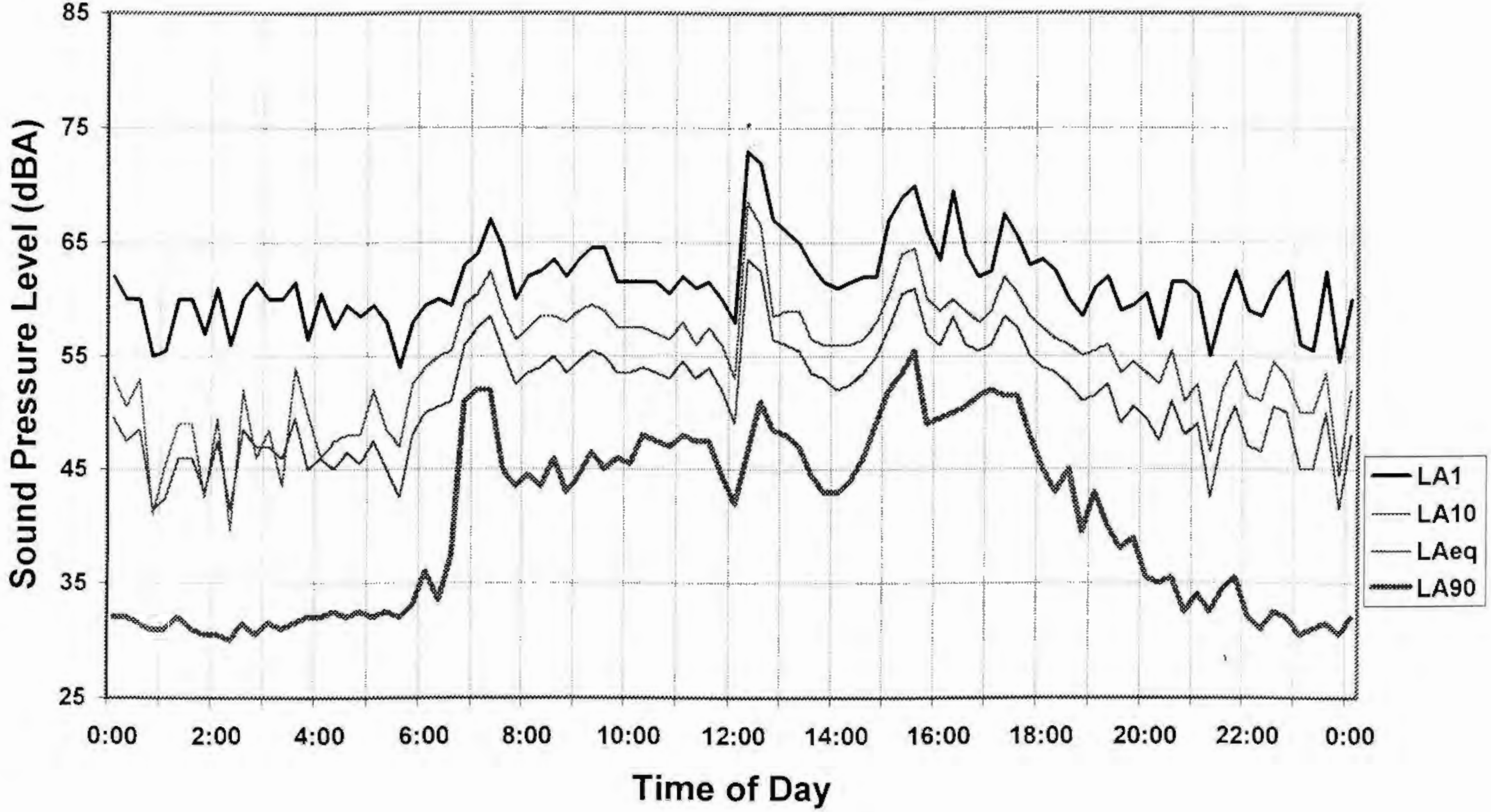
Dick Thompson Fram 1054 - Wednesday 12 April 2000

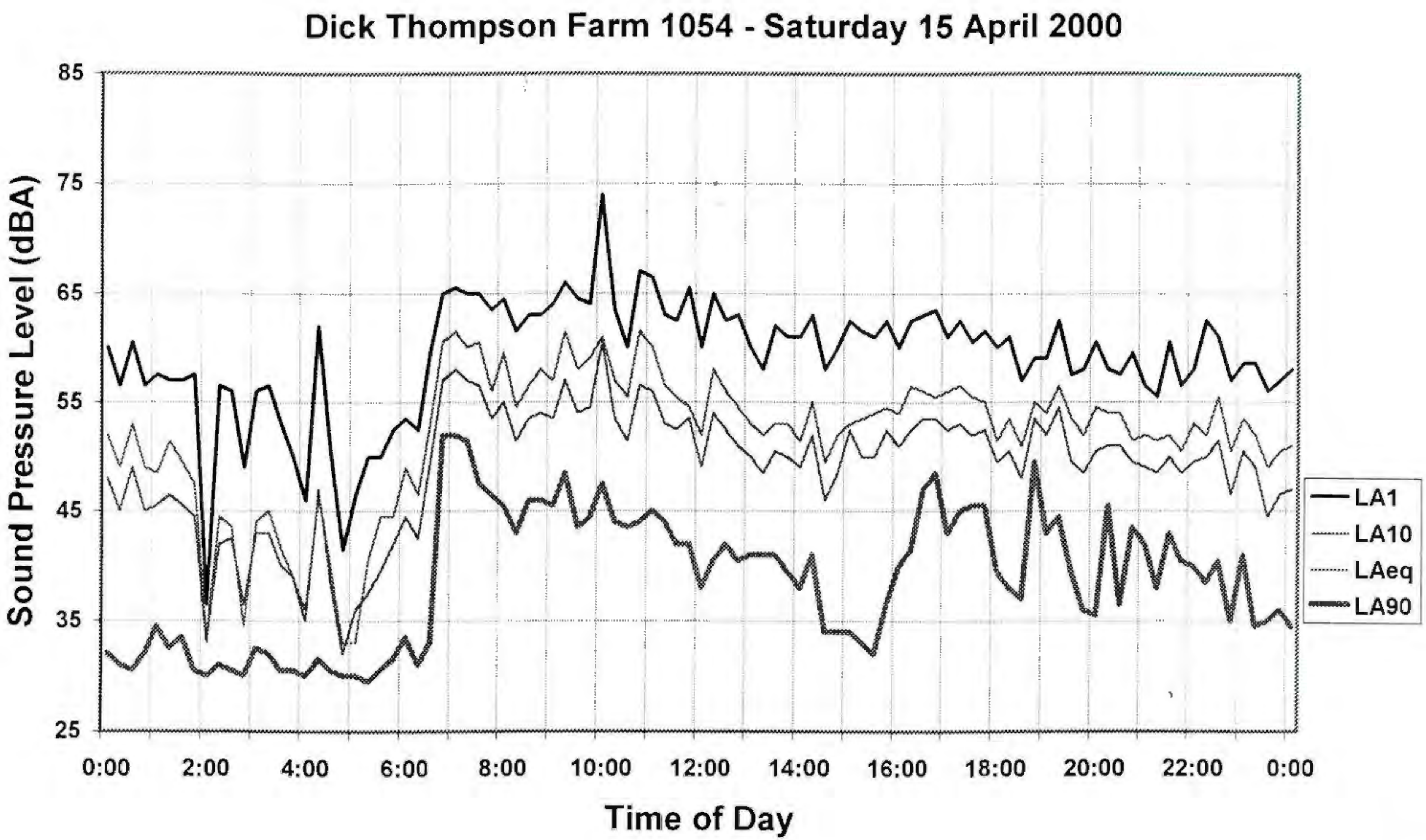


Dick Thompson Farm 1054 - Thursday 13 April 2000

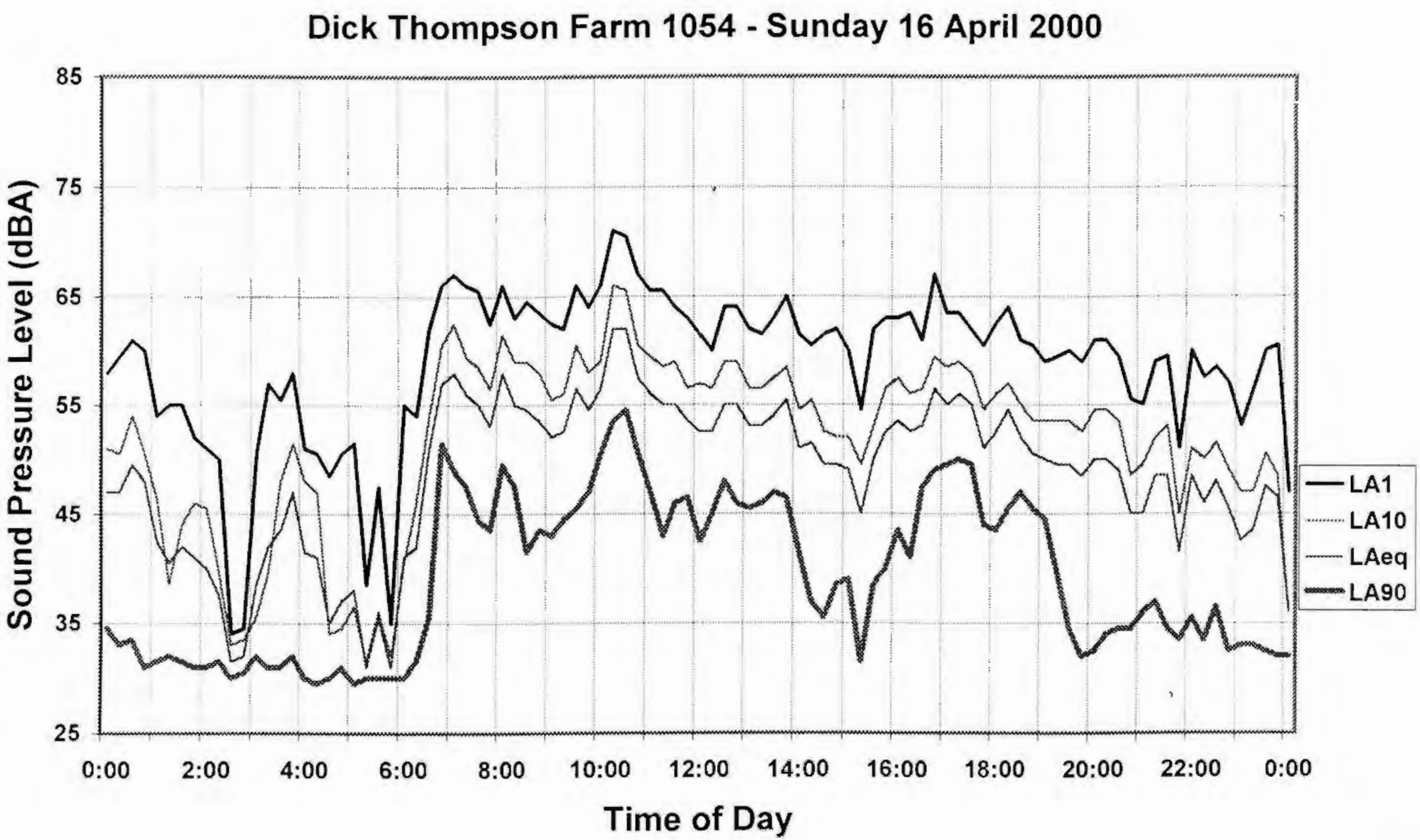


Dick Thompson Farm 1054 - Friday 14 April 2000

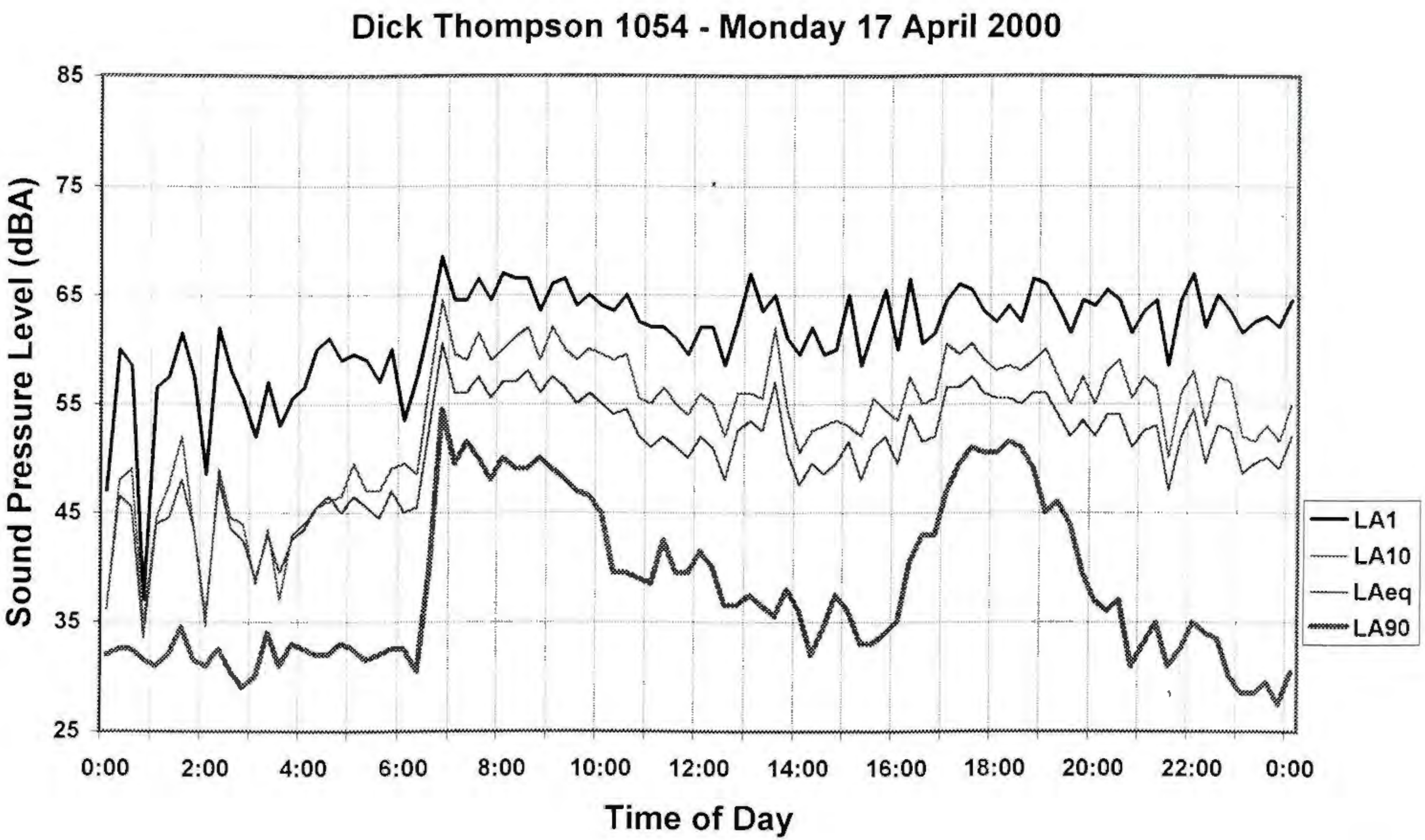




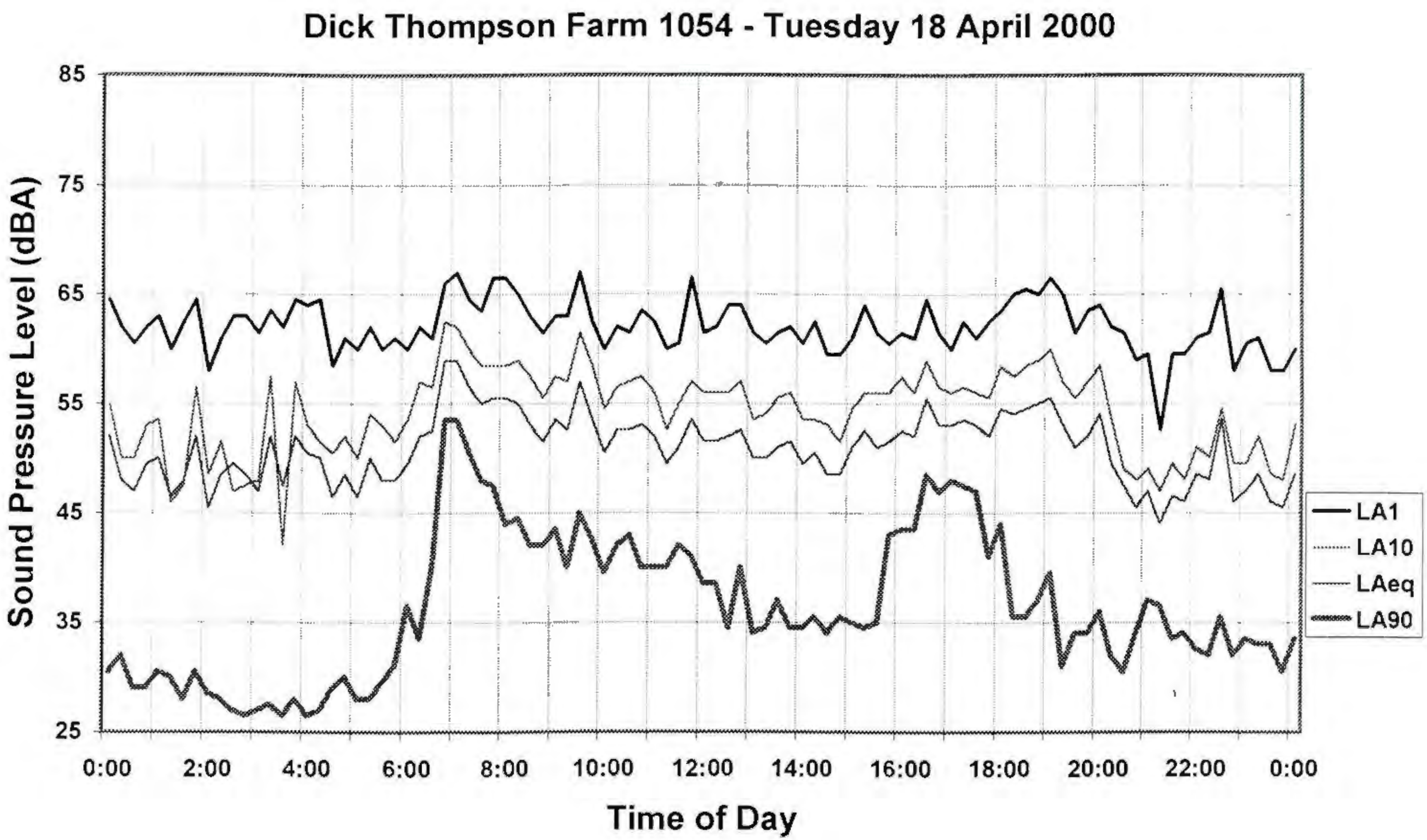
Dick Thompson Farm 1054 - Saturday 15 April 2000
Sound Pressure Level (dBA)
85
75
65
55
45
35
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day
LA1
LA10
LAeq
LA90



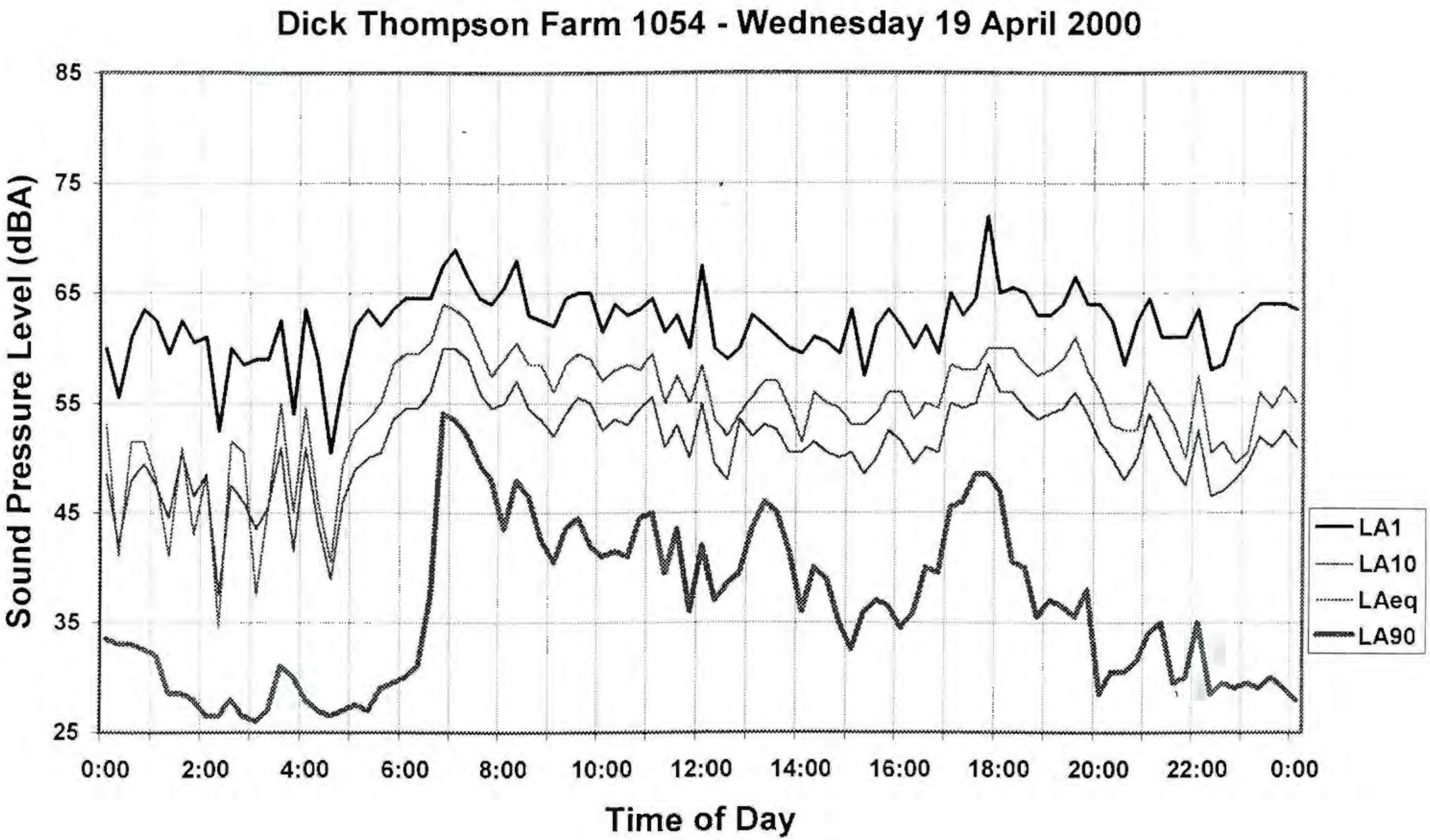
Dick Thompson Farm 1054 - Sunday 16 April 2000
Sound Pressure Level (dBA)
85
75
65
55
45
35
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day
LA1
LA10
LAeq
LA90

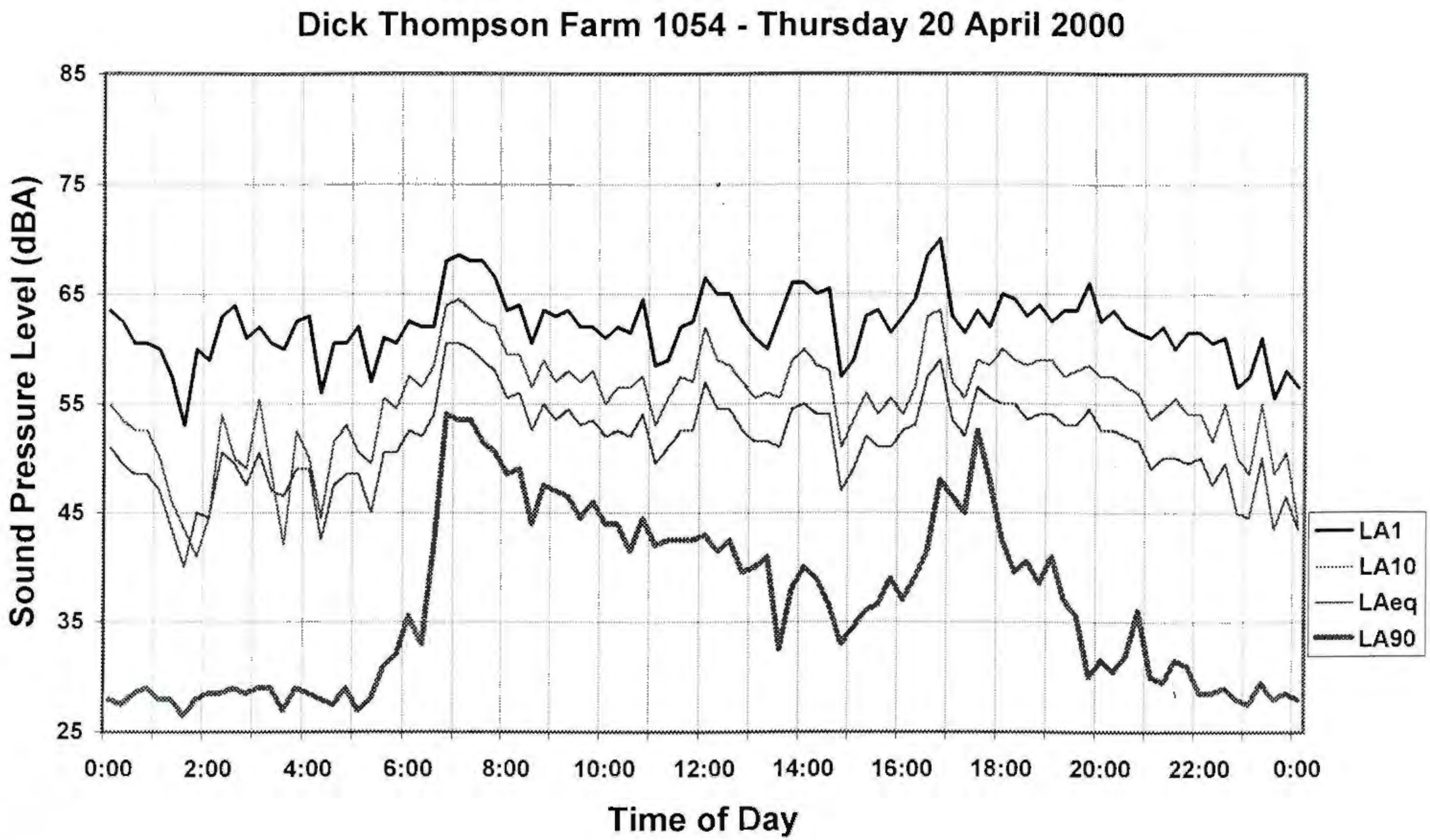


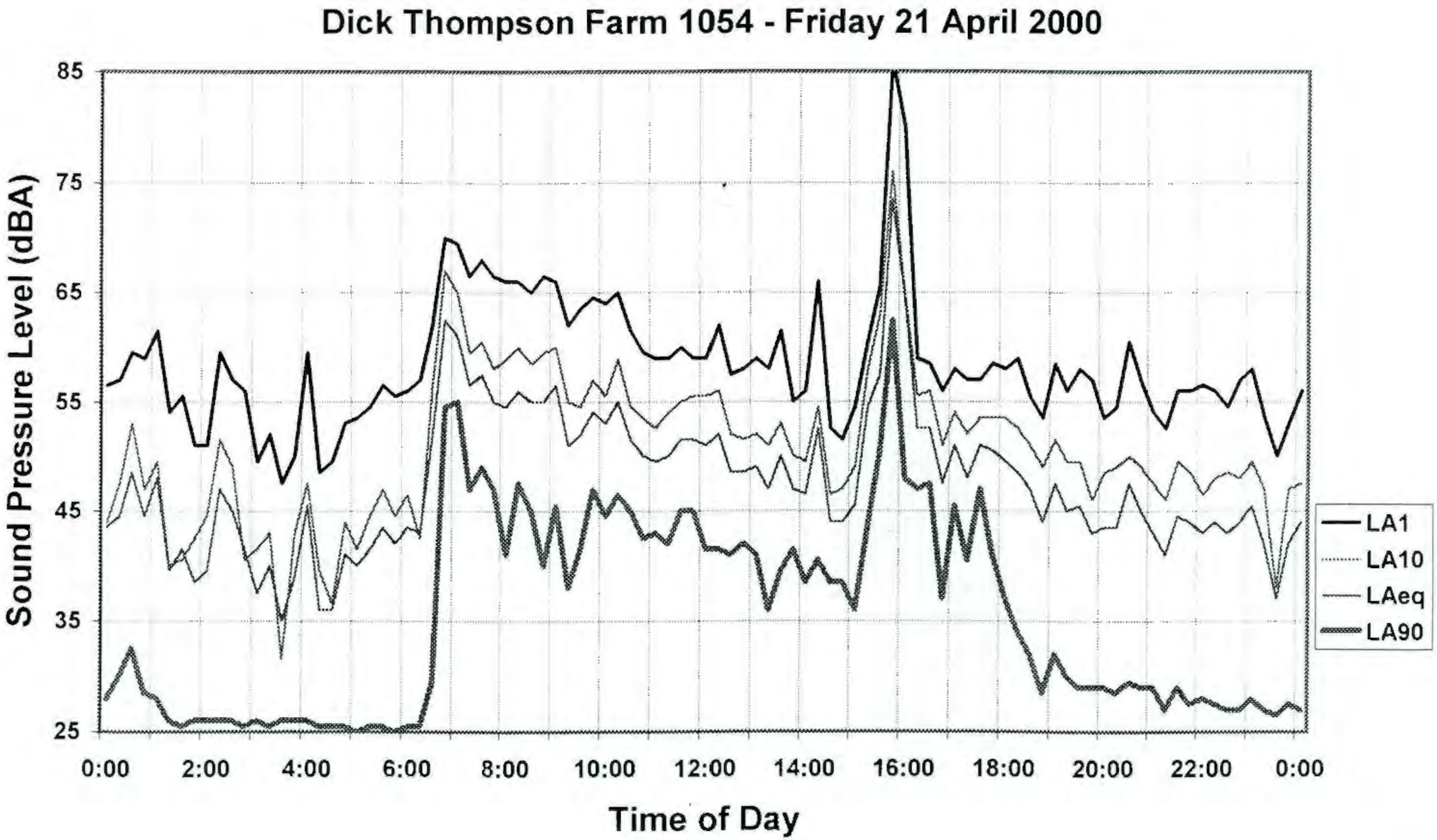
Dick Thompson 1054 - Monday 17 April 2000
85
75
65
55
45
35
25
Sound Pressure Level (dBA)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day
LA1
LA10
LAeq
LA90



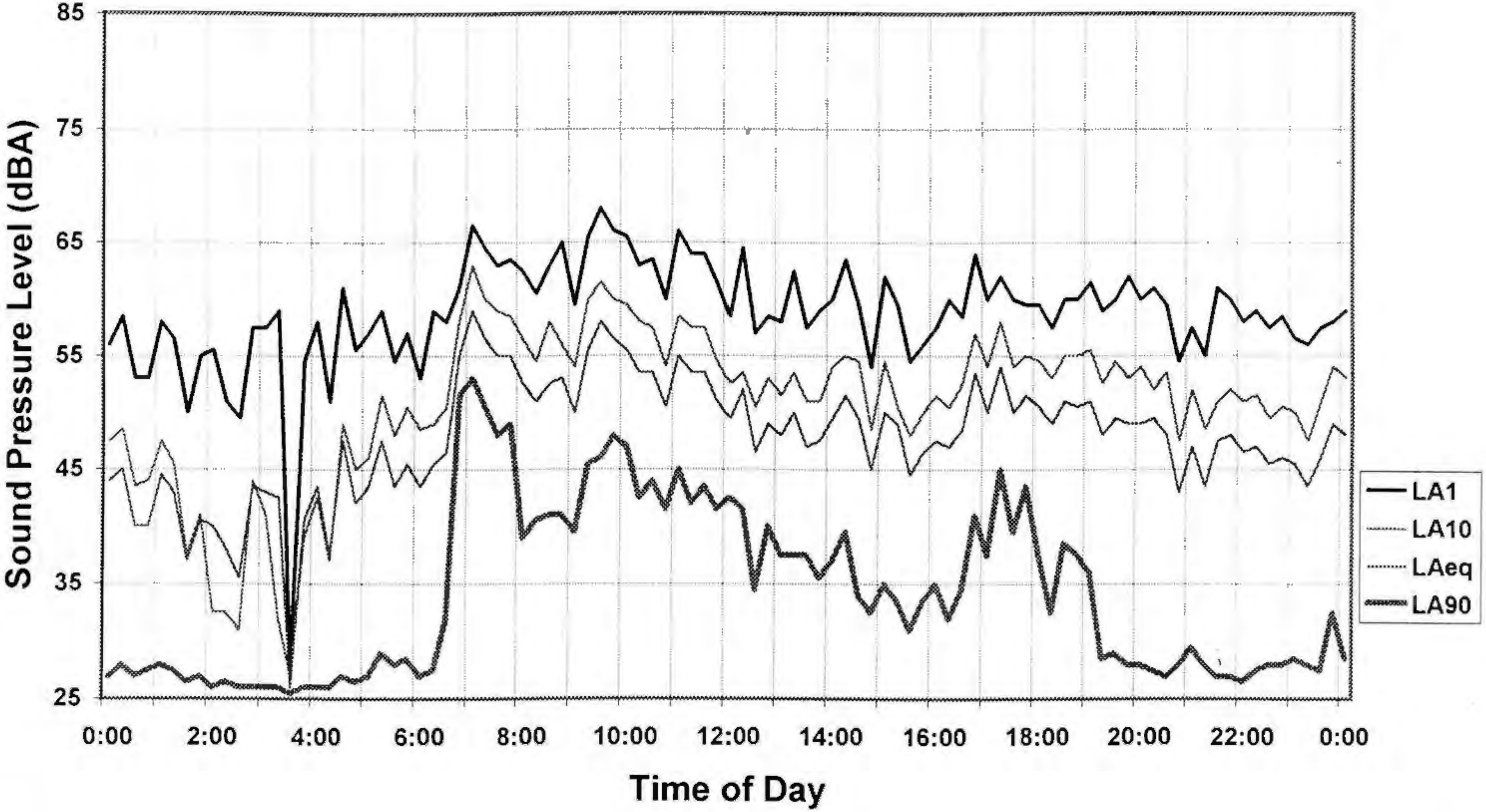
Dick Thompson Farm 1054 - Tuesday 18 April 2000
Sound Pressure Level (dBA)
85
75
65
55
45
35
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day
LA1
LA10
LAeq
LA90

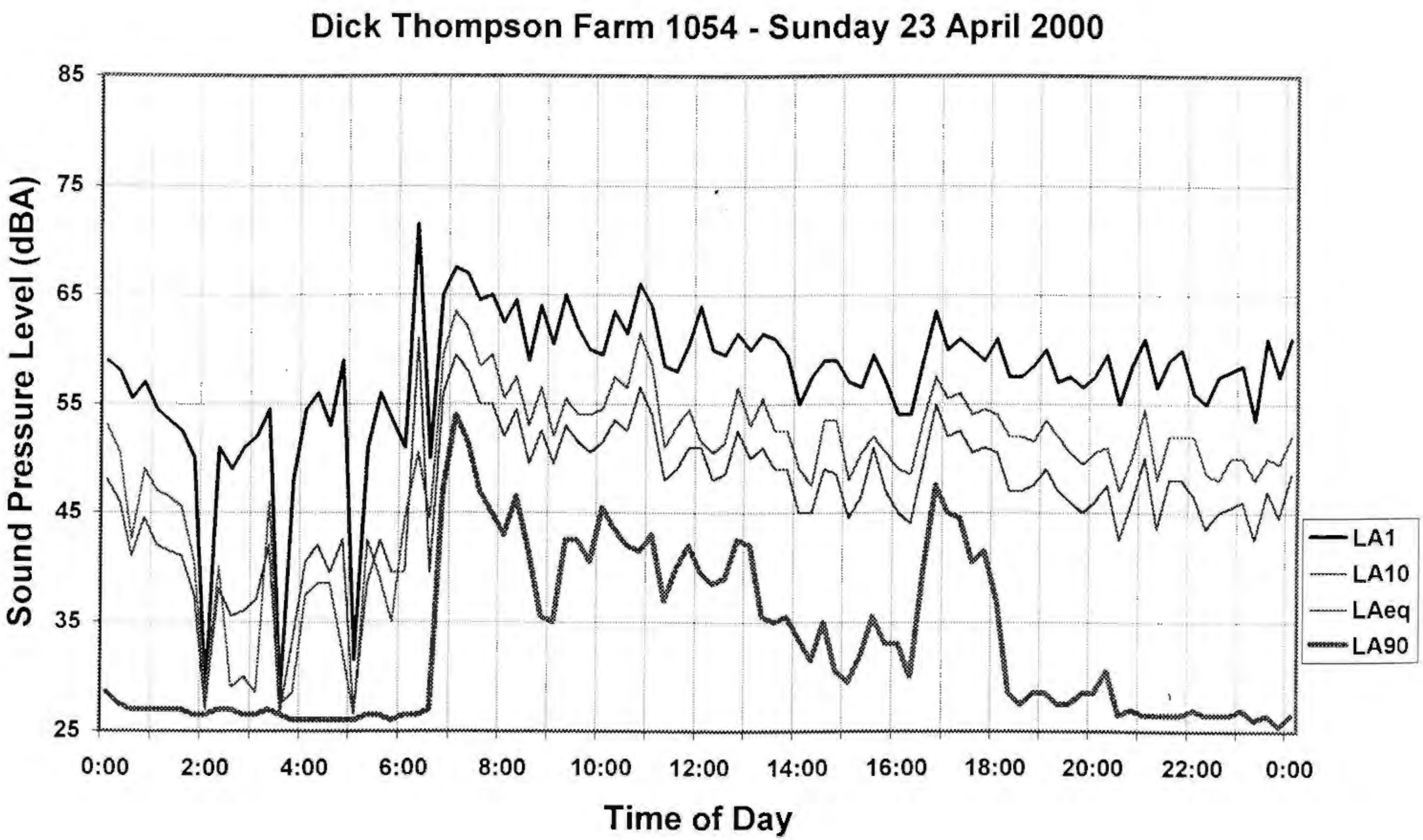

Dick Thompson Farm 1054 - Wednesday 19 April 2000
Sound Pressure Level (dBA)
85
75
65
55
45
35
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day
LA1
LA10
LAeq
LA90


Dick Thompson Farm 1054 - Thursday 20 April 2000
Sound Pressure Level (dBA)
85
75
65
55
45
35
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day
LA1
LA10
LAeq
LA90

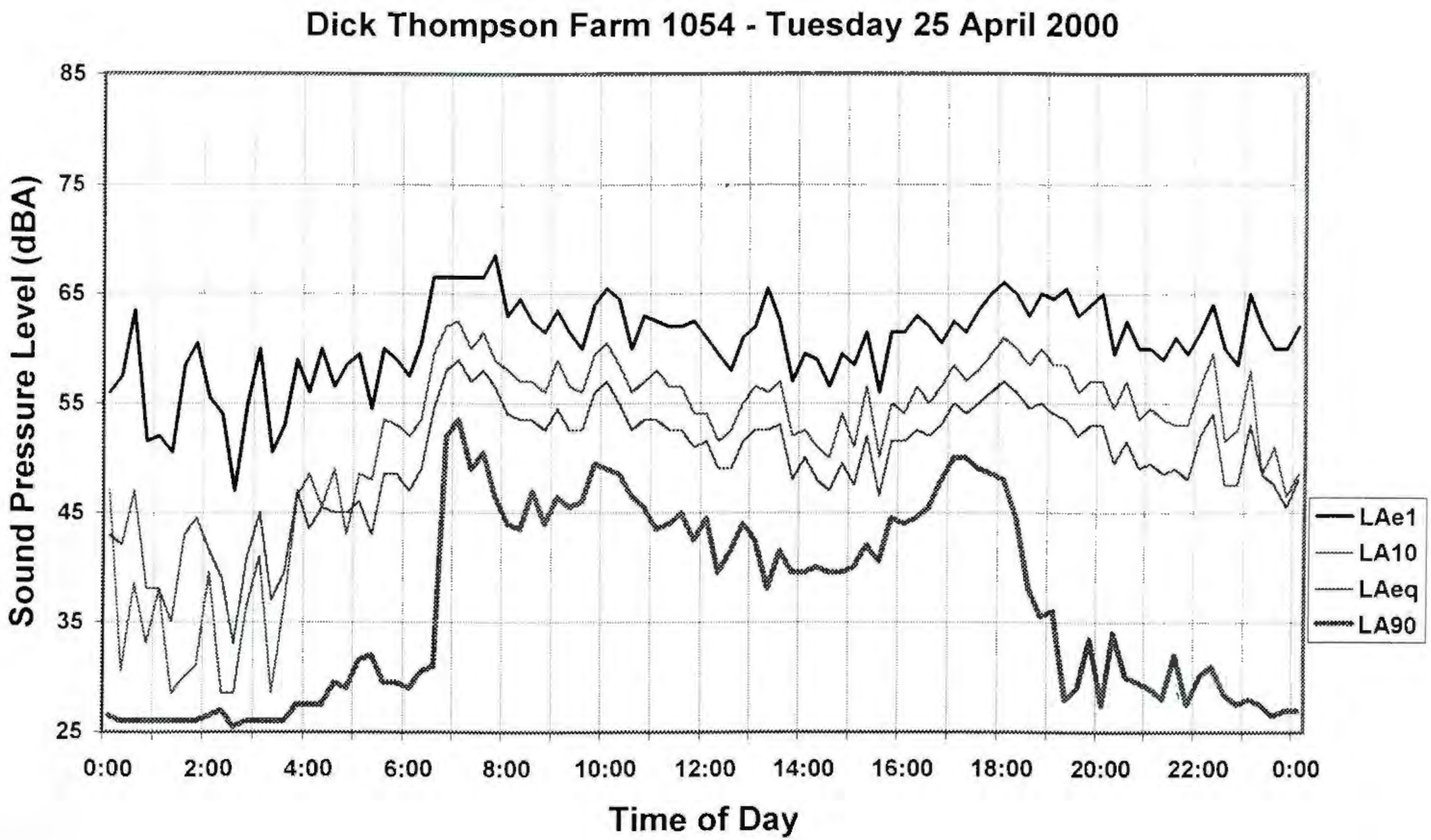

Dick Thompson Farm 1054 - Friday 21 April 2000
Sound Pressure Level (dBA)
85
75
65
55
45
35
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day
LA1
LA10
LAeq
LA90

Dick Thompson Farm 1054 - Saturday 22 April 2000

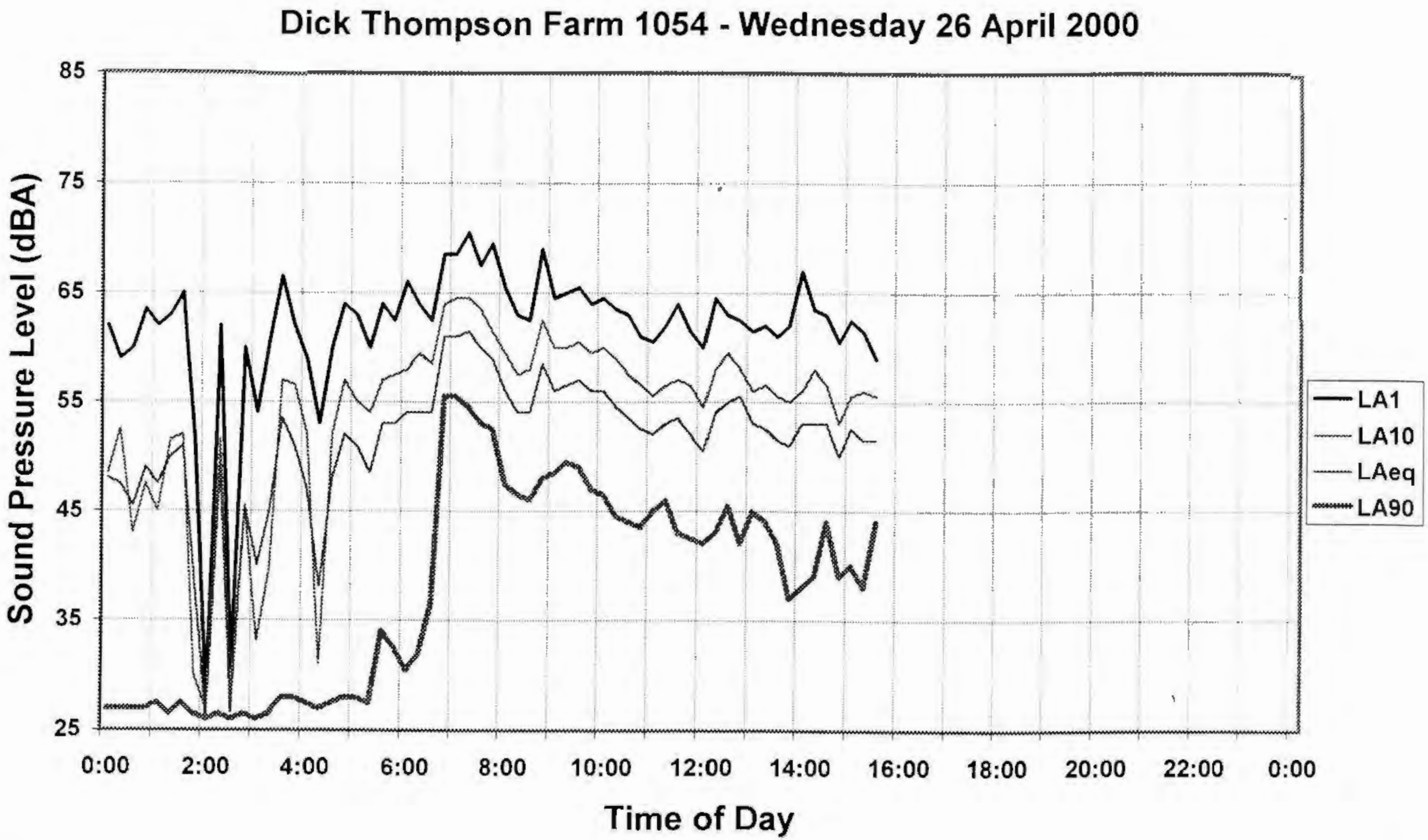




Dick Thompson Farm 1054 - Sunday 23 April 2000
Sound Pressure Level (dBA)
85
75
65
55
45
35
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day
LA1
LA10
LAeq
LA90

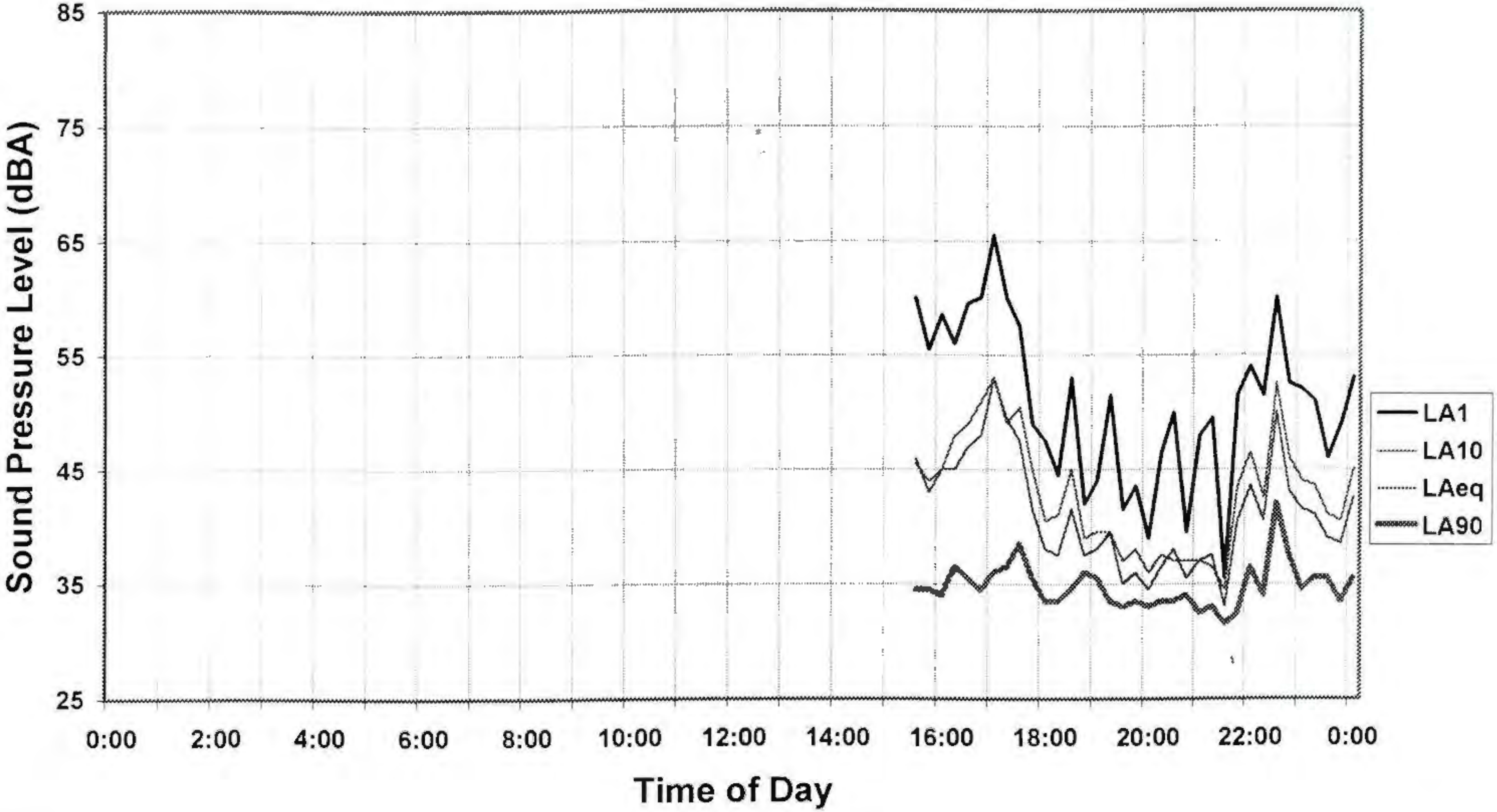


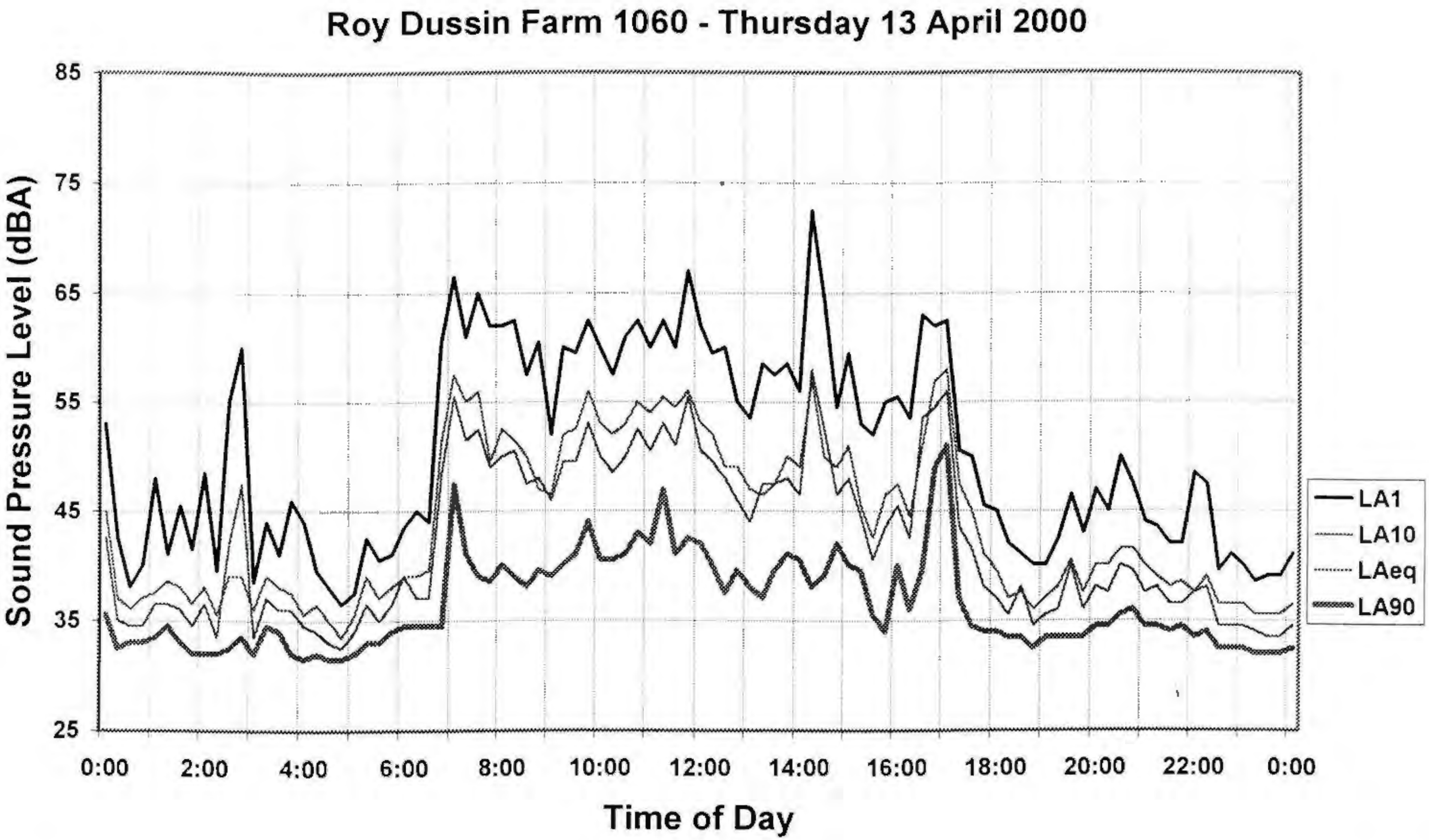
Dick Thompson Farm 1054 - Tuesday 25 April 2000
Sound Pressure Level (dBA)
85
75
65
55
45
35
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day
LAe1
LA10
LAeq
LA90



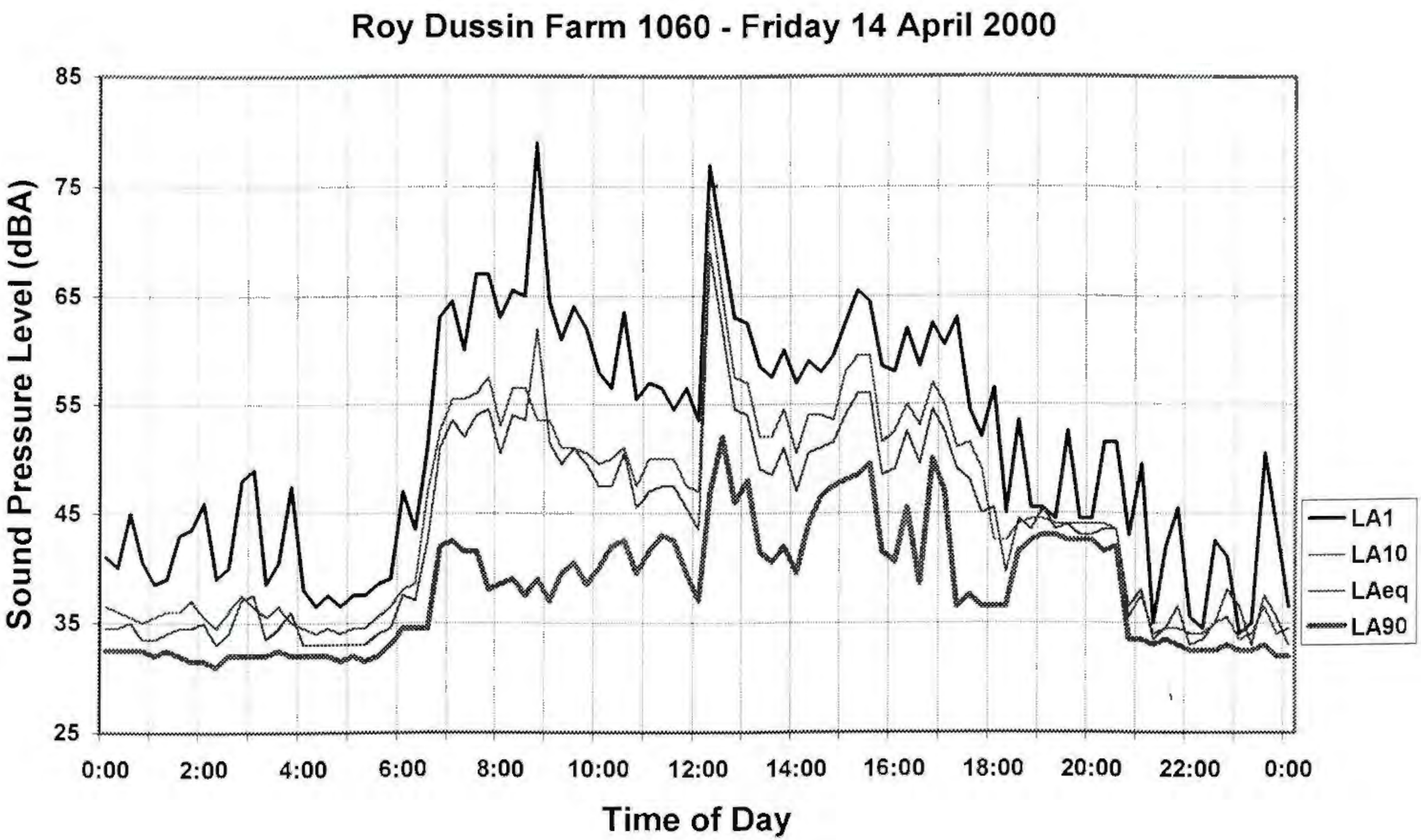
Dick Thompson Farm 1054 - Wednesday 26 April 2000
Sound Pressure Level (dBA)
85
75
65
55
45
35
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day
LA1
LA10
LAeq
LA90

Roy Dussin Farm 1060 - Wednesday 12 April 2000

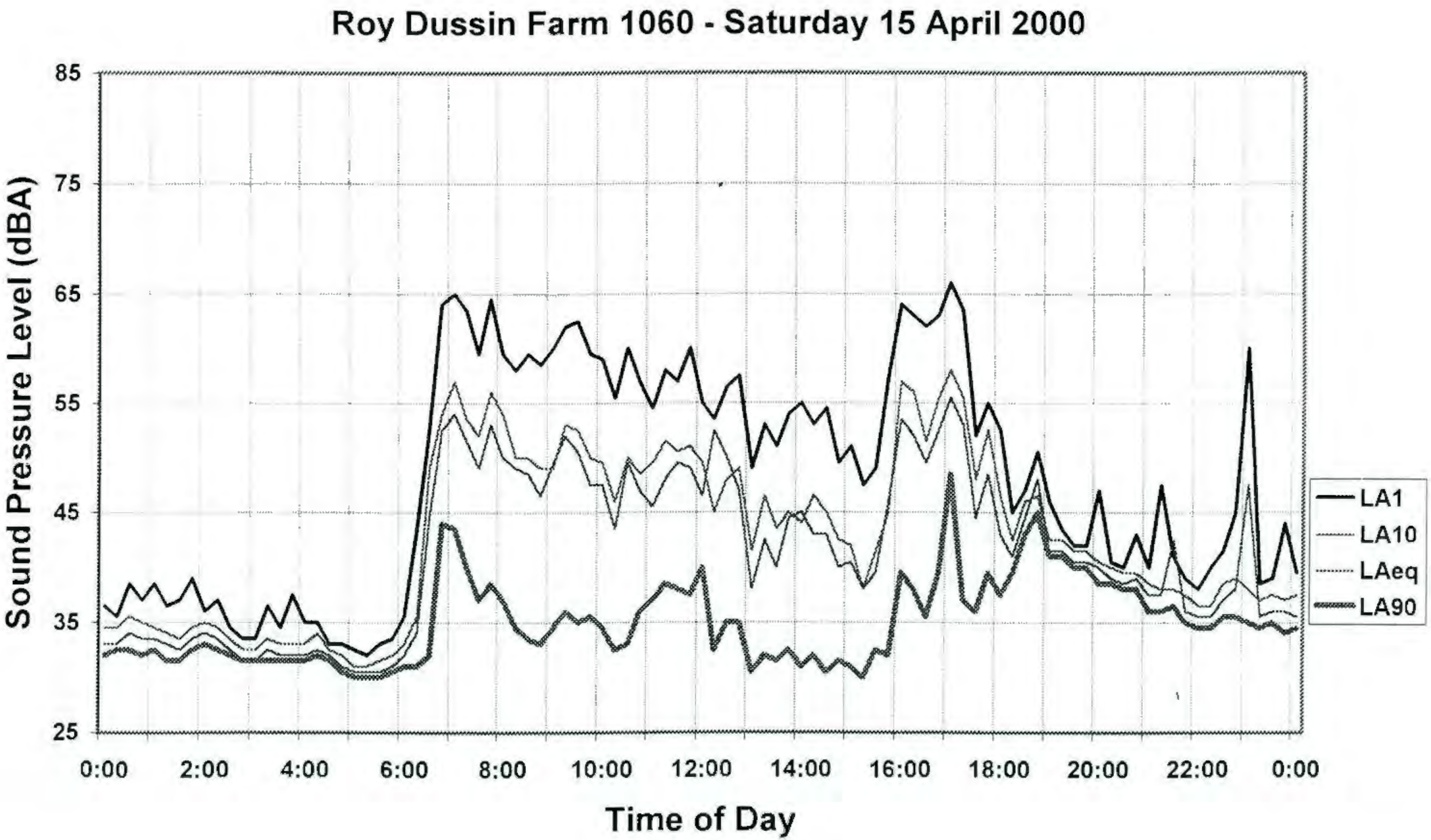




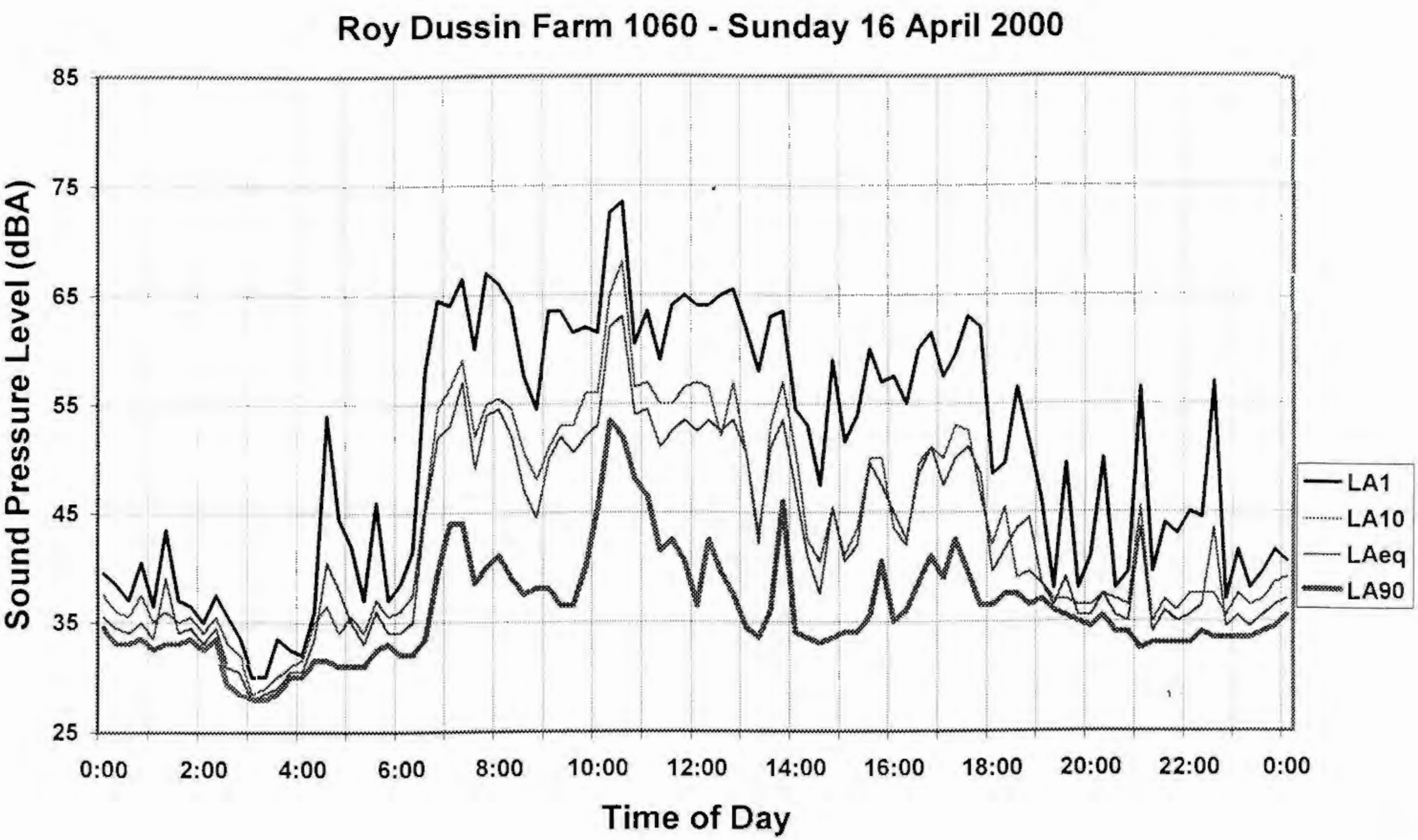
Roy Dussin Farm 1060 - Thursday 13 April 2000
Sound Pressure Level (dBA)
85
75
65
55
45
35
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day
LA1
LA10
LAeq
LA90



Roy Dussin Farm 1060 - Friday 14 April 2000
Sound Pressure Level (dBA)
85
75
65
55
45
35
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day
LA1
LA10
LAeq
LA90

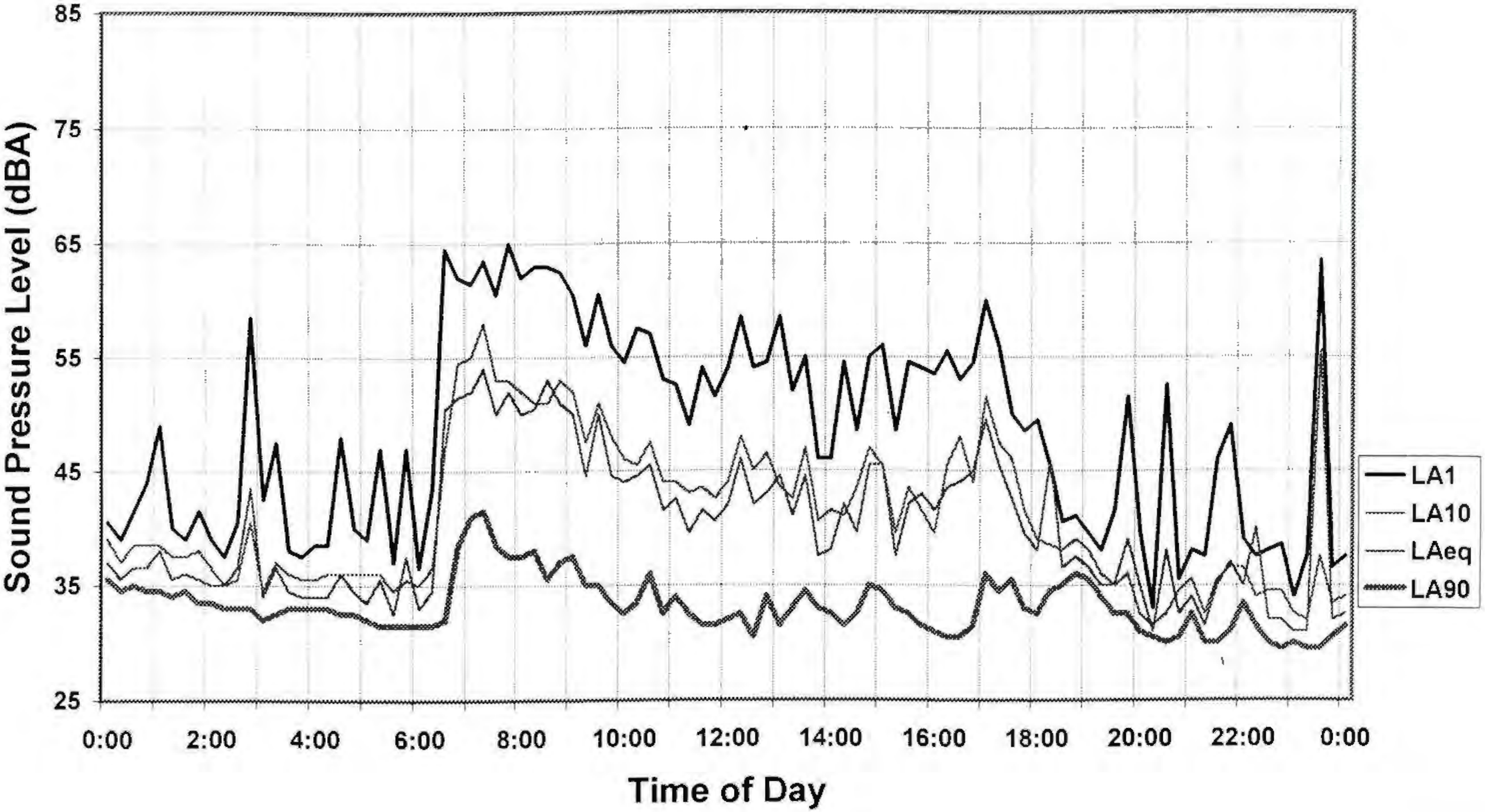


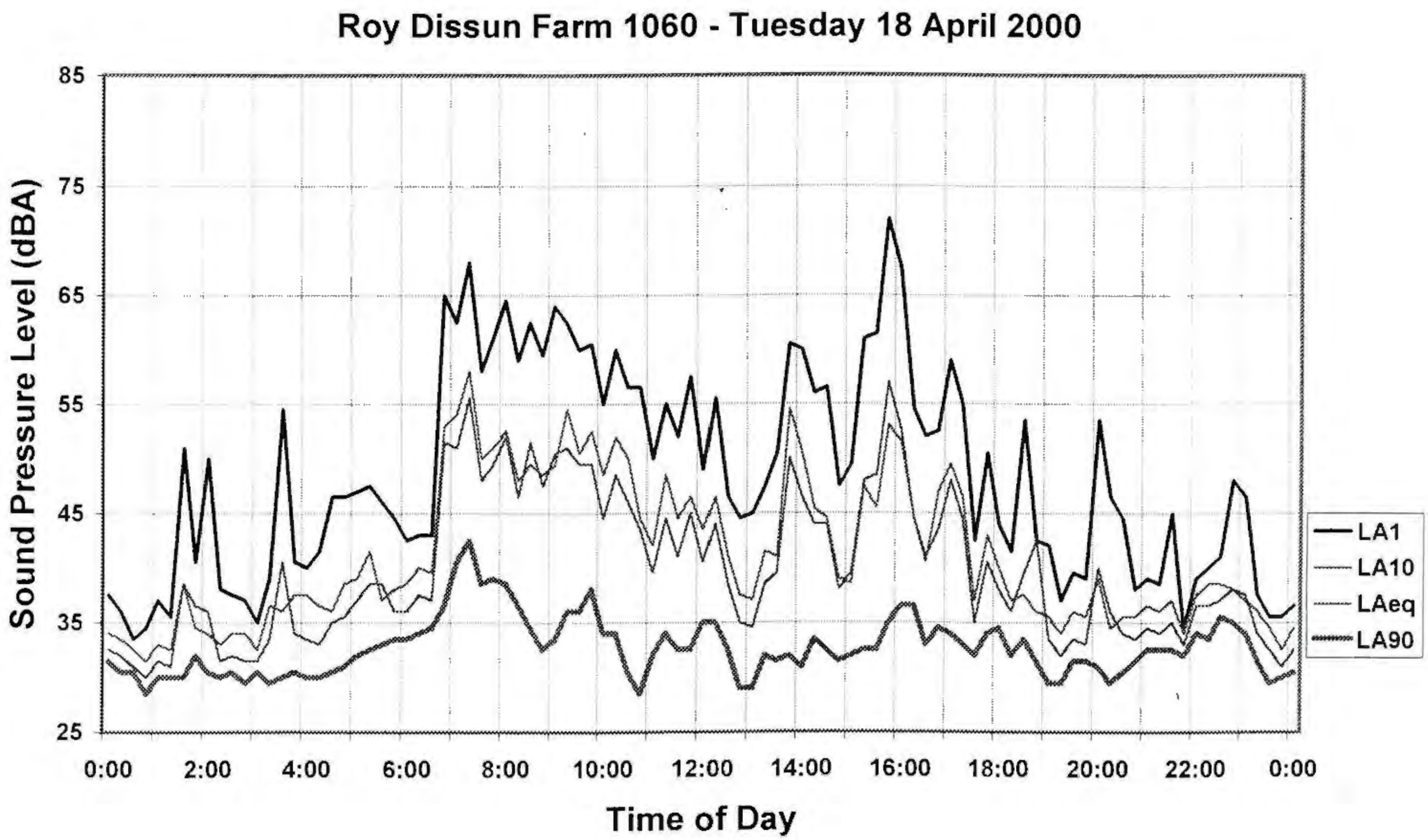
Roy Dussin Farm 1060 - Saturday 15 April 2000
Sound Pressure Level (dBA)
85
75
65
55
45
35
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day
LA1
LA10
LAeq
LA90

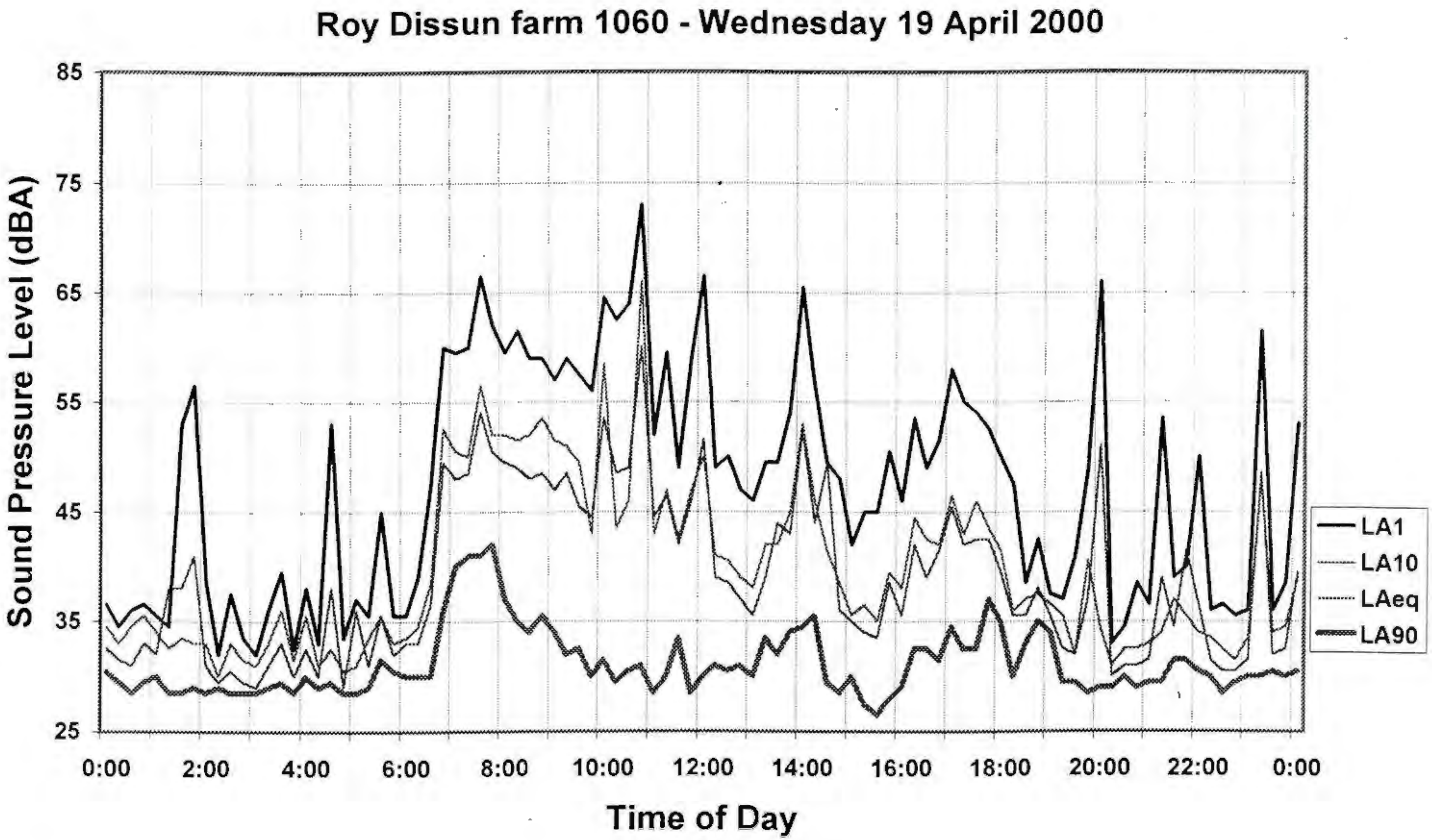


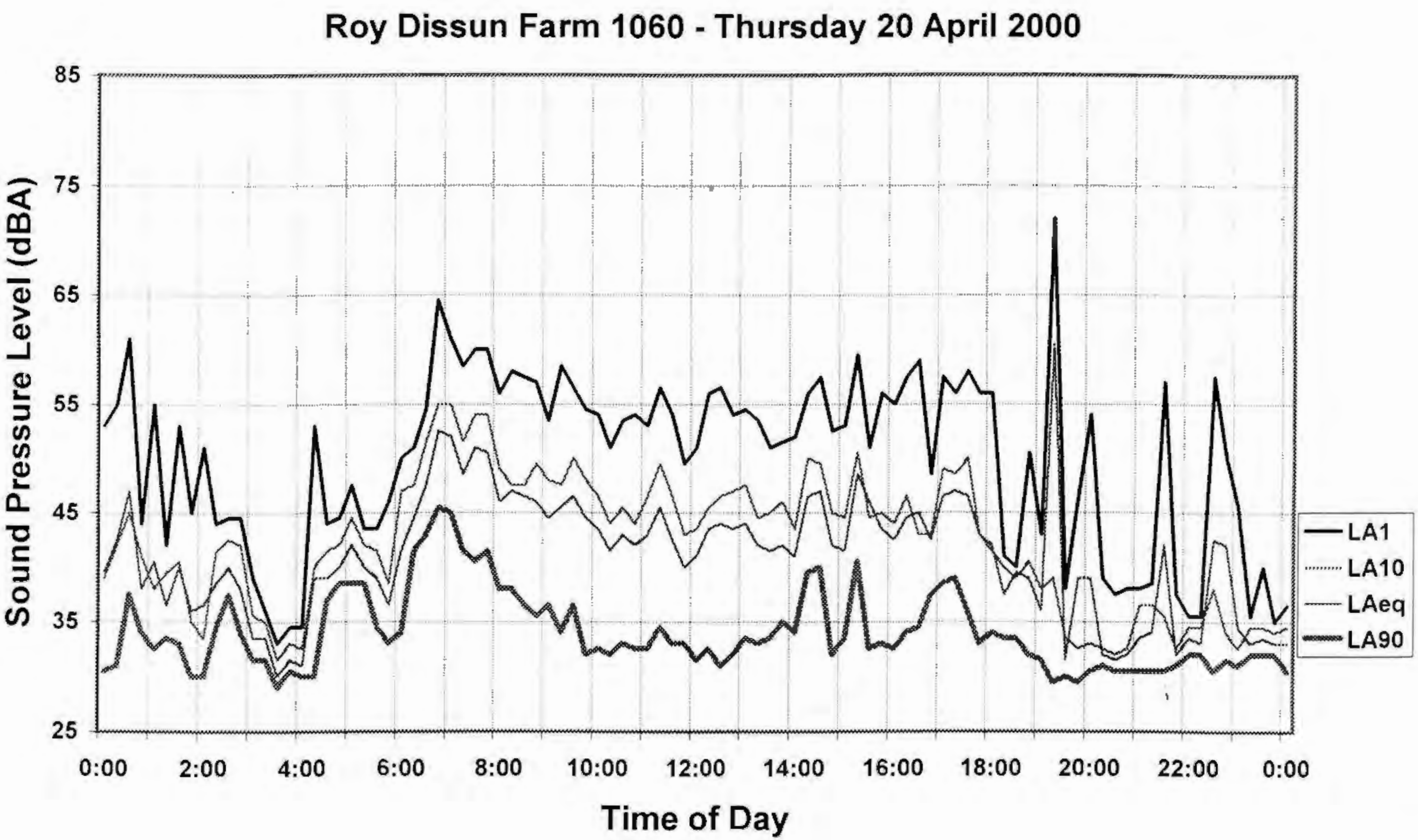
Roy Dussin Farm 1060 - Sunday 16 April 2000
Sound Pressure Level (dBA)
85
75
65
55
45
35
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day
LA1
LA10
LAeq
LA90

Roy Dussin Farm 1060 - Monday 17 April 2000

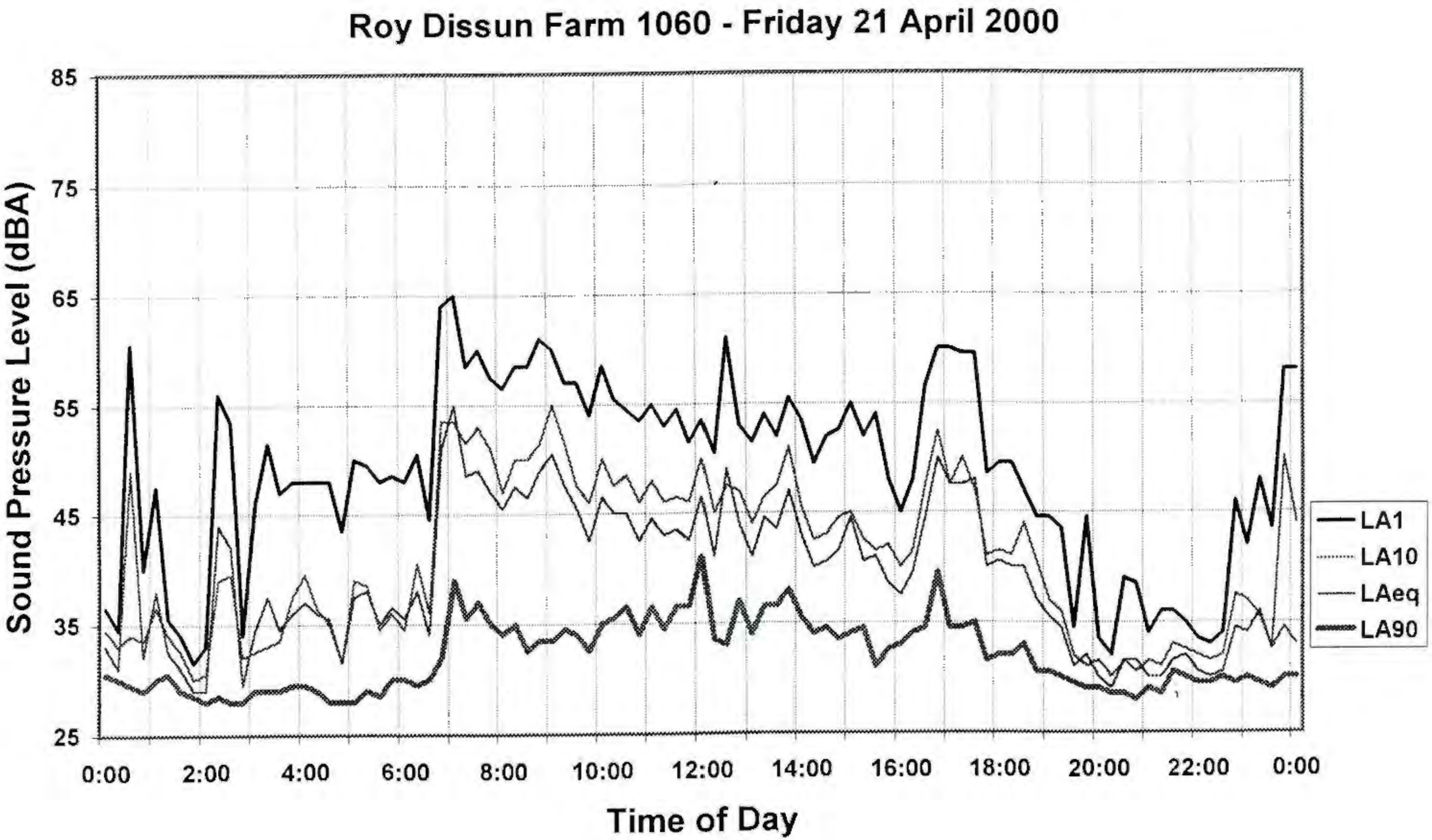


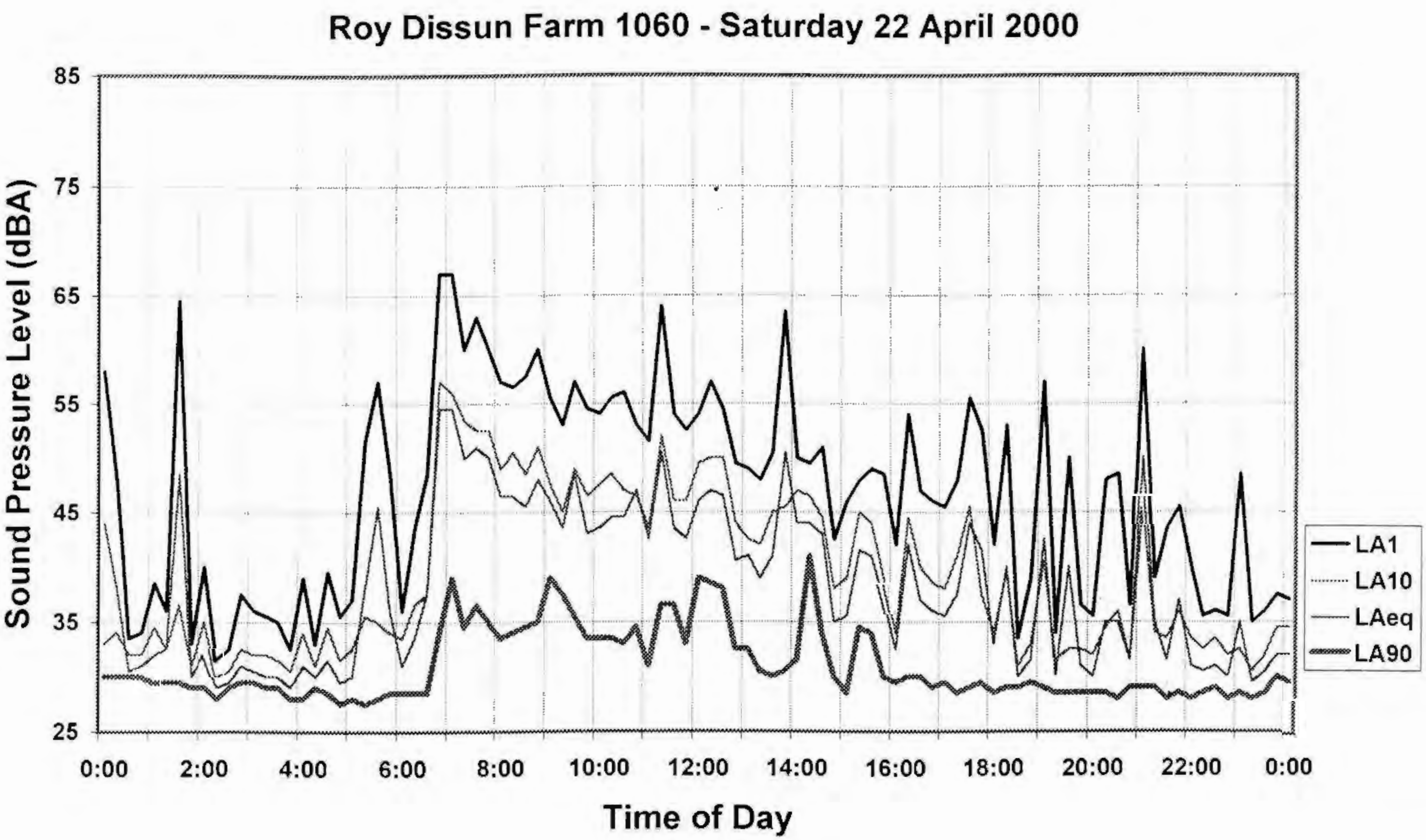

Roy Dissun Farm 1060 - Tuesday 18 April 2000
Sound Pressure Level (dBA)
85
75
65
55
45
35
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day
LA1
LA10
LAeq
LA90


Roy Dissun farm 1060 - Wednesday 19 April 2000
Sound Pressure Level (dBA)
85
75
65
55
45
35
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day
LA1
LA10
LAeq
LA90

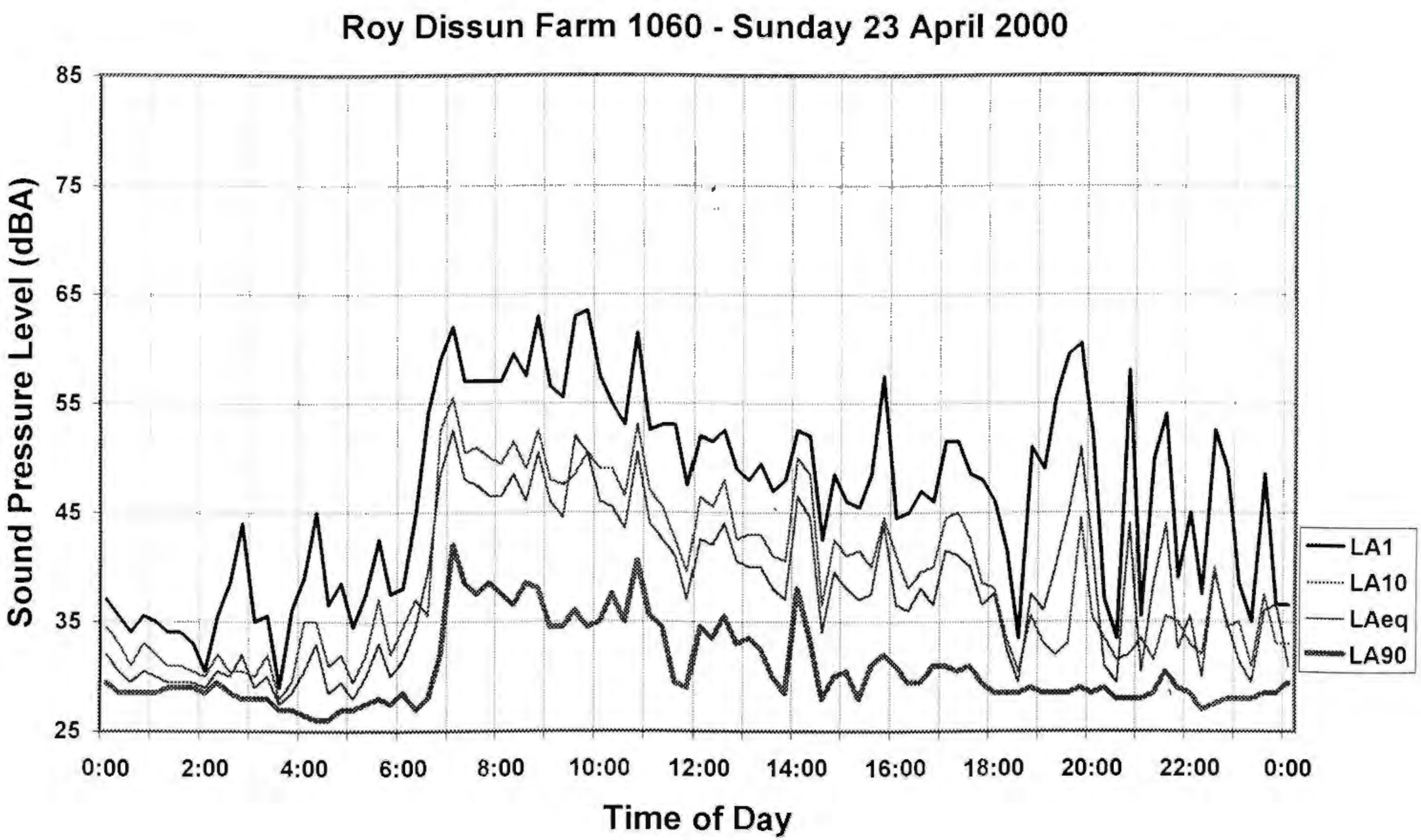


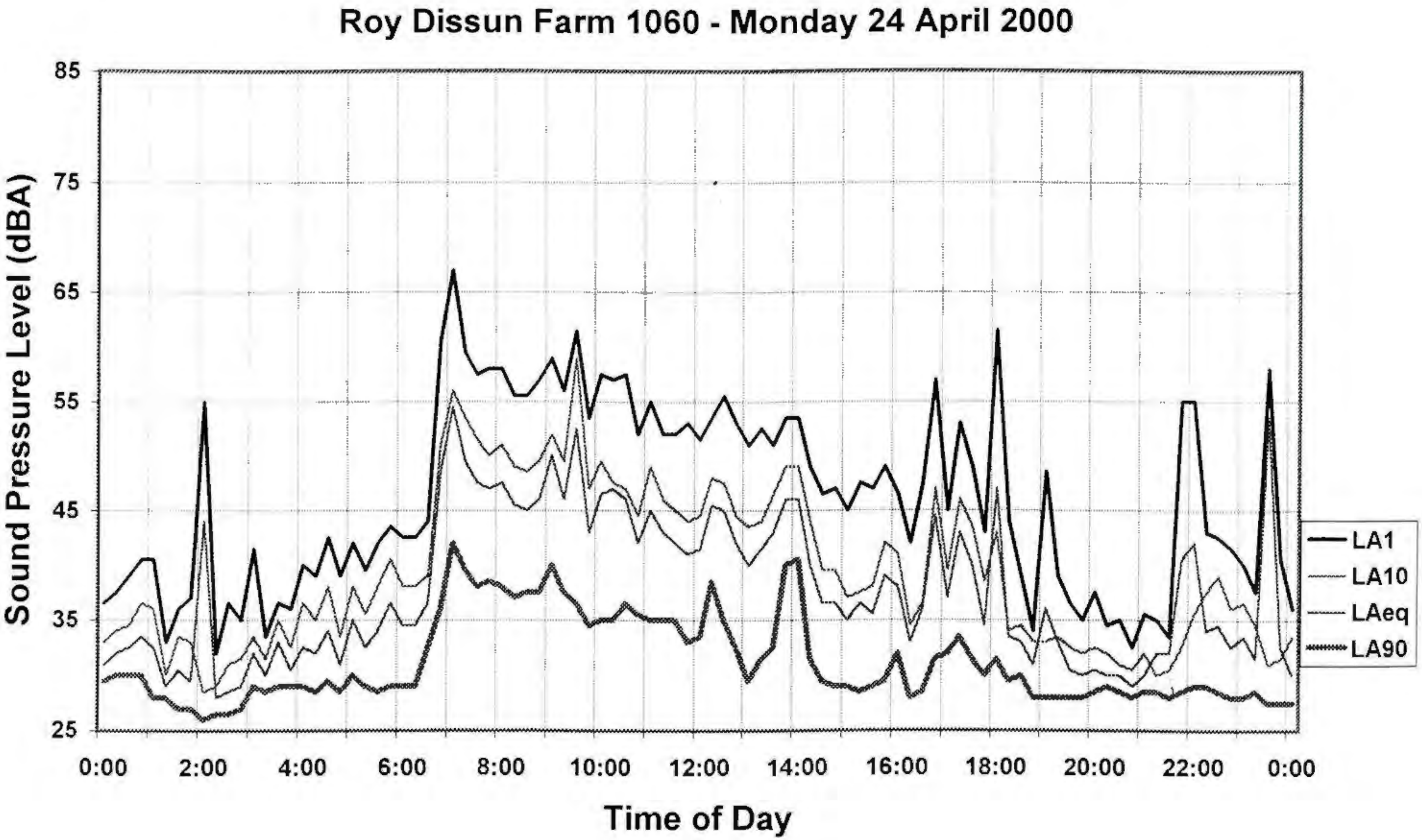
Roy Dissun Farm 1060 - Thursday 20 April 2000
Sound Pressure Level (dBA)
85
75
65
55
45
35
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day
LA1
LA10
LAeq
LA90


Roy Dissun Farm 1060 - Friday 21 April 2000
Sound Pressure Level (dBA)
85
75
65
55
45
35
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day
LA1
LA10
LAeq
LA90

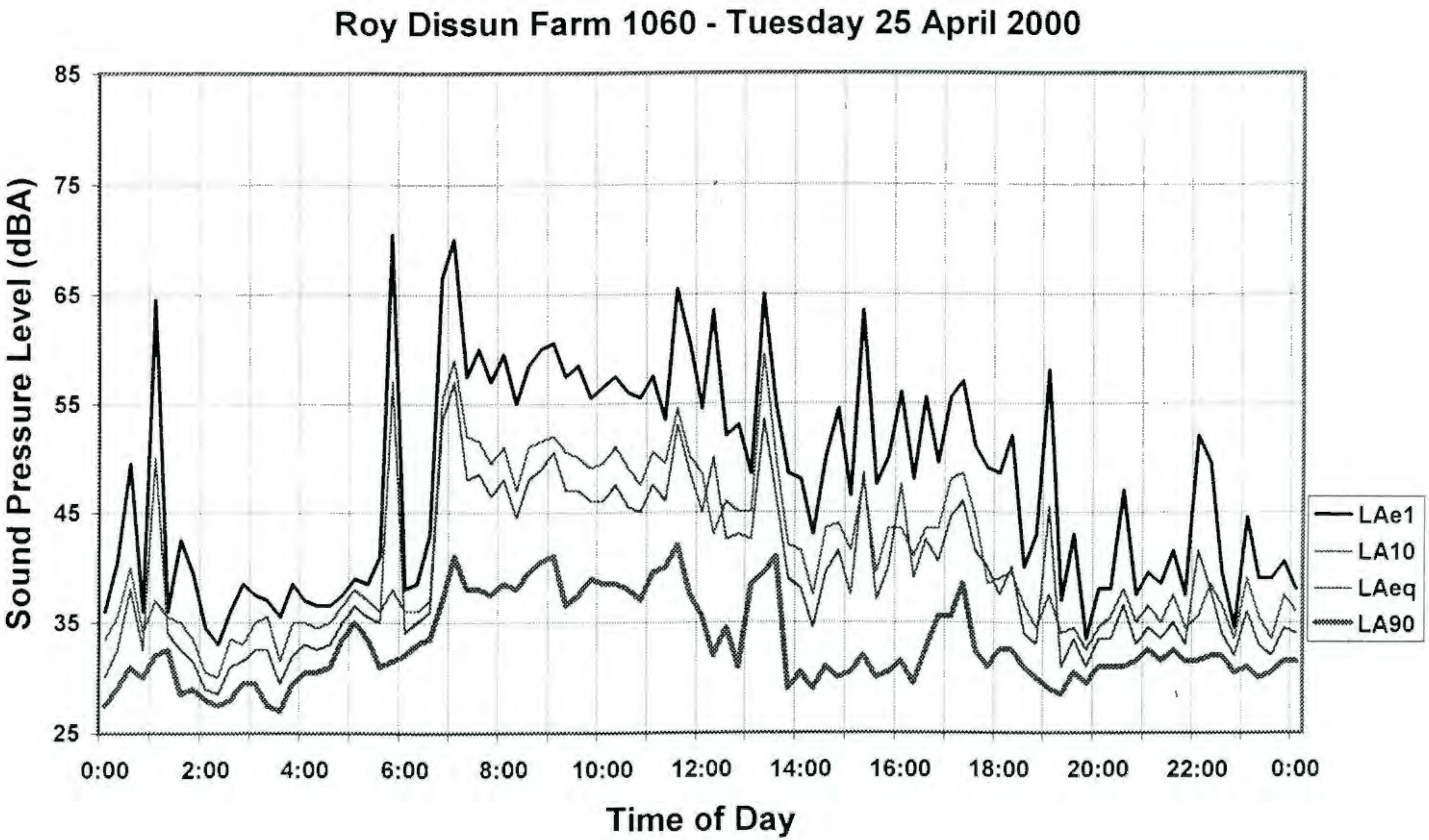


Roy Dissun Farm 1060 - Saturday 22 April 2000
Sound Pressure Level (dBA)
85
75
65
55
45
35
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day
LA1
LA10
LAeq
LA90

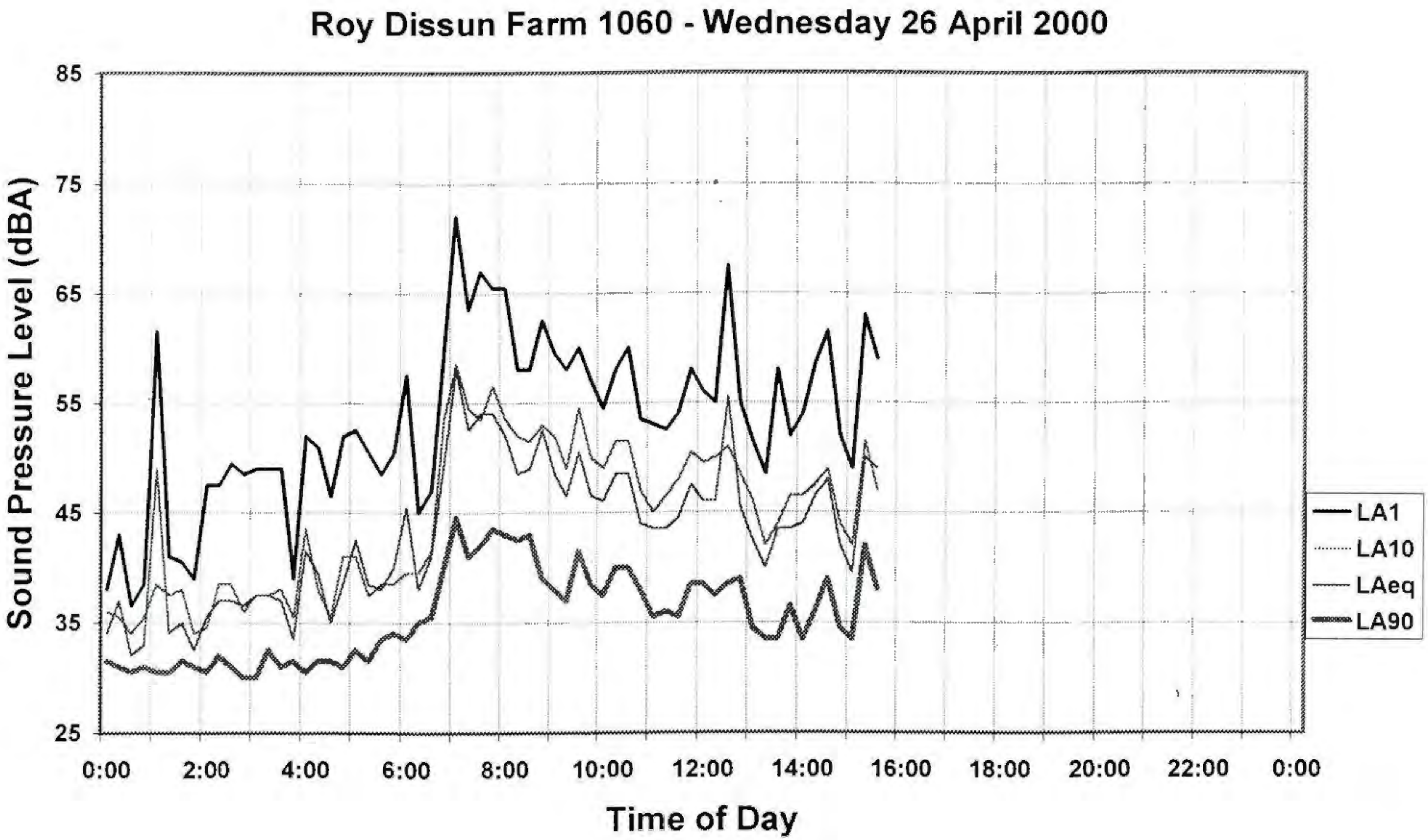

Roy Dissun Farm 1060 - Sunday 23 April 2000
Sound Pressure Level (dBA)
85
75
65
55
45
35
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day
LA1
LA10
LAeq
LA90



Roy Dissun Farm 1060 - Monday 24 April 2000
Sound Pressure Level (dBA)
85
75
65
55
45
35
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day
LA1
LA10
LAeq
LA90

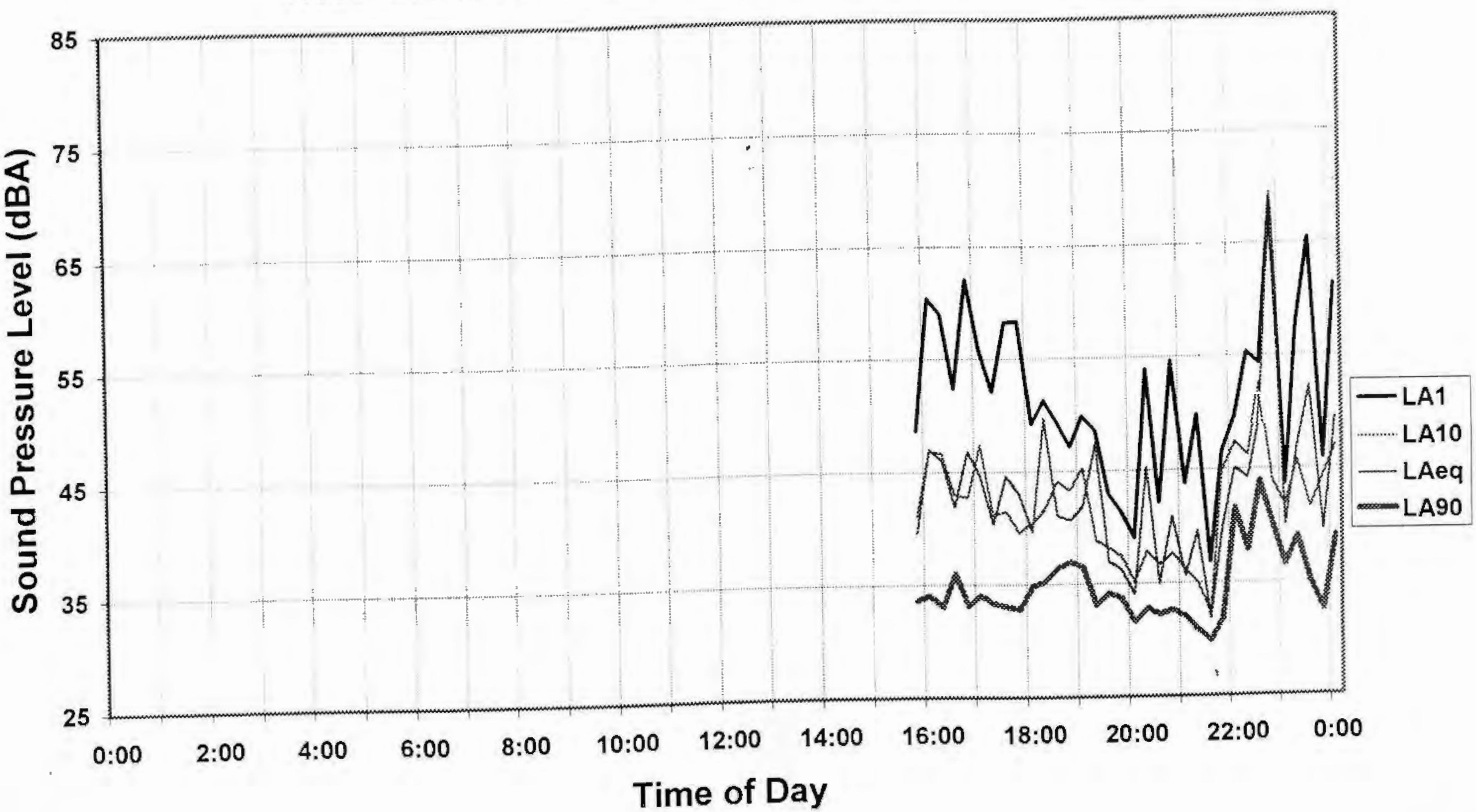


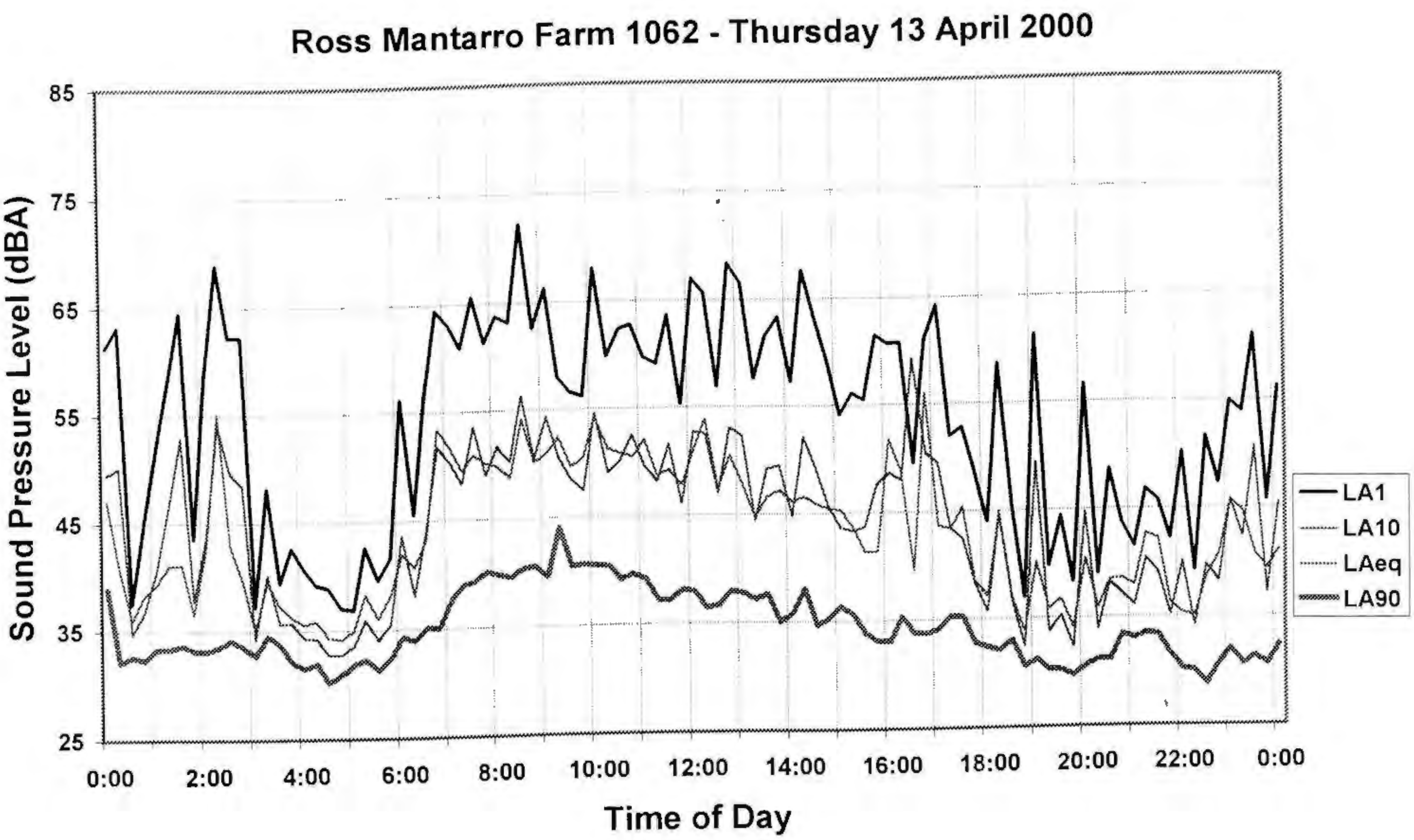
Roy Dissun Farm 1060 - Tuesday 25 April 2000
Sound Pressure Level (dBA)
85
75
65
55
45
35
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day
LAe1
LA10
LAeq
LA90

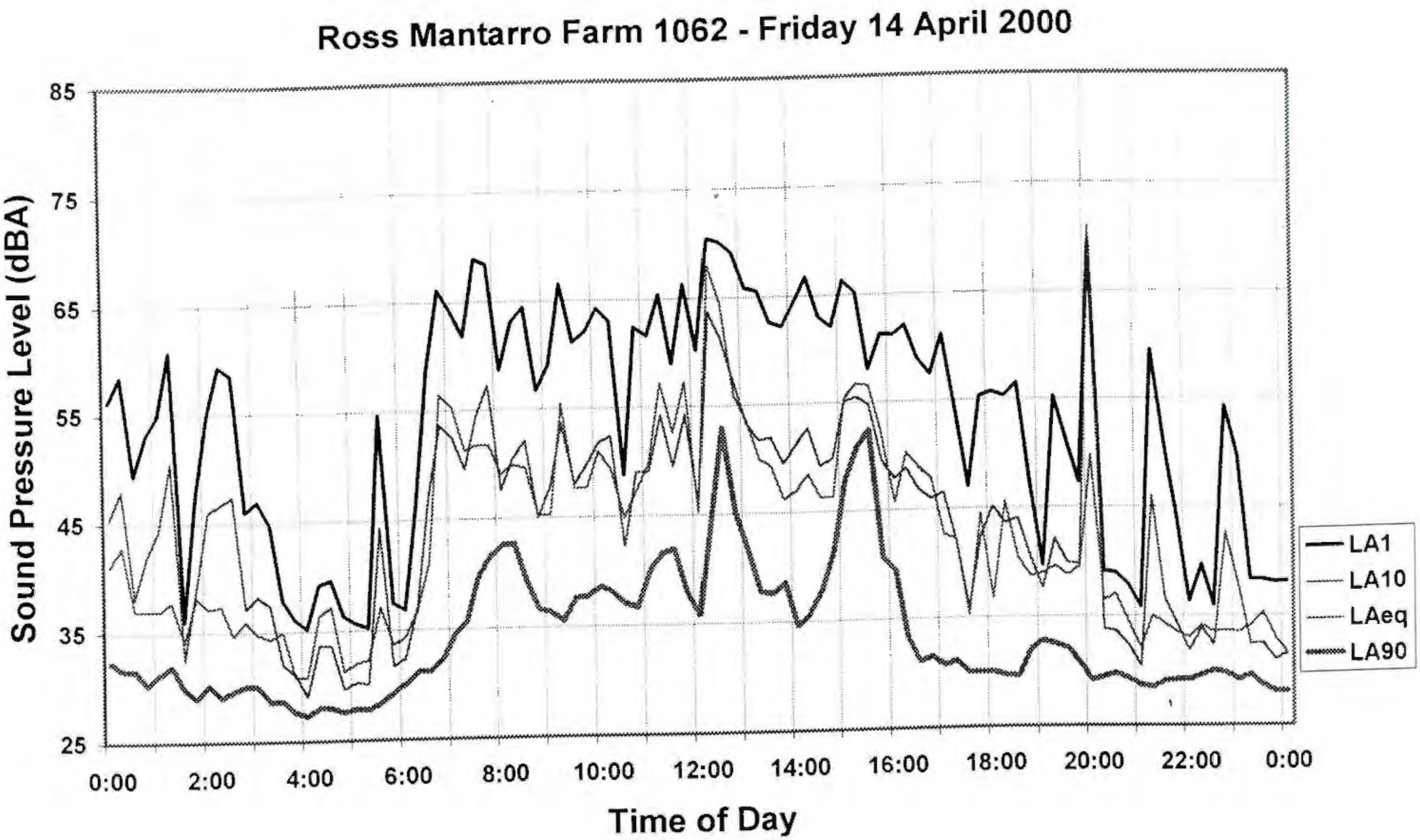


Roy Dissun Farm 1060 - Wednesday 26 April 2000
Sound Pressure Level (dBA)
85
75
65
55
45
35
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day
LA1
LA10
LAeq
LA90

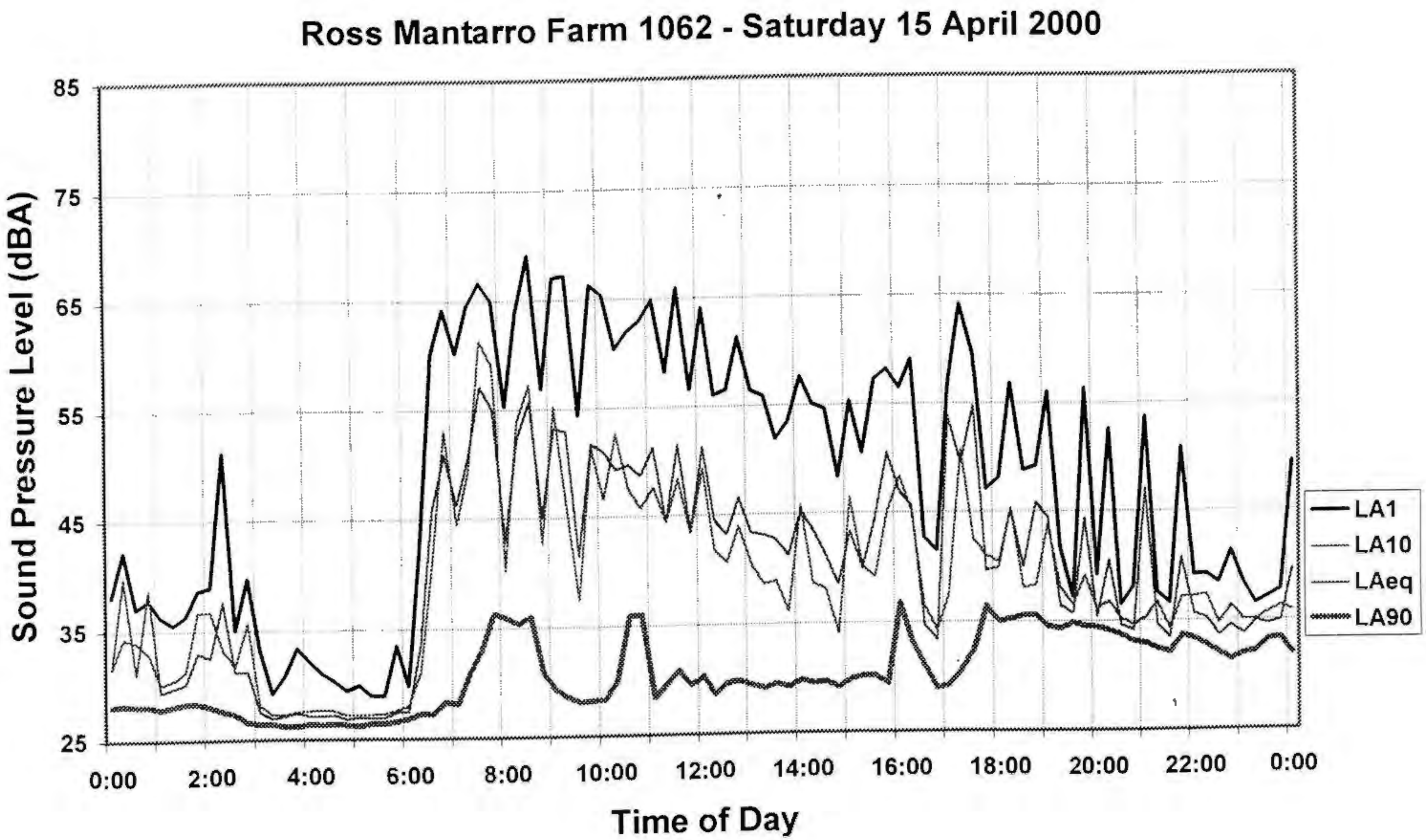
Ross Mantarro Farm 1062 - Wednesday 12 April 2000

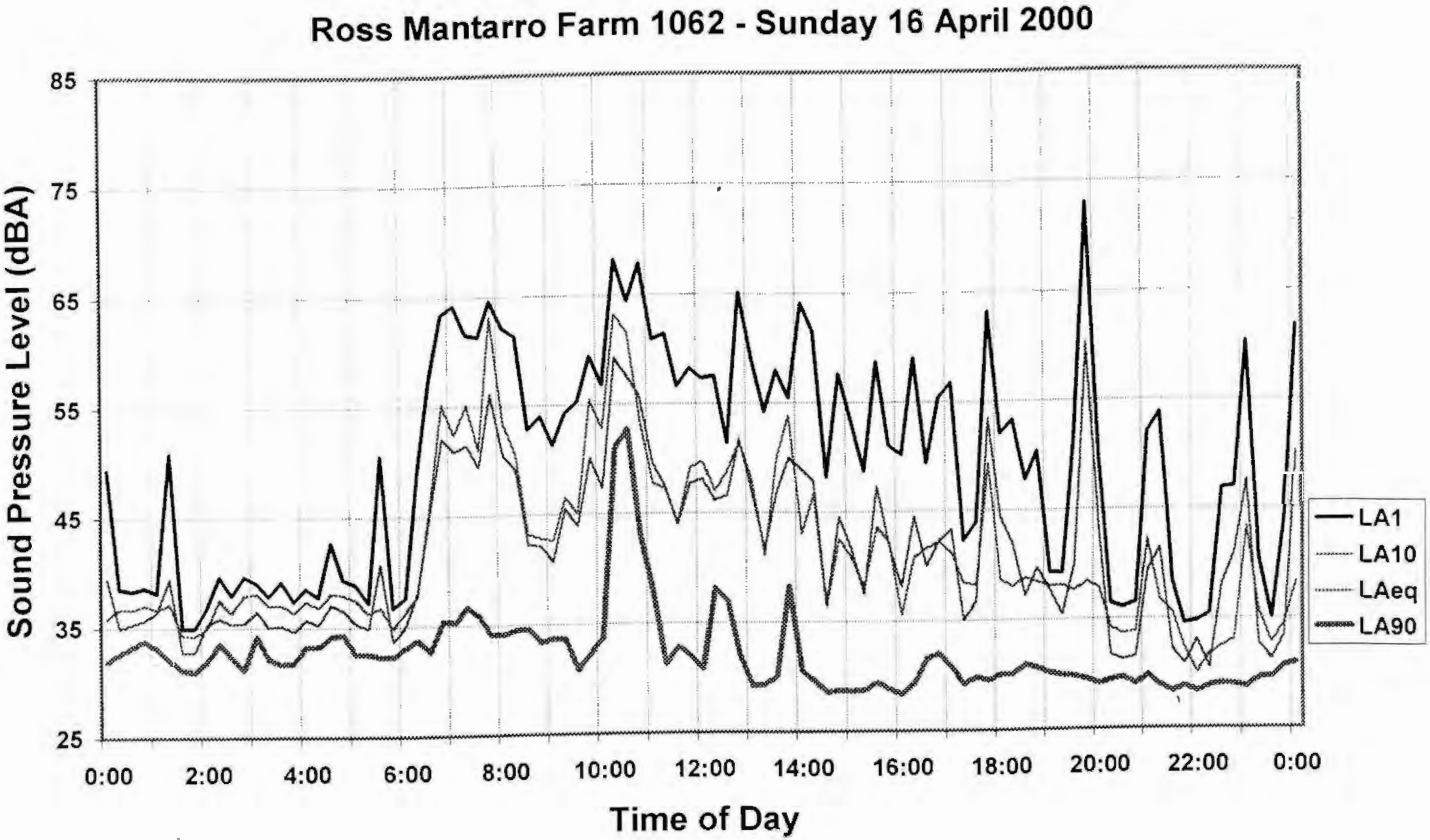


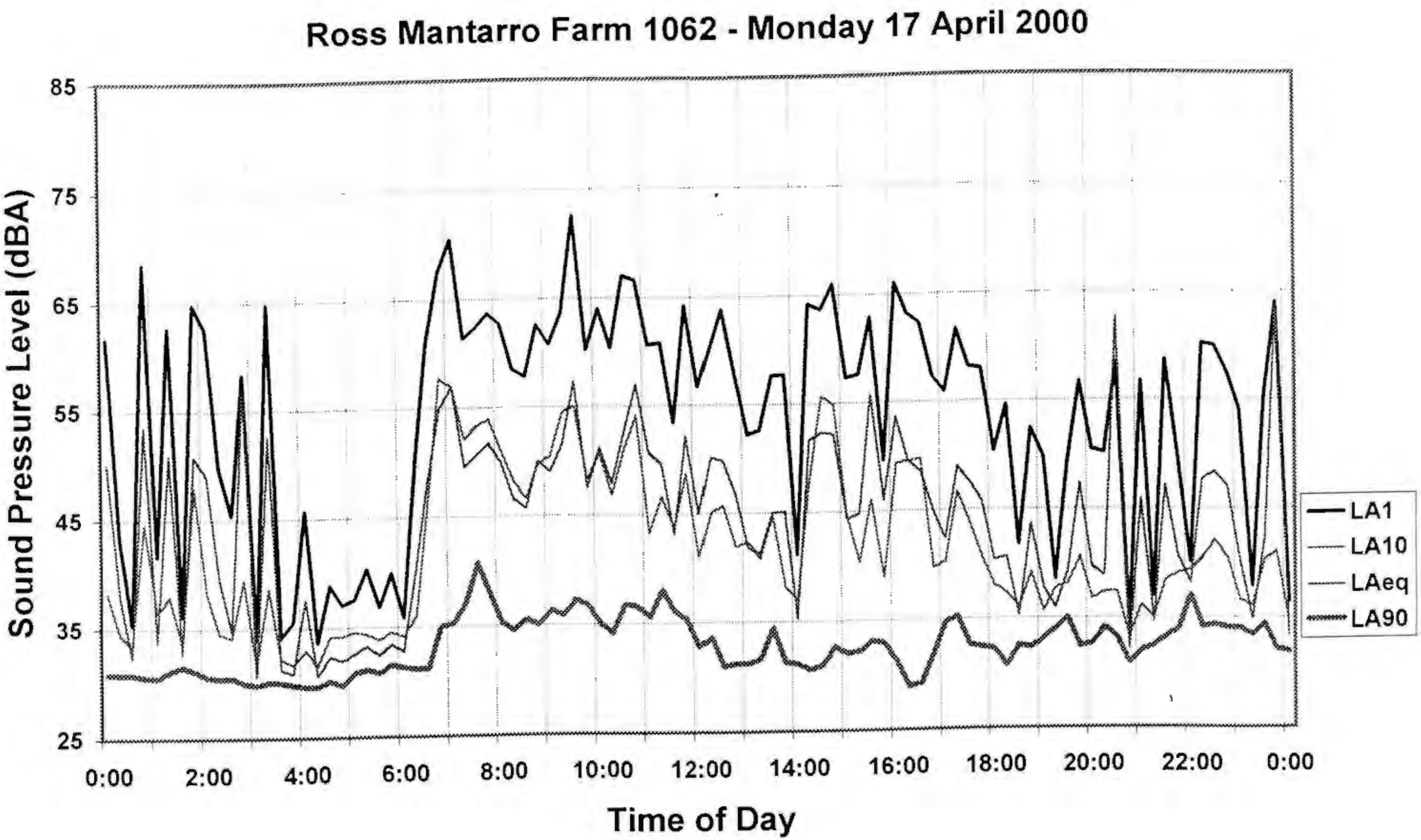

Ross Mantarro Farm 1062 - Thursday 13 April 2000
Sound Pressure Level (dBA)
85
75
65
55
45
35
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day
LA1
LA10
LAeq
LA90

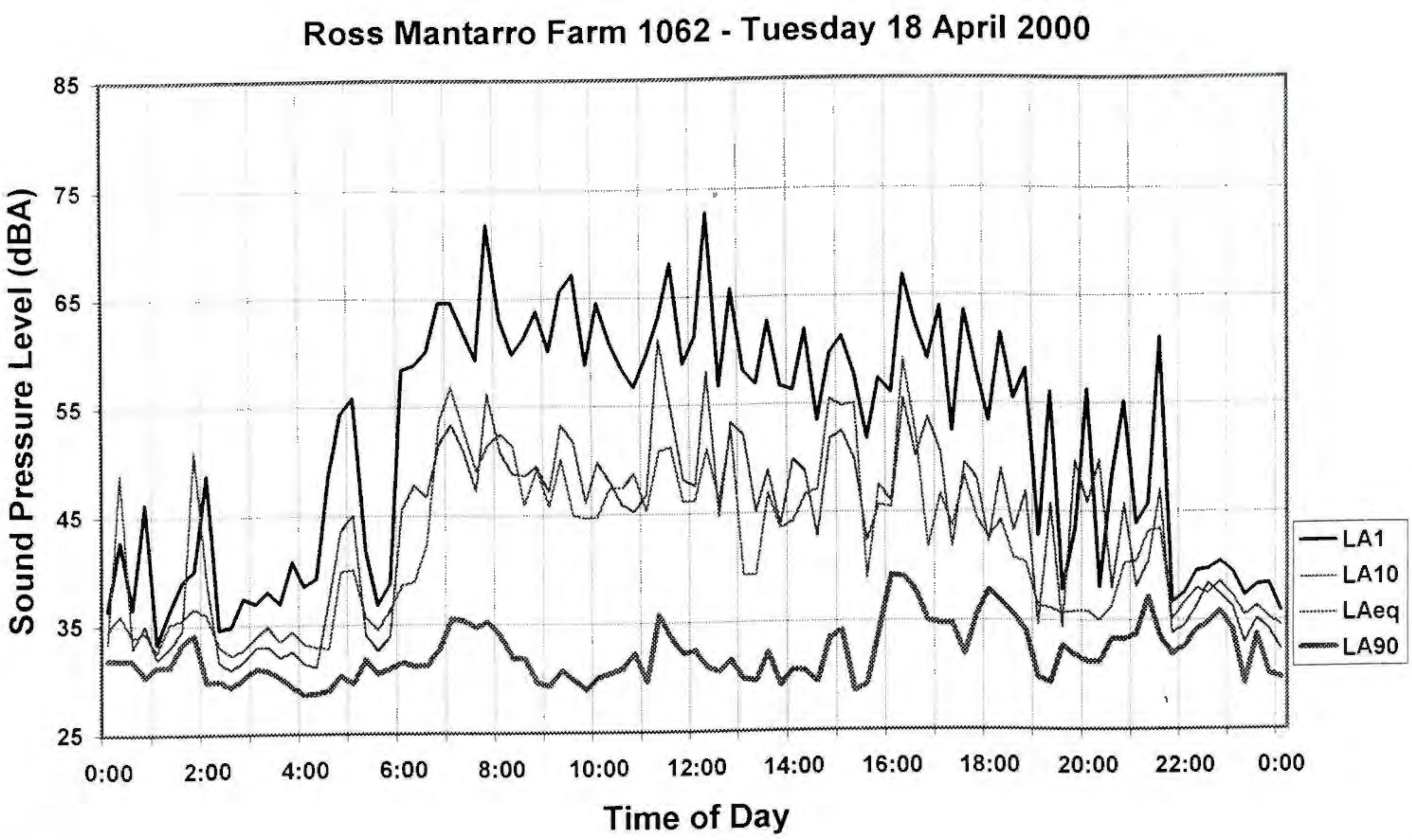


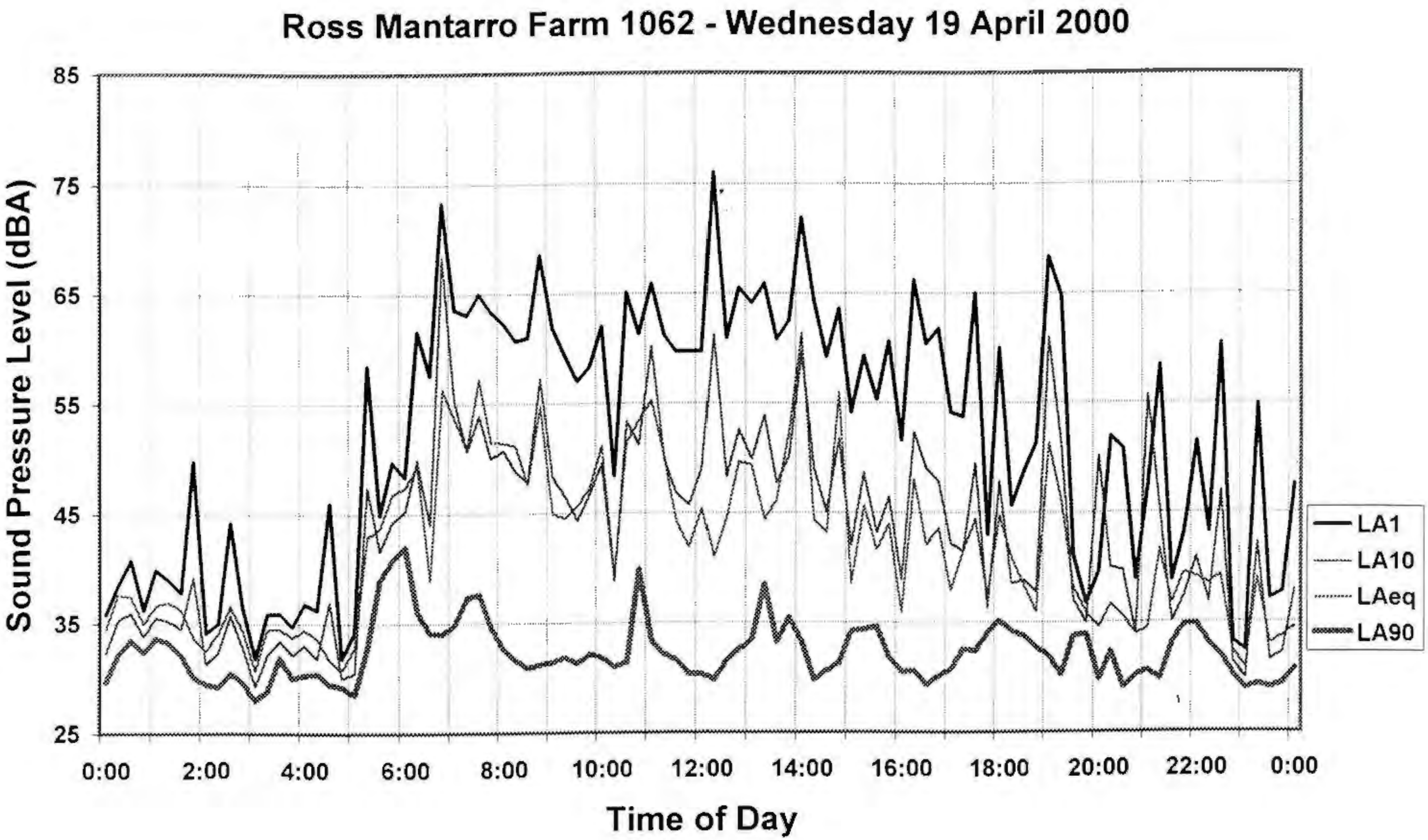
Ross Mantarro Farm 1062 - Friday 14 April 2000
Sound Pressure Level (dBA)
85
75
65
55
45
35
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day
LA1
LA10
LAeq
LA90


Ross Mantarro Farm 1062 - Saturday 15 April 2000
Sound Pressure Level (dBA)
85
75
65
55
45
35
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day
LA1
LA10
LAeq
LA90


Ross Mantarro Farm 1062 - Sunday 16 April 2000
Sound Pressure Level (dBA)
85
75
65
55
45
35
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day
LA1
LA10
LAeq
LA90

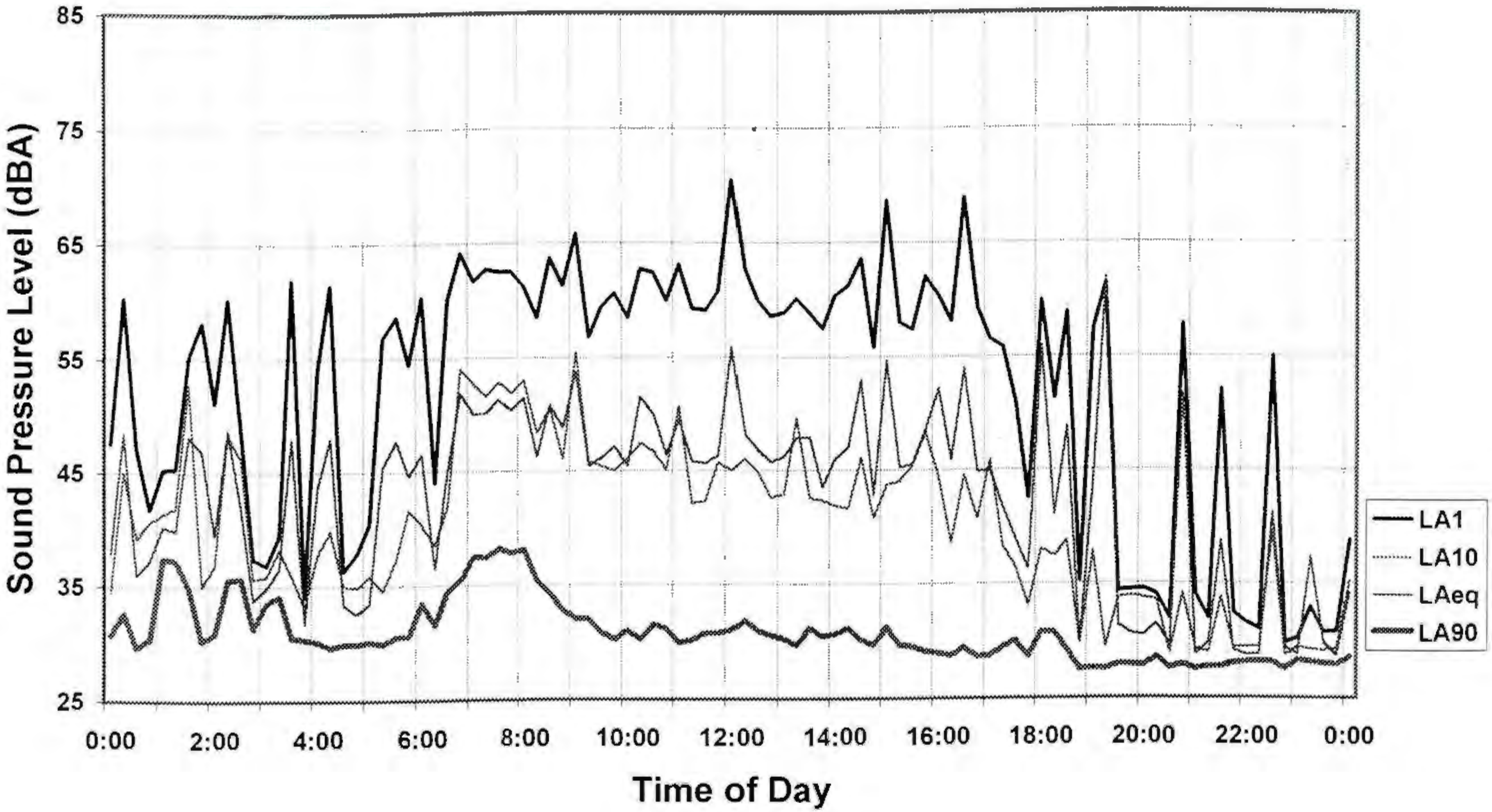

Ross Mantarro Farm 1062 - Monday 17 April 2000
Sound Pressure Level (dBA)
85
75
65
55
45
35
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day
LA1
LA10
LAeq
LA90

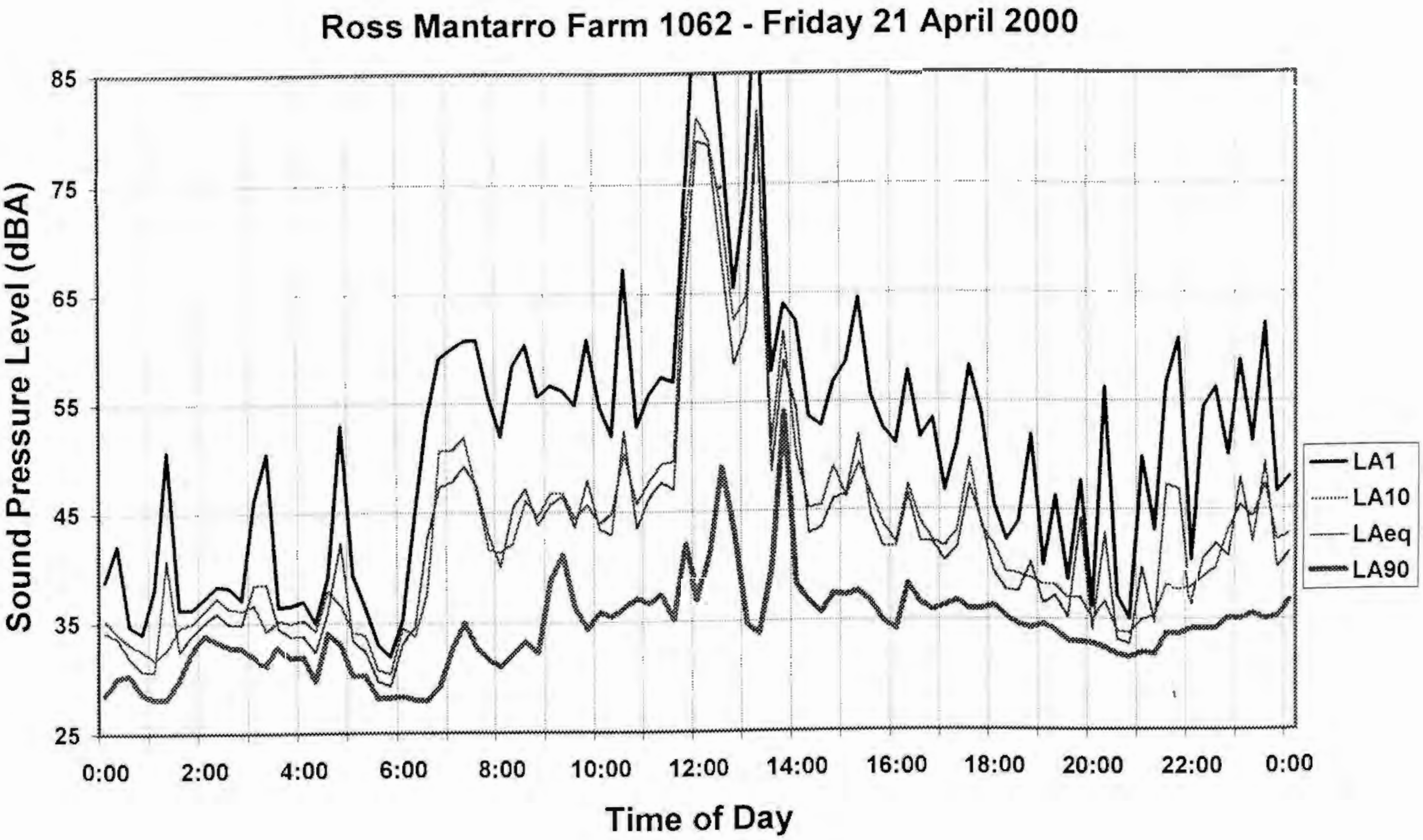

Ross Mantarro Farm 1062 - Tuesday 18 April 2000
Sound Pressure Level (dBA)
85
75
65
55
45
35
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day
LA1
LA10
LAeq
LA90



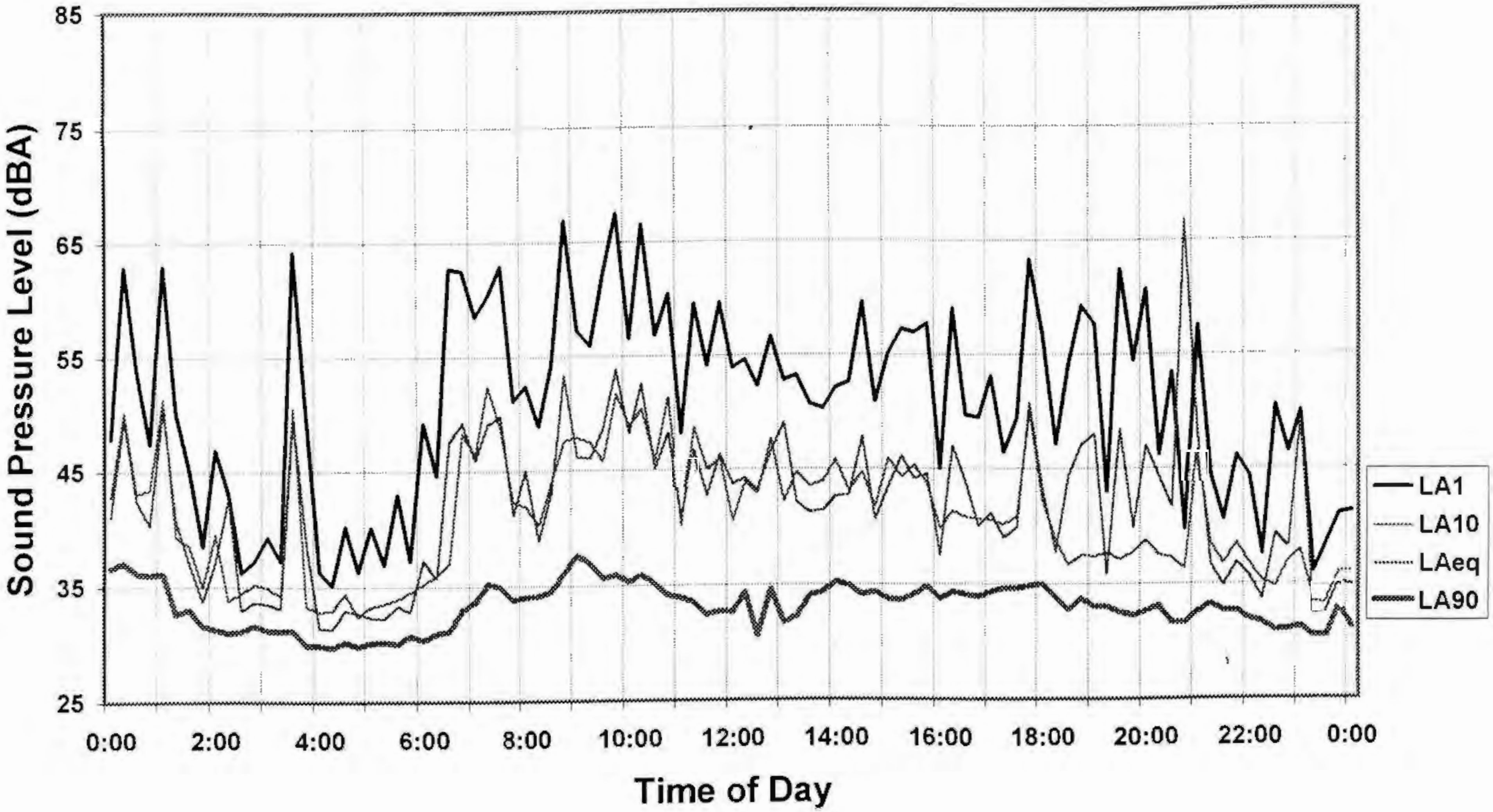
Ross Mantarro Farm 1062 - Wednesday 19 April 2000
Sound Pressure Level (dBA)
85
75
65
55
45
35
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day
LA1
LA10
LAeq
LA90

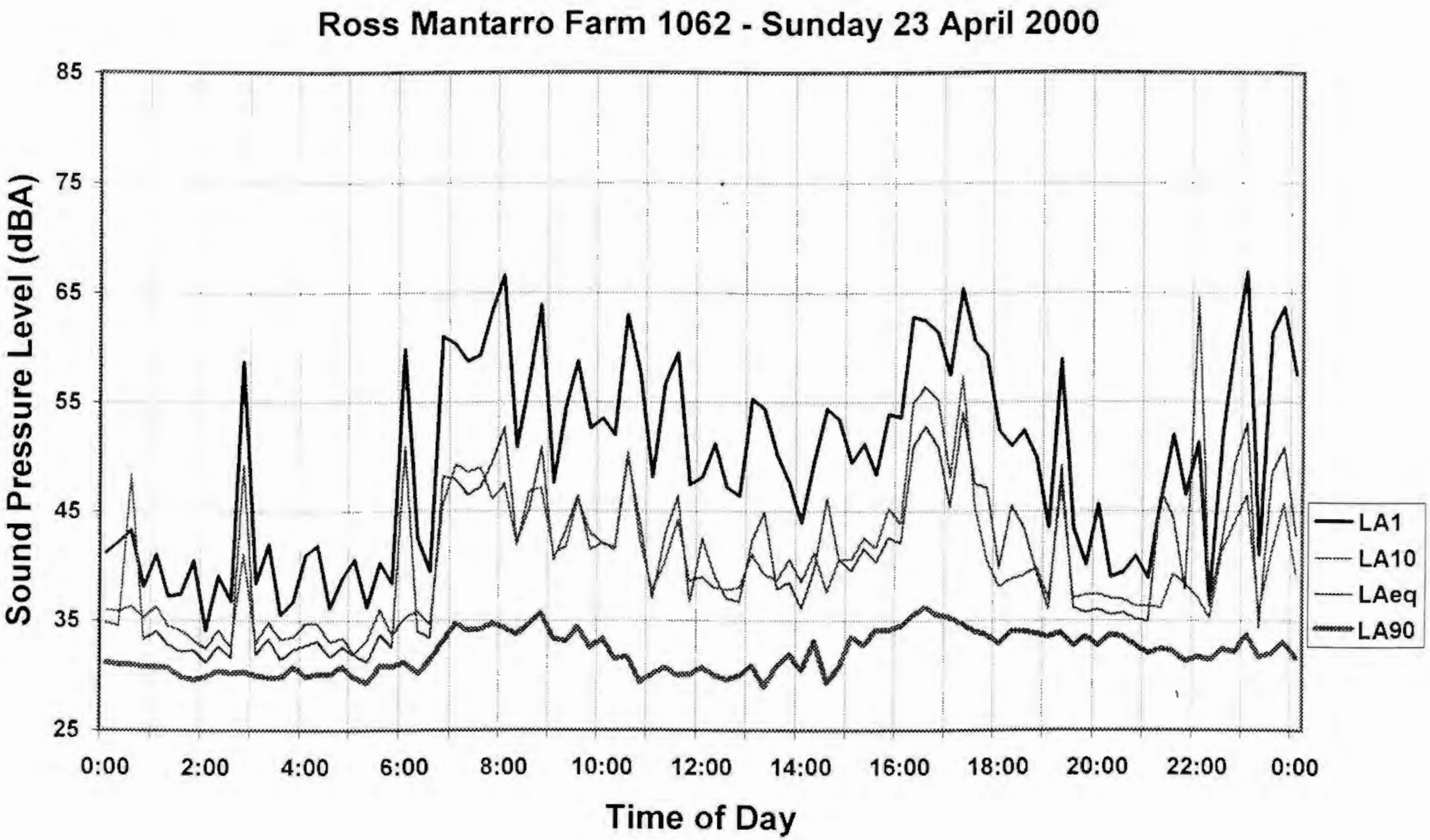
Ross Mantarro Farm 1062 - Thursday 20 April 2000



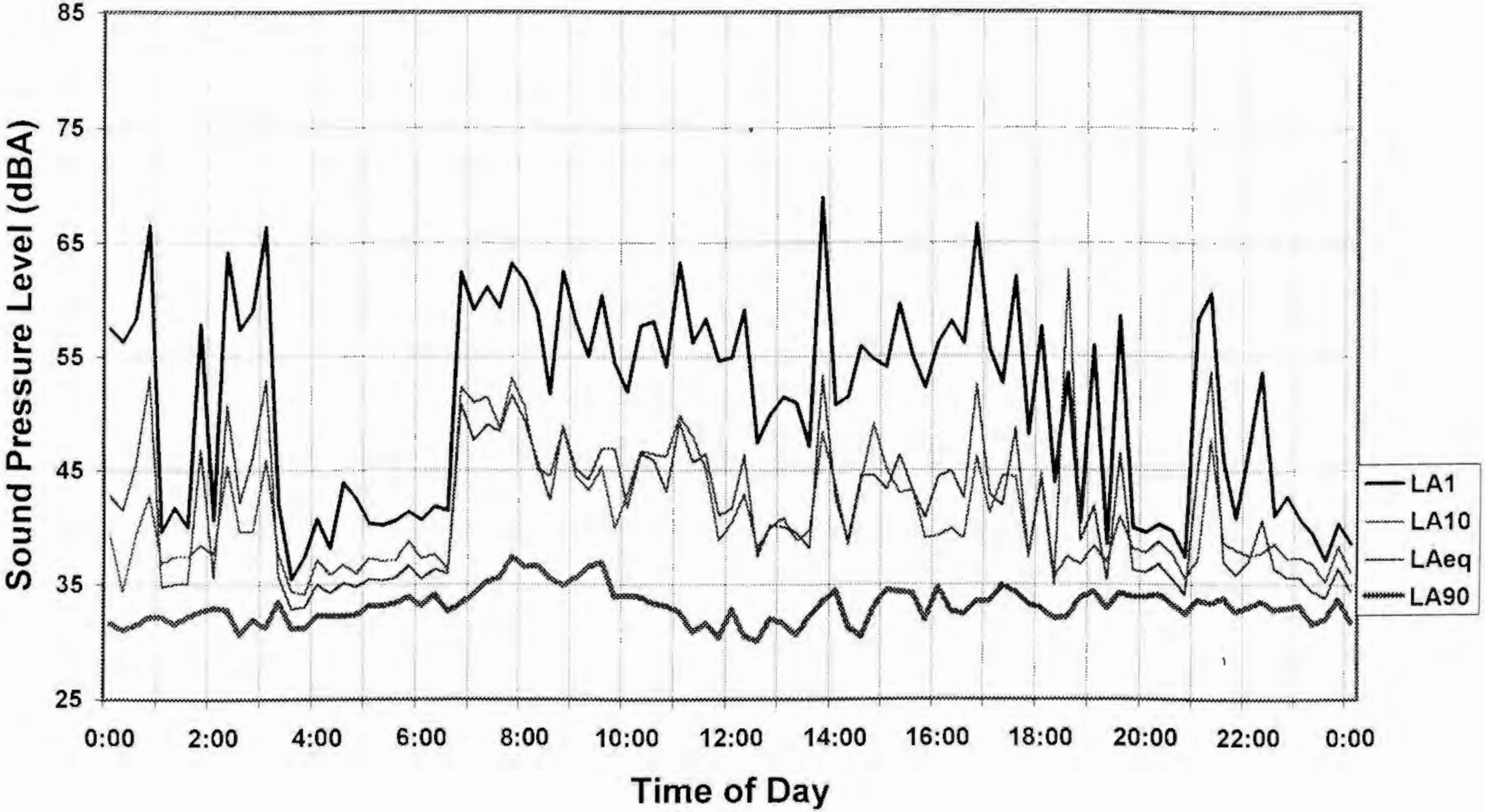

Ross Mantarro Farm 1062 - Friday 21 April 2000
Sound Pressure Level (dBA)
85
75
65
55
45
35
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day
LA1
LA10
LAeq
LA90

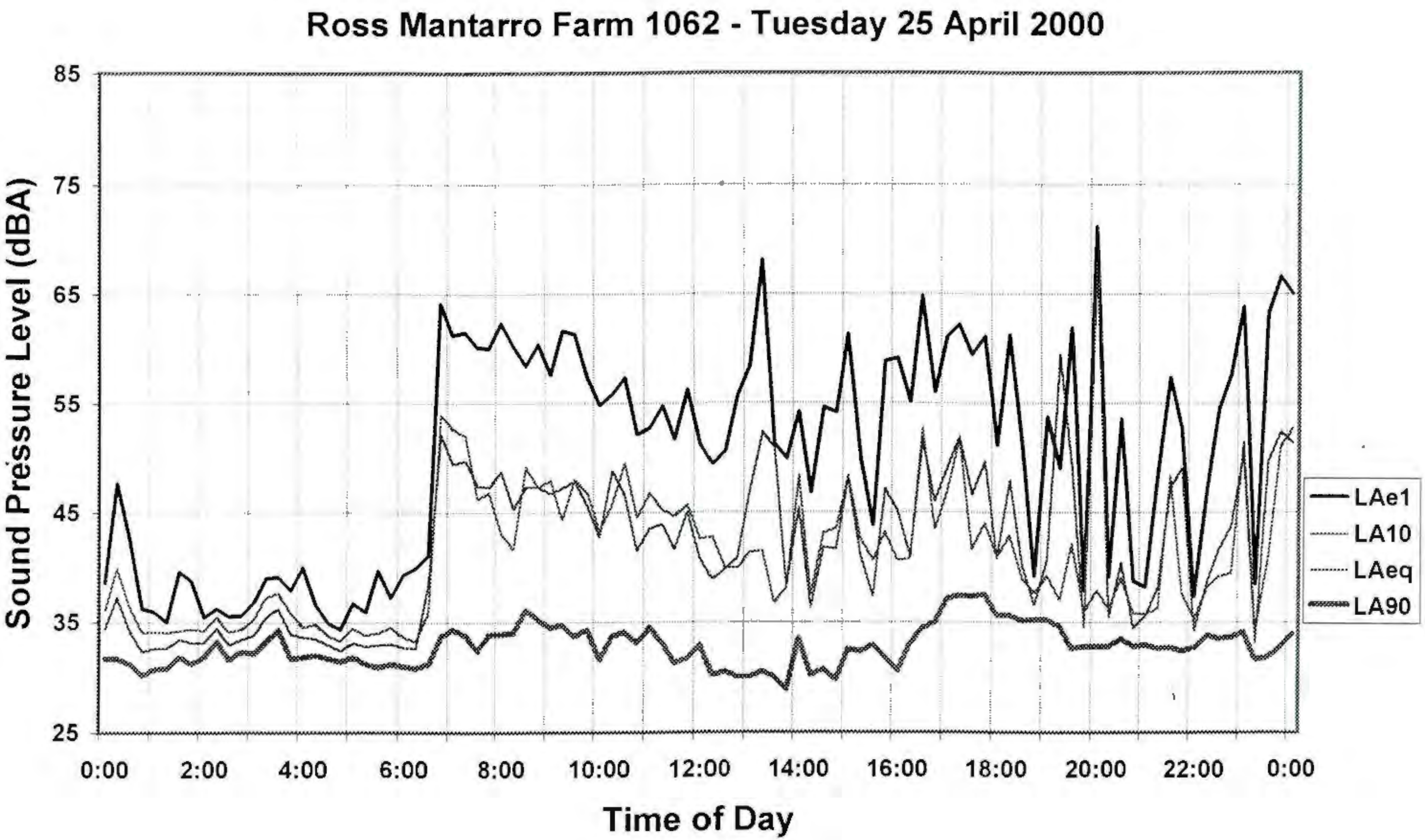
Ross Mantarro Farm 1062 - Saturday 22 April 2000

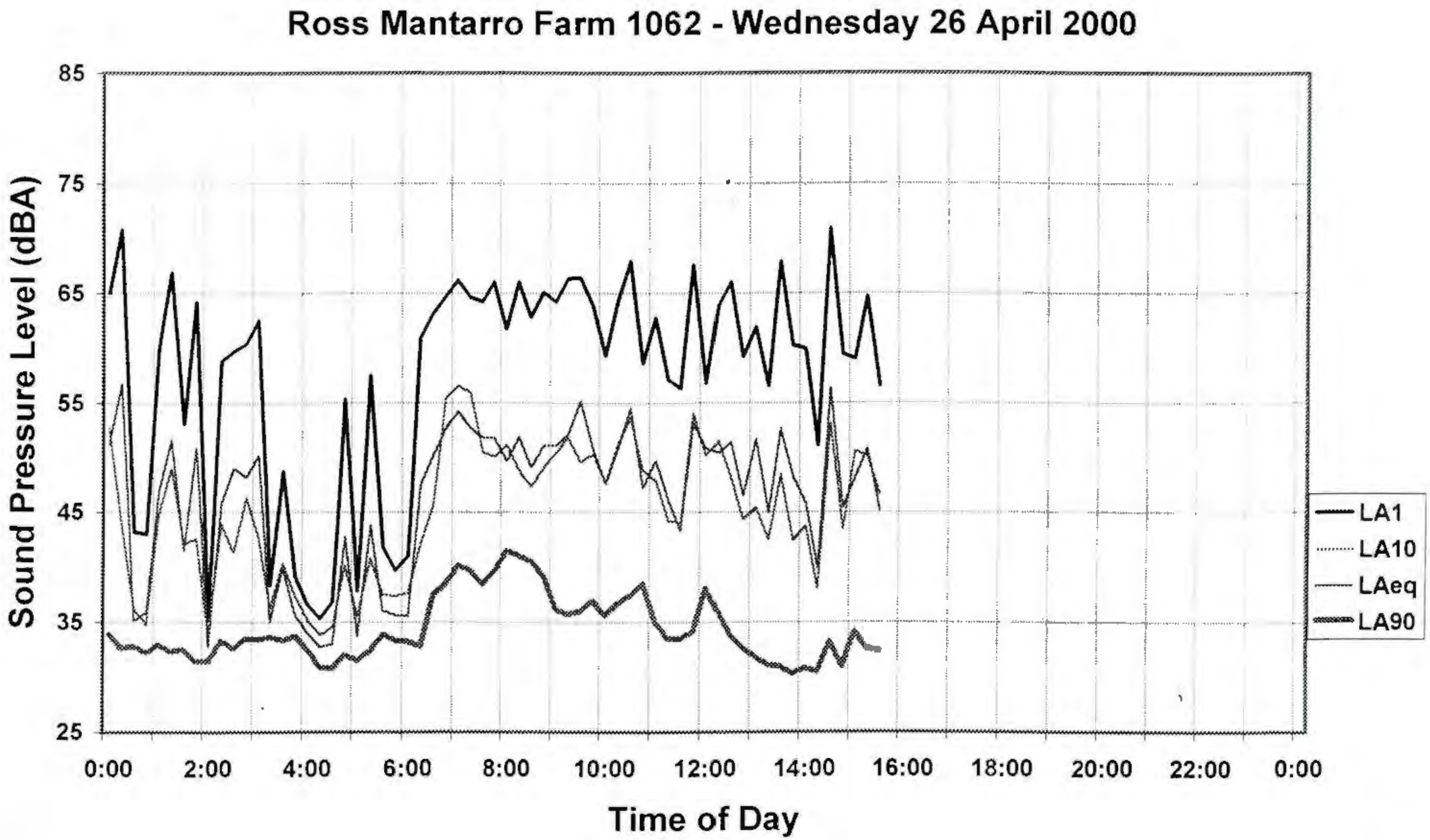



Ross Mantarro Farm 1062 - Sunday 23 April 2000
85
75
65
55
45
35
25
Sound Pressure Level (dBA)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day
LA1
LA10
LAeq
LA90

Ross Mantarro Farm 1062 - Monday 24 April 2000




Ross Mantarro Farm 1062 - Tuesday 25 April 2000
Sound Pressure Level (dBA)
85
75
65
55
45
35
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day
LAe1
LA10
LAeq
LA90



Ross Mantarro Farm 1062 - Wednesday 26 April 2000
Sound Pressure Level (dBA)
85
75
65
55
45
35
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day
LA1
LA10
LAeq
LA90

NOISE AND SOUND SERVICES

Specialists in Noise and Vibration Assessments, Control and Training
Spectrum House, 1 Elegans Avenue, St Ives, NSW 2075
Ph: (02) 9449 6499. Fax (02) 9402 5849. Mob: 0411 648153
E-Mail scannell@rivernet.com.au WorkCover Accredited Trainer No. 86/676/602631
ABN : 7277 134 9599

Nigel Cates
PO Box 545
Griffith NSW 2680

11 May 2000
Our Ref: nss20109
Fax: (02) 6964 7618
Ph: (02) 6964 7611

Page 1 of 1

Nigel

Re: Proposed Food Processing Plant – Lot 1059, DP 751686, Pt 77 Millis Road Willbriggie.

Further to your telephone call of 11 May 2000. I confirm that the plantation of trees, over a 200 m length, between the proposed processing plant and the nearest northern residences will provide some noise attenuation. The trees should be planted to be sufficiently dense to completely block the view along the propagation path ie when it is impossible to see through short distances of the foliage. The trees should be planted as close as possible to the proposed processing plant and at least 50 m wider than the processing plant on each side.

The attention has been calculated by the method given in the International Standard ISO 9613-2 (1996(E)) '*Acoustic – Attenuation of sound during propagation outdoors Part 2 General method of calculation*' using typical source noise spectrum from the existing plant.

Once established the foliage will provide between 5 dB and 10 dB extra attenuation depending upon the density of the trees.

Please let me know if you require any further information or discussion.

Best regards

Ken Scannell MSc MAAS MIOA MAES

APPENDIX H

Wastewater and Farm Management Issues – Mr Warren Muirhead

Coffey

SITE CHARACTERISTICS

Climate

The climate of the area is warm temperate with hot and dry summers and mild winters with a number of frosty nights. The 423 mm of rain is spread uniformly throughout the year but very variable from year to year. The annual evapotranspiration is 1800mm and varies from 270 mm in December and January to a low of about 45 mm in June and July.

Topography and Geology

The landscape is gently sloping to the west with a gradient of less than 1 in 3000. The site is located on an extensive alluvial fan of low relief that has formed where the Murrumbidgee river enters the open Riverine plain.

The depth of sedimentary deposits is of the order of 100 m and these deposits consist of very variable layering of sands and clays (van Dijk (1961). The sand layers are generally associated with prior streams and the sand layers are often poorly connected. The surface of the present landscape is largely parna, an aeolian deposit.

Soil Types

Van Dijk (1961) has mapped the soils on the property. Generally, the soils are classified as red-brown earths or transitional red-brown earths. The main variation is in the depth of the A horizon. All of the soil types have moderately dense to dense plastic clay subsoils.

The area that will be devoted to cropping is predominantly classed as the Coree series and is surrounded by the Wilbriggie series. The Coree series is the grey counterpart of the Wilbriggie series and, except for colour, has very similar physical and chemical properties (Stannard 1970). The puff component of the Coree series is the Wunnamurra clay and at this site occupies about 20% of the landscape.

A typical profile description for a Coree clay loam is:

Depth	Characteristics
0 - 8 cm	Grey loam, brittle and compact, sporadic bleaching in the subsoil
8 - 30 cm	Dark grey heavy clay, medium to coarse angular blocky structure
30 - 60 cm	Grey heavy clay, massive, slight concretionary lime
60 - 100 cm	Grey-brown medium clay, slight concretionary lime and crystalline gypsum

The Coree and Wilbriggie series were classified by van Dijk (1961) as unsuitable for horticultural crops. The site has been used for rice culture for many years.

These soils are considered suitable for rice because of their low saturated infiltration rates (average 0.25mm/day over a 16 week period - van der Lelij and Talsma 1978). Consequently, deep percolation to the groundwater will be low.

The north east corner of the site is dominated by soils of the Beelbangera Association. The typical soil type is the Beelbangera clay loam that is similar to the Wilbriggie clay loam but the A horizon is up to 20 cm deep. Because of the deeper topsoil, it is classified as a red-brown earth and considered suitable for some horticultural crops. Red-brown earths are considered to have higher saturated infiltration rates than transitional red-brown earths.

The south east corner of the property that is on a slight rise, is characterised by the Thulabin Association, predominantly Thulabin clay loam (van Dijk 1961). It forms part of a recent prior stream course. The profile is similar to the Beelbangera clay loam but has a brown sandy loam averaging 20 cm in depth. Because this area was not easily commanded for gravity irrigation, it has not been cropped.

Soil characteristics

Surficial (0.0 to 0.1m) soil samples were collected by Coffeys from a total of 33 locations over the property and combined to form 5 composite samples which were then analysed by Riverina Laboratories of Jindera and the information is summarised in Table 1.

Table 1. Chemical properties of the topsoils at the Parle Foods property.

Analysis	**301**	**302**	**303**	**304**	**305**	**Average**
pH (water)	6.0	6.9	6.8	6.5	7.4	6.72
EC (dS/m)	0.25	0.28	0.28	0.28	0.49	0.32
Olsen P (mg/kg)	23	20	8	12	3	13.2
Total P (mg/kg)	236	208	144	180	70	167.6
TKN (%)	0.12	0.11	0.15	0.14	0.04	0.11
Nitrate (mg/kg)	300	200	160	300	1	192.2
Exch Na (mg/kg)	525	473	805	704	877	676.8
Exch K (mg/kg)	570	513	334	427	455	459.8
Exch Ca (mg/kg)	2460	3300	3370	2890	5540	3512
Exch Mg (mg/kg)	778	466	1070	1000	1450	952.8
Total Organic C (%)	1.6	1.2	1.9	1.7	0.4	1.36

The pH of the topsoil is near neutral and can tolerate the application of wastewater that is slightly acid. The EC of the topsoil is relatively low (assuming the values are equivalent to the saturated extract) and may be due to leaching if the soil was sampled soon after rain. The available P level is low although quite variable between sites. The value would need to be increased to about 20 mg/kg to ensure that P was not limiting crop growth. Again, Total Kjeldahl Nitrogen (TKN) is variable and very low at one site, but consistent with the organic C levels. Nitrate levels are high at all sites except Site 305 where it is very low. This nitrogen would be at risk to loss through denitrification. The exchangeable sodium percentage (ESP), an indication of possible structural instability caused by sodicity, is high at 17% and indicates that the irrigated area will require gypsum to reduce crusting. The desirable level of ESP is 5% (Rengasamy and Churchman (1990).

Soil samples were also collected by Coffeys from the subsoil (0.3 m to 0.4 m) at the same locations as the surficial samples and composited and tested in the same manner and the analytical results are shown in Table 2.

Table 2. Chemical properties of the subsoil at the Parle Foods property.

Analysis	306	307	308	Average
PH (water)	7.7	7.5	7.4	7.53
EC (dS/m)	0.37	1.51	1.06	0.98
Olsen P (mg/kg)	3	2	4	3
Total P (mg/kg)	88	52	88	76
TKN (%)	0.03	0.03	0.04	0.03
Nitrate (mg/kg)	125	1	1	42.33
Exch Na (mg/kg)	815	199	1190	735
Exch K (mg/kg)	279	268	265	271
Exch Ca (mg/kg)	4230	4800	2910	3980
Exch Mg (mg/kg)	1100	1860	1430	1460
Total Organic C (%)	0.3	0.4	0.6	0.43

As would be expected, the pH of the subsoil (7.5) is higher than the topsoil and again will provide buffering for the application of slightly acidic wastewater. The EC has risen but is not a concern if it represents the EC of the saturated paste. The TKN is very low as would be expected at this depth. Nitrate is very variable but generally low. The ESP, as would be expected has increased to 23.3%.
The results of the laboratory analytical testing are enclosed as Appendix I.

Groundwater

The property is located in an area that has historically had high water tables. For example, bore G1718 and G1730 averaged a depth to the groundwater of 1.25m in June 1965 and averaged 1.34 when last measured in September 1993 (Attachment 3). The groundwater level in the deep aquifer observation bore 36576 (installed at 78m) at Hanwood fluctuates seasonally by 1 to 1.5m with a declining long-term trend in response to pumping to the south and south-west (Lawson and Webb 1998). Here, the aquifer pressure is about 9 m beneath the soil surface.

Four (4) shallow monitoring wells were established at the site by Coffeys during the course of the EIS study and the water from the bores were sampled in late March 2000 and analysed by Riverina Laboratories of Jindera, the composition of the water is shown in Table 3. The results of the analytical testing are enclosed in Appendix I. The water is slightly alkaline and the average salinity is 9.6 dS/m. The salinity is very variable and ranges from 1.5 to 15.4 dS/m. This can be attributed to samples being taken from a bore located in an intake area (1.5 dS/m) and discharge areas (15.4 dS/m). The Total P, TKN and BOD levels are generally low.

Table 3. Composition of the water in the 4 shallow bores at Parle Foods property.

Analysis	349	350	351	352	Average
PH	7.8	7.2	7.1	7.4	7.38
EC (dS/m)	1.55	15.4	13.3	8.33	9.65
TSS (mg/L)	1040	10340	8930	5581	6470
Total P (mg/L)	0.01	0.05	0.01	0.05	0.03
TKN (mg/L)	1.1	1.1	0.8	0.1	0.78
Nitrate-N (mg/L)	2	3	12	8	6.25
BOD (mg/L)	6	5	5	5	5.25
TDS (mg/L)	1160	8780	7360	4280	5395

Conclusions

The soils on the property, and particularly where irrigation will be carried out, are transitional red-brown earths with low saturated hydraulic conductivities and classified suitable for rice culture. The pH of the topsoil is near neutral. Available phosphorus is medium to low for optimum crop growth. Although nitrate levels are high, this form of mineral nitrogen is at risk to loss through denitrification. Total nitrogen and organic matter is low. The exchangeable sodium percentage in the topsoil is high and the surface soil is at risk to dispersion and crusting with rain and irrigation. This can be ameliorated in the short term with gypsum and in the longer term by building up organic matter in the soil.

Shallow aquifers have pressures with levels that fluctuate between 1 and 2 m below the surface. However, the deep aquifer pressure appears to be dropping. Water tables are saline and very variable in concentration, suggesting intake and discharge areas within the property. This can be managed by removing rice from the property and irrigating to achieve more even intake of water.

Woodlot Management

A 15 ha woodlot will be established between the processing plant and the northern boundary of the property. This will assist in mananging the wastewater. The woodlot will comprise of Australian native eucalyptus to be operated along the lines of a commercial woodlot with the trees harvested for pulpwood or commercial saw logs.

The land on which the woodlot is located has been landformed previously to a grade of approximately 1:1500.

The general management of the woodlot will be based on the guidelines prepared by Meyers et al (1999) for establishing, growing and harvesting productive plantations.

Species and spacing

Eucalyptus grandis (Flooded Gum) is frequently used to manage wastewater (Meyer et al 1995) and is proposed to be used in this plantation along with Corymbia maculata (Spotted Gum), Eucalyptus camaldulensis (River Red Gum) and Eucalyptus occidentalis (Swamp Yate). This is a mix of local and non-local indigenous species. Wood from these species can be used as building frames, joinery, plywood, paneling, boat building, furniture and flooring, fencing posts, poles, pulping and firewood.

The trees will be planted at a density of the order of 1000 to 1200 stems/ha, typically 3 m between trees and 3 to 5 metres between rows. Sequential thinning will take place until the density is reduced to about 200 stems/ha.

Site Preparation

The rows will be ripped to a depth of 40 cm and gypsum applied to improve soil structure. The soil along the row will be mounded to a height of about 30 cm. Weed growth on the mound will be controlled but the area between the rows will be sown with pasture to increase evapotranspiration. Stock will not be on the property so grazing of the trees will not be a problem. Replanting will be carried out if plant mortality is greater than 15%.

Planting

A planting machine will be used due to the size of the woodlot. This tractor mounted machine will open up the planting trench, place the plant in the trench, add a small amount of fertilizer and close the trench around the plant.

The young trees will have tree guards to protect the young seedling and from frost and predators, whilst providing an ideal microclimate for the initial growth stages.

Post Planting

Pasture between the rows will be periodically harvested, weeds around the trees will ultimately be controlled by tree canopies and via rook competition for water and nutrients. Applications of pre-emergent herbicides will control weeds until this stage is reached.

Tree guards will be removed at the point when the trees and shrubs have outgrown them. This should occur in the first 12 months.

Irrigation

Initial irrigation will be carried out by flood/furrow irrigation. This will water the trees and the inter-row pasture. Once the woodlot reaches canopy closure the installation of a fully automated drip irrigation system is proposed. The system will be programmable to operate when required with the ability to shut down after a predetermined quantity of rainfall has been received. The system will also be able to alarm operators in the event of malfunction and automatically shut down. Additional trace elements can also be added through the system.

In the first year, irrigation scheduling will be based on routine measurements of resistance blocks located in the root zone. In addition, water balance estimates will be carried out to ensure that the crop is not stressed. In the second and subsequent years, the monitoring will be re-evaluated to ensure that the irrigation strategy will ensure rapid canopy closure and optimum evapotranspiration rates.

Winter and Summer Forage Crops

A 45 ha area of border check irrigation has been laser leveled to ensure uniform grades with no reverse grades. This area designated for summer cropping is divided into two blocks, one block containing 7 bays (slope 1:1400) and the other block with 4 bays (slope 1:2000).

Timetable of operations

Table 4 summarises the operations required to prepare the site for sowing in November

Date	Activity
Aug -Sept 00	Prepare 45 ha border check area for sowing and irrigation
Early Nov 00	Apply gypsum to ameliorate sodicity
Mid Nov 00	Pre-irrigate site with supply water
Late Nov 00	Sow to forage maize
Dec 00	Irrigate using a water budget to develop deep root system
Jan to Apr 01	Irrigate with wastewater and channel supply to maintain growth and avoid over-watering
Mid Apr 01	Harvest crop with a forage harvester and ensile harvested material Sod seed in annual ryegrass and sub clover.
Oct 01	Harvest annual pasture with forage harvester

Irrigation

The irrigation of the bays will aim to apply the water in 6 to 8 hours and drain excess water from the bay in a similar time. The existing bays may need to be split to ensure that the ratio of bay width (m) to flow (ML) is no less than 6 m/ML (Rahman and Darnley-Naylor 1994). Wastewater will be transported from the storage facility to the bays by supply channel. Bay outlets will control the water flow from the supply channel to the bays.

A tailwater recirculation system will quickly remove excess water from each bay returning it to the supply channel or storage facility.

Irrigation scheduling will be based on soil observations, soil water balance and a limited number of resistance meters in the crop.

References

Lawson and Webb (1998). Review of groundwater use and groundwater level behaviour in the Lower Murrumbidgee Valley. Department of Land and Water Conservation, Murrumbidgee Region.Technical Report 98/05

Meyers, Bond, Falkiner, O'Brien, Polglase, smith and Theiveynathan (1995). Effluent irrigation plantations: Design and management. CSIRO Division of Forestry Technical Paper No 2.

Rahman and Darnley-Naylor (1994). Evaluation of supply flow rates on irrigation efficiency and farm management. Benerembah Land and Water Management Plan - On Farm Options. NSW Agriculture, Griffith 39-44.

Rengasamy and Churchman (1999). Cation exchange capacity, exchangeable cations and sodicity. In: Soil analysis, an Interpretation Manual. CSIRO, Melbourne. P147-157.

Stannard (1970). Morphological description of soils occurring in the Coleambally Irrigation Area. Water Conservation and Irrigation Commission, Sydney.

Greening Australia Griffith – Recommended Species List for Irrigation Areas in Northern Riverina, Anon.
National Parks & Wildlife Griffith – Common Trees and Shrubs of the Western Plain in Griffith District, Anon.

Natural Resources Conservation League of Victoria – Tree Planters Guide for Farms and Public Lands, David Carew Ed.

State Forests Narrandera – Tree Species Trials for Salt Affected Sites, Ted Nicholls, 1990

Costermans LF 1992 – Native Trees and Shrubs of South Eastern Australia. Weldon. Sydney.

Elliot WR & Jones LJ 1982 – 1993 - Encyclopedia of Australian Plants Suitable for Cultivation. Vol 1-6. Lothian. Melbourne.

Wrigley JW & Fagg M 1988 – Australian Native Plants. Collins Australia. Melbourne/

van der Lelij and Talsma (19978). Infiltration and water movement in Riverine plain soils used for rice growing. In: the Hydrogeology of the Riverine Plain of South-Eastern Australia. Ed Storrier and Kelly, Australian Society of Soil Science, Riverina Branch 89-98.

van Dijk (1961). Soils of the southern portion of the Murrumbidgee Irrigation Areas. CSIRO Division of Soils. Soils and Land Use Series No 40. Melbourne.

WATER BALANCE

Rainfall and Evaporation

The rainfall and evaporation data used was collected at CSIRO, Griffith Laboratory that is located about 10 km from the site. The data was collected between January 1962 and December 1999 and the monthly totals are shown in Appendix 1. The potential evapotranspiration was calculated using a modified Penman equation that is described by Meyer (1999).

The average yearly rainfall for the 38 years was 4% higher than recorded by the Bureau of Meteorology for the period from 1914 to 1989 (Table 1).

Table 1. Comparison of the rainfall for the period used (1962 to 1999) and 1914 to 1989.

Month	1962 - 1999	1914 - 1989
January	37.2	29.6
February	26.3	27.8
March	35.5	34.4
April	34.4	33.0
May	39.9	37.8
June	35.6	37.2
July	35.2	33.2
August	37.4	40.4
September	39.7	32.6
October	44.0	41.3
November	27.2	28.5
December	30.9	30.7
Total	423.3	406.5

Maximum Hydraulic Loading

The maximum hydraulic loading was calculated for the 37 years as outlined in EPA NSW (1995). The value for each year is shown in Attachment 1 and the mean, median and 60 percentile values are summarised in Table 2.

The mean annual rainfall for tbe period is 423 mm and the mean annual potential evapotranspiration is 1815 mm. The mean and median yearly maximum hydraulic loading (YHL) for the period are very similar at 1391 mm. The 60 percentile value for YHL is 1457 mm.

The minimum area that is required to manage the effluent is 31 ha (424ML/y) wastewater and potential ETp of 13.91ML/ha/y) in a year of average rainfall and 39 ha in a 10 percentile wet year.

Table 2. The mean, median and 60 percentile values for the monthly and total rainfall, evapotranspiration (ETp) and maximum hydraulic loading (MHL) for the period from1962 to 1999.

Month	Rainfall (mm)			ETp (mm)			MHL (mm)		
	Mean	Median	60 Percentile	Mean	Median	60 Percentile	Mean	Median	60 Percentile
January	37.2	26.8	33.9	275	274.1	281.9	237.8	252.1	262
February	26.3	11.8	23.6	229	228.8	236.7	202.7	215.7	228.3
March	35.5	29.6	36.2	187.4	188.3	195.4	151.9	163.8	172.4
April	34.4	19.9	33.3	112	111.8	115.8	77.6	91.7	97
May	39.9	34.8	39.8	65.2	64.7	66.6	25.3	35	41.1
June	35.6	27.8	37.1	43.3	44.7	46	7.7	11.2	16.1
July	35.2	34.5	37	48.9	47.4	52	13.8	14	24.8
August	37.4	38.3	41.4	74.4	74.6	76.6	36.9	37.2	40.9
September	39.7	32.5	37.5	111.8	111.3	115.2	72.1	81.5	87.2
October	44	32.8	41.2	172.5	177.9	181.8	128.5	143.9	160.9
November	27.2	23	29.9	225.2	231.7	233.4	198	200.3	215.5
December	30.9	21.5	30.9	270.1	269.9	279.7	239.2	243	257.6
Total	423.2	405.8	449.3	1814.7	1831.8	1855.8	1391.5	1390.8	1456.8

Storage Facility

The wastewater is classified as a low strength effluent for nitrogen and phosphorus, but at the low end of the intermediate strength for BOD (Parle wastewater BOD 303 mg/L and intermediate strength effluent 40 to 1500 mg/L). Consequently, the 60 percentile storage requirement is used to establish the storage area.

The analysis of the nutrient loading concluded that 15 ha of wood lot and 45 ha of summer forage maize followed by winter grass/clover pasture would be suffieient area to manage the nutrients in the wastewater. This area of irrigated crop will be used in the calculations of wastewater application in excess of evapotranspiration losses.

The monthly crop factors for the wood lot (Table 3) are those recommended at Wagga by Myers et al (1999). It is assumed that the wood lot will reach canopy closure in 3 years when these figures are applicable. When the trees are young, pasture will be sown between the tree rows to maintain evapotranspiration losses and when necessary, removed with a forage harvester. In the first and possibly second year, the factory will not be operating at the potential and the quantity of wastewater will be less than used in the calculations.

The crop factors for the forage maize and winter pasture (Table 3) are based on the values in the MIA and District Land and Water Management Plan (Meyer 1996). The forage maize will be harvested with a forage harvester in late April and the winter pasture harvested in October.

Table 3. Monthly crop factors for the irrigated wood lot and cropped areas.

Month	Wood lot	Crop	Comments
January	0.78	0.7	
February	0.84	0.85	
March	0.94	0.85	
April	1.17	0.6	Forage maize harvested
May	1.21	0.4	Winter pasture established
June	1.15	0.6	
July	1.13	0.7	
August	1.33	0.8	
September	1.33	0.8	
October	1.26	0.6	Winter pasture harvested
November	0.99	0.4	Forage maize sown
December	0.83	0.5	

The 4 years with YHL closest to the median (1457 mm) were 1966 (1428 mm), 1996 (1455 mm) 1998 (1465 mm) and 1962 (1479 mm).

When the monthly evapotranspiration is subtracted from the monthly wastewater for these years, there is no month when the volume of wastewater exceeds the evapotranspiration (Attachment 2 & 3). Consequently, there is no need for a large storage.

The volume of wastewater in summer (January to April) is just under 3 ML per day with the remainder of the year being just under 0.5 ML per day (Attachment 2). Therefore a storage facility of 4 ML holds more than a days supply in peak season and more than 9 days supply in the off season (May to December).

Rain days during the peak processing season will necessitate termination of crop harvesting and delivery to the plant. Due to the method of harvest and the crops involved, harvested product will not be stored therefore once harvesting stops processing will also cease. Wastewater outflow will then decrease to the off season volume until harvesting again resumes once the paddocks have dried out.

Couclusion

This analysis demonstrates that the planned 15 ha wood lot and 45 ha of summer and winter forage crops will be sufficient to manage the wastewater in years similar or drier than the 60 percentile year. Under these conditions, there is no need for a storage larger than that designed.

WASTEWATER QUANTITY AND QUALITY

Quantity

The wastewater will come from several processing operations with the majority (318 ML) produced in a 105 day period (January to mid April) and the remaining 106 ML produced during the rest of the year. The anticipated quantities are shown in Table 1.

Table 1. Anticipated quantity of wastewater produced.

Product	Volume (ML/yr)	Period of production
Corn	53	January to mid April
Tomato	212	January to mid April
Pickles washings	3.2	Equally during year
Other products	156	Equally during year
Total	**424.2**	

Composition of the Wastewater

Sweet Corn

The Heinz Wattie plant in New Zealand is similar to that being installed at Parle Foods, Hanwood. The press effluent waste produced is stored in a tank in New Zealand. The composition of this wastewater is used as an estimate of the concentration of nutrients in the wastewater at the Parle Foods factory. However, at Parle Foods, the equivalent to the press effluent will be diluted 10 fold.

The average nutrient composition of the tank effluent sampled on 8 occasions from 26 January 1999 to 23 March 1999 is shown in Table 2.

Table 2. Average composition of the New Zealand tank effluent and estimated corn wastewater composition at Parle Foods factory, Hanwood.

Nutrient	New Zealand Tank	Parle Foods (diluted)
Nitrogen (mg/L)	1742	174
Phosphorus (mg/L)	362	36
Potassium (mg/L)	1307	131
Calcium (mg/L)	101	10
Magnesium (mg/L)	156	16

The BOD of the tank effluent was measured on a number of occasions and using a range of production processes. The measurements are shown in Table 3.

Table 3. Corn wastewater BOD (mg/L) results derived from various production processes and crop varieties in 1999 in New Zealand.

Parameter	New Zealand Tank	Parle Foods (diluted)
Hot cob	1530	
Conventional	3397	
Shallow cut	1605	
Sweetened	2948	
Unsweetened	4533	
Average	2803	280

Tomatoes

Wastewater samples were collected on 9th May 2000 from the tomato processing line at the Parle Foods factory in Griffith and analysed by ANCO Australasia Pty Ltd. Sample "A" came from the shaker table, Sample "C" from the spray/roller table and Sample "D" from the cooling tower.

The analytical results and the calculated wastewater composition is shown in Table 4. The wastewater composition assumes that 70 ML/yr originates from the processing line and 130 ML/yr from the cooling tower.

Table 4. Characteristics of the water samples from the tomato processing line and estimated composition of the wastewater at Parle Foods factory, Griffith.

Analysis	Sample A	Sample C	Sample D	Tomato W/water
Volume (ML/yr)	35	35	130	200
BOD (mg/L)	188	774	216	309
TDS (mg/L)	180	450	130	195
EC (dS/m)	0.286	0.735	0.208	0.314
pH	5.7	4.9	5.8	5.6
Total N (mg/L)	1.4	5.2	1.5	2.1
P (mg/L)	2.7	5.9	2.4	3.1
K (mg/L)	66	155	42	66

Pickles

The quantity of wastewater originating from the pickle line is quite small at less than 1% of the total. The wastewater from the pickle line has a salinity of 1000 mg/L (1.6 dS/m).

Other Products

Other products that will be processed include capsicum, celery, carrot, rice and onion. No information is available on the composition of the wastewater produced by these products and it is assumed that it will be similar to the average composition for sweet corn and tomato wastewater (Table 5).

Table 5. Estimated composition of wastewater from the pickles and other products processed at Parle Foods, Hanwood processing plant.

Analysis	Corn	Tomato	Estimated
Volume (ML/yr)	53	212	265
BOD (mg/L)	280	309	303
EC (dS/m)		.31	0.33
PH		5.6	
TN (mg/L)	174	2.1	36
P (mg/L)	36	3.1	9.7
K (mg/L)	131	66	79

Assuming that the composition of the wastewater produced by the other products is similar to the major wastewater producers - tomatoes and sweet corn, then the nutrient level would be classified as low (Table 4.7 EPA NSW 1995). However, the BOD (303 mg/L) is at the low end of the intermediate strength range 40 - 1500 mg/L).

Quantity of BOD Nutrients in Wastewater

The quantity of BOD and nutrients in the wastewater is shown in Table 6. The annual wastewater production contains 129 tonnes of BOD, 15.4 tonnes of nitrogen and 4.11 tonnes of phosphorus.

Table 6. Quantity of BOD, nitrogen and phosphorus in the wastewater streams and total content.

Component	Sweet corn		Tomatoes		Pickles		Other		Total	
	Conc mg/L	Amount kg/y	Conc mg/L	Amount kg/y	Conc mg/L	Amount kg/y	Conc mg/L	Amount kg/yr	Conc mg/L	Amount Kg/y
Volume (ML)	53		212		3.2		156		424	
BOD	280	14840	309	65508	303	970	303	47268	303	128.6
Nitrogen	174	9222	2.1	445	36	115	36	5616	36	15.4
Phosphorus	36	1908	3.1	657	9.7	31	9.7	1513	9.7	4.11

It is generally accepted that 10,000kg/ha/yr of BOD can be applied in surface irrigation without adverse effects (Meat Research Corporation 1995). The BOD applied here is estimated to be 129 t/yr (Table 6). Therefore, providing the effluent is applied to more than 13 ha, there should be no detrimental effect to the environment. Furthermore, Bowmer and Laut (1992) concluded that a BOD:N:P ratio of the order of 20:5:1 is ideal for successful stabilisation by microorganisms. The ratio here is 31:3.7:1, close to the ideal.

Management of Nutrients

A number of alternatives have been evaluated to determine the most appropriate crops to manage the volume of wastewater and nutrients it contains. The strategy that will be adopted is to establish a wood lot for saw logs that will have a life of at least 16 years. On a separate area, forage maize will be grown during the summer and winter pasture during the winter. The above ground biomass of both crops will be removed with a forage harvester at the appropriate time.

Wood lot

A 15 ha wood lot will be established on the site and wastewater applied with drip irrigation.

Extensive research at Wagga has led to the development of guidelines for the management of sustainable effluent-irrigated plantations (Meyers et al 1999). Table 7 shows the estimated rate that nitrogen accumulation in the above ground parts of gum trees. The average nitrogen uptake for the first 8 years is 70 kg/ha/yr and will be used in the calculations.

The average phosphorus uptake varies from 8 to 12 kg/ha/yr and an average of 10 will be used in the calculations.

Table 7. Above ground accumulation rate of nitrogen in relation to stand age.

Interval (yr)	0 - 2	2 - 4	4 - 8	8 - 12	12 - 16	Average
Nitrogen (kg N /ha/yr)	79	84	57	35	17	48

The annual quantity of nutrients taken up by the 15 ha of wood lot in the 8 years after establishment is shown in Table 8.

Table 8. Quantity of nutrients taken up by the 15 ha wood lot.

Element	Concentration (kg/ha)	Quantity (kg/yr)
Nitrogen	70	1050
Phosphorus	10	150

Forage Maize

The crop that will be grown during the period of maximum wastewater production will be forage maize. The projected yield is 14 t dry matter/ha/y (Meat Research Council 1995).

In the FILTER project at Griffith (Blackwell et al 1999), 25 t dry matter /ha was produced with maize grown on border check with subsurface drainage but with irrigation water containing 4 times the quantity of salt. Therefore, the yield of forage maize of 14t dry matter/ha is considered realistic. The composition of the forage maize is based on Meat Research Corporation (1995) recommendations for plant nutrient removal in the harvested part of forage crops. The concentration and quantity of nitrogen and phosphorus taken up by this crop is shown in Table 9.

Table 9. Concentration of nutrients in the forage maize (Meat Research Corporation 1995) and winter pasture (Glendinning 1981) and nutrient uptake by the crops.

Element	Forage Maize		Winter Pasture		Total (kg/ha/y)
	Conc (mg/kg/)	Quantity (kg/ha/y)	Conc (mg/kg/)	Quantity (kg/ha/y)	
Nitrogen	110	154	260	130	284
Phosphorus	25	35	32	16	51

Winter Pasture

After the maize is harvested for silage in late April, a winter pasture containing annual ryegrass and sub clover will be sod seeded into the maize stubble. The pasture will be harvested with a forage harvester in late spring. The yield is estimated to be 5 t dry matter/ha, the composition of the pasture Glendenning (1981) and quantity of nutrients removed is shown in Table 9.

The nutrient balance and crop area required to achieve no net gain in nitrogen and phosphorus when applied to 10 ha of wood lot and 45 ha of crop is shown in Table 10.

Table 10. Quantity of nutrients removed by the summer and winter crops and area required for sustainable application.

Element	In Wastewater (t/yr)	Uptake Wood lot (t/yr)	Remainder (t/yr)	Crop Removal (kg/ha)	Crop Area Required (ha)
Nitrogen	15.4	1.0	14.4	284	51
Phosphorus	4.1	0.1	4.0	51	78

The estimated area required is 51 ha of crop to manage the nitrogen and 78 ha of crop to manage the phosphorus. The area required for nitrogen assumes no losses through volatilisation and denitrification will occur. A Canadian study (Bole et al 1985) showed that 45% of the labelled nitrogen applied in the wastewater was lost through denitrification and volatilisation. They attributed the high loss to the high levels of oxidizable carbon in the wastewater that enhanced denitrification. An area of 45 ha should be more than adequate to manage the nitrogen. The losses to achieve a nitrogen balance for this area is 13%.

The irrigation site now has available phosphate levels lower than desirable. The average value for the Olsen available phosphate test in the topsoil was 13 mg/kg (range 3 to 23). To achieve a sufficiency level for the crops planned, at least 20 mg/kg is required in the topsoil. Consequently, the opportunity exists to increase the available phosphate in the soil without a detrimental impact on the environment.

The phosphorus nutrient balance ignores the phosphorus fixation capacity of the soil.

Meyer et al (1999) developed a method to calculate the P retention capacity (TPR) of the soil and the P retention time. They found that their method yielded more accurate predictions of vertical soil P movement at the Wagga research site than other methods.

This method has been applied to the Parle Foods site. Here, the wastewater (424 ML/y) will be applied to 15 ha of wood lot and 45 ha of forage crops. The application rate will be 7.1 ML/ha/y.

TPR = P retained per kg* BD* ST/100

Where BD = bulk density in kg/m^3, and
ST = soil layer thickness (m).

The P retained value is 200 mg/kg (Meyer *et al* 1999). The average value of BD for transitional red-brown earth's is 1400 kg/m^3 for the surface 20cm (Hornbuckle and Christen 1999). The soil layer thickness where the P accumulates is set at 0.2m. Therefore,

TPR = 200*1400*0.2/100
= 560 kg/ha

The P retention time (PRT) is calculated as follows:

PRT =TPR/ Pa where
Pa = annual P loading

Here, the Pa will be the difference between the P applied in the wastewater (70.7 kg/ha/y - derived from Table 6) and the P removed by the crop (40 kg/ha/y - derived fromTable 8).

PRT = 560/(71 - 51.0) -= 18 y

Thus, the prediction is that after 18 y of wastewater application and crop removal, the surface 20cm soil will reach saturation and P will begin to move out of this zone. This time is longer than the time to when the trees will be harvested.

Salinity

The salinity of the wastewater is 0.33dS/m (Table 5) and is considered to be at the low end of the medium salinity range ((0 - 0.27 dS/m - EPA 1995). However, other authorities would consider it to be of low salinity (0 - 0.7 dS/m - Robbins et al 1991). The wastewater is high in potassium (Table 5) and other nutrients and much of these will be removed by crops and therefore will not accumulate in the soil.

The annual salt loading excluding potassium is estimated to be 940kg/ha, similar to the salt loading for a rice crop.

When the potassium removal is taken into consideration, the wastewater can be considered to be of low salinity and suitable for border check irrigation.

Conclusions

The quantity and quality of the wastewater from the Parle Foods plant at Hanwood has been determined and the nitrogen and phosphorus levels are of low strength (Table 6). However, the BOD is at the low end of intermediate strength, the nutrient balance will encourage optimum microbiological activity and the land application rate will be considerably less than the maximum.

15 ha of wood lot and 45 ha of forage maize followed by a grass/clover winter pasture will be established to manage the nutrients. The biomass from both crops will be removed with a forage harvester. All of the nitrogen will be removed if a denitrification and volatilisation loss of 13% is assumed. There will be a slow increase in phosphorus over time. Initially this will increase the available phosphorus in the soil to levels that will allow optimum crop growth. Thereafter, the phosphorus will be adsorbed in the soil and it is estimated that no phosphorus will leave the root zone for at least 18 years. In addition, the organic matter will increase in the soil and immobilise more phosphorus.

The salinity of the wastewater will average 0.33 dS/m and is at the low end of the medium salinity range. The salinity is about twice that of irrigation supply water. However, this not considered as be an issue because of the high potassium content of the wastewater. The potassium will be removed when the crops are harvested.

References

EPA NSW (1995). Draft Environmental Guidelines for Industry. The utilisation of treated effluent by irrigation. Environmental Protection Authority, Bankstown. ISBN 0 7310 3733 2.

Blackwell, Biswas, Jayawardane and Townsend (1999). A novel method for treating effluent from rural industries for use in integrated aquaculture systems. In: Proceedings of workshop on Wastewater Treatment and Integrated Aquaculture adelaide, 17-19 September 1999. SARDI, adelaide.

Bole and Gould (1985). Irrigation of forages with rendering plant wastewater: forage yield and nitrogen dynamics. **Journal of Environmental Quality** 14: 119-126.

Bowmer and Laut (1992). Waste management in intensive rural industries. In: CSIRO Division of Water Resources: Research areas pertinent to intensive rural industry waste management. CSIRO Division of Water Resources Divisional Report 92/4, Canberra. ISBN 0 643 05407 3.

Glendenning (1981). Fertilizer handbook. Australian fertilizers Ltd., North Sydney. ISSN 0705-8977.

Hornebuckle and Christen (1999). Physical properties of soils in the Murrumbidgee and Coleambally Irrigation Areas. CSIRO Land and Water, technical report 17/99, Canberra.

Meat Research Corporation (1995). Effluent irrigation manual for meat processing plants. Meat Research Corporation Environmental Issues Sub-Program Project M476.

Meyers, Bond, Benyon, Falkiner, Polglase, Smith, Snow and Theiveyanathan (1999). Sustainable Effluent-Irrigated Plantations: An Australian Guideline. CSIRO Forestry and Forest Products, Canberra, 293 pp.

Robbins, Meyer, Prathapar and White (1991). Understanding salt and sodium in soils, irrigation water and shallow groundwaters. CSIRO Water Resources Series No 4. ISBN 0 643 05221 6.

ATTACHMENT 1

Monthly Totals 1962 to 1999

Rainfall (mm)

Date	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83
Jan	64.2	60.7	9.4	4.6	12.7	11.5	49.1	15.8	24.1	9.9	32.1	48	111.8	12.9	46.4	22.8	61.2	42	11	16.5	30.3	3.4
Feb	1	7.5	1.8	1.8	9.4	1	4.1	146.9	12.7	60.2	65.3	78.6	52.4	12.4	52.1	58.8	0.4	3.2	2.2	97.4	0	23.3
Mar	40.5	31.8	20.1	0.8	59.8	11.2	41.5	82.5	63.7	15.6	16.5	32.4	6.2	19.2	19.2	61.4	61	7.6	30	36.1	57.9	40.7
Apr	5.3	37.8	99.3	42	10.7	1	37.4	58.7	89	32.3	37.3	75.8	184.2	10.2	6.4	12.6	6.9	44.5	39.8	8.2	2.5	74.6
May	49.6	86.1	19.7	33	37.2	37.4	95.5	71.1	15.1	12.1	13.4	28.9	17.2	25.4	4.8	89.2	119	48.6	30.1	42.5	12.8	45.8
June	20.5	67.4	38	30	8.5	42.8	27.9	48.4	13.6	12.5	5.6	65.9	20.6	20	6.5	21.2	50.7	46.6	31.6	56.3	24.7	22.7
July	27.2	39.3	35.4	15	18.4	9.9	35.5	61.1	10	47.9	11.1	23.4	37.9	36.8	10.8	2.6	38	1.7	28.6	84.7	0.4	45
Aug	56	30.6	27.7	73	29	29.1	32.4	27.3	59.3	23.1	57	59	60.7	48.2	14.7	3.2	18.7	38.2	41.4	30.5	0.7	55.5
Sept	31.8	46.7	78.3	22	35.9	12.2	13	43.7	91.1	8.2	8.2	22	46.6	48.6	44.9	13.5	101.6	36.6	8.8	32.9	10.4	24.7
Oct	30.5	52.6	41.1	30	74	37	36.1	10.5	26.7	8.7	20.4	120.3	115.8	86.3	117.4	13.2	28.5	50	19.6	13.8	2.7	22.2
Nov	16.7	16.2	11.5	52	55.6	0.8	30.1	39.5	29.3	127.6	9.7	30.6	21.2	0.1	22.2	13.2	30.6	13.9	5.2	8	0	38.5
Dec	9.8	40.4	11.3	45	49.1	0	72.7	4.8	19.5	42.2	3.8	32.5	10	69.8	20	0.5	39.4	0.4	49.8	25.8	0.9	30.5
Total	353.1	517.1	393.6	347	400.3	193.9	475.3	610.3	454.1	400.3	280.4	617.4	684.6	389.9	365.4	312.2	556	333.3	298.1	452.7	143.3	426.9

Monthly Etp (mm) summary 1962 to 1999

Date	62	63	64	65	66	67	68	69	70	71	72		74	75	76	77	78	79	80	81	82	83
Jan	247	252.4	269.5	306	287.7	282.8	273.7	325.5	275	269.5	239.8	283.3	257.2	244.4	209	245	210.2	316	272.4	327.3	263.8	269.1
Feb	221.7	226.2	240.3	260	214.3	251.5	282.2	212.9	245.5	205.6	203	191.1	200.1	199	186.5	202.8	207.3	236.4	244.6	209.6	237.7	233.3
Mar	186.5	201.7	208.9	226	192.6	192.9	203.7	155	169.2	188.2	188.4	174.6	188.2	151.9	166.9	154.6	151.4	203.9	195.3	163.5	173.9	162.9
Apr	125.3	124.1	110.5	115	124.9	142.8	123.7	106.5	113	129.2	102.3	106.8	66.5	103.7	118.8	95	104.1	107.5	126.2	113.5	103.6	82.3
May	61.5	64.7	68	86	69.3	81	59	62.6	61.7	70.7	76.4	65	58	74.6	71.8	57.9	57.2	58.2	65.7	56.2	62.7	49.9
June	48.9	42.3	57.9	60	52.3	57.2	40.4	46.9	55.5	46.5	59.3	33	42.5	49.9	45.2	36.4	30.2	48.5	40.3	40.5	17.7	29.8
July	51.9	52.5	70.1	58	64.2	64.1	42.3	46.2	72.8	52.6	62.5	48.4	43.7	59.9	51.6	53.9	36.3	57.3	41.7	41.2	38.9	38.5
Aug	74.4	83.3	80.2	70	81.5	84.8	73.4	75.7	80.8	72.1	86.5	54.4	60.7	63.8	85.8	96.2	52.3	73	80.6	68.8	105.1	61.4
Sept	124.3	121.1	110.2	137	117	141.6	112.2	90.1	94.2	112.6	145.1	105	89.6	86.5	92.8	104	80.4	106.8	130.1	114.8	129.5	111.2
Oct	176.1	181.8	167.2	196	149.7	208.4	170.4	177.9	181.8	198.9	193.6	128.7	129.1	100.4	106.7	177.9	130.4	160.5	189	181.8	188	149.5
Nov	247.4	232.8	241.9	232	220.3	270.1	234.4	219.3	232.9	196.8	237.9	192.1	207	192.2	150.7	200.3	187.2	231.3	233.3	186	260.7	205.8
Dec	267	269.1	270.7	296	254.6	300.6	278	298.2	262.2	248.7	312.2	257.5	252.3	236.5	217.7	272	222	291.6	279.4	247.6	201.3	262.2
Total	1832	1852	1895.4	###	1828.4	2077.8	1893.4	1816.8	1844.6	1791.4	1907	1639.9	1594.9	1562.8	1503.5	1696	1469	1891	1898.6	1750.8	1782.9	1655.9

MHL Maximum Hydraulic Loading (mm)

	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83
Jan	182.8	191.7	260.1	301	275	271.3	224.6	309.7	250.9	259.6	207.7	235.3	145.4	231.5	162.6	222.2	149	274	261.4	310.8	233.5	265.7
Feb	220.7	218.7	238.5	258	204.9	250.5	278.1	66	232.8	145.4	137.7	112.5	147.7	186.6	134.4	144	206.9	233.2	242.4	112.2	237.7	210
Mar	146	169.9	188.8	225	132.8	181.7	162.2	72.5	105.5	172.6	171.9	142.2	182	132.7	147.7	93.2	90.4	196.3	165.3	127.4	116	122.2
Apr	120	86.3	11.2	73	114.2	141.8	86.3	47.8	24	96.9	65	31	-117.7	93.5	112.4	82.4	97.2	63	86.4	105.3	101.1	7.7
May	11.9	-21.4	48.3	54	32.1	43.6	-36.5	-8.5	46.6	58.6	63	36.1	40.8	49.2	67	-31.3	-61.8	9.6	35.6	13.7	49.9	4.1
June	28.4	-25.1	19.9	30	43.8	14.4	12.5	-1.5	41.9	34	53.7	-32.9	21.9	29.9	38.7	15.2	-20.5	1.9	8.7	-15.8	-7	7.1
July	24.7	13.2	34.7	43	45.8	54.2	6.8	-14.9	62.8	4.7	51.4	25	5.8	23.1	40.8	51.3	-1.7	55.6	13.1	-43.5	38.5	-6.5
Aug	18.4	52.7	52.5	-3	52.5	55.7	41	48.4	21.5	49	29.5	-4.6	0	15.6	71.1	93	33.6	34.8	39.2	38.3	104.4	5.9
Sept	92.5	74.4	31.9	116	81.1	129.4	99.2	46.4	3.1	104.4	136.9	83	43	37.9	47.9	90.5	-21.2	70.2	121.3	81.9	119.1	86.5
Oct	145.6	129.2	126.1	166	75.7	171.4	134.3	167.4	155.1	190.2	173.2	8.4	13.3	14.1	-10.7	164.7	101.9	110.5	169.4	168	185.3	127.3
Nov	230.7	216.6	230.4	181	164.7	269.3	204.3	179.8	203.6	69.2	228.2	161.5	185.8	192.1	128.5	187.1	156.6	217.4	228.1	178	260.7	167.3
Dec	257.2	228.7	259.4	251	205.5	300.6	205.3	293.4	242.7	206.5	308.4	225	242.3	166.7	197.7	271.5	182.6	291.2	229.6	221.8	200.4	231.7

Yearly Hydraulic Loading (mm)

	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83
Total	1478.9	1334.9	1501.8	###	1428.1	1883.9	1418.1	1206.5	1390.5	1391.1	1626.6	1022.5	910.3	1172.9	1138.1	1383.8	913	1557.7	1600.5	1298.1	1639.6	1229

84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99
159.9	4.7	22.7	1.6	29.5	43.2	21.7	20.2	24.1	31.6	0.3	105.6	97.2	41	44	65.5
13.1	0.2	1.9	33.5	7.6	6.4	27.4	0	45.4	39.4	52.5	11.2	29.6	3	25	9.4
8.3	66.8	13.4	5.6	29.2	230.3	1.3	2.5	1.3	64.1	36.4	0	52.4	8.2	0	73.4
59.5	46.7	20.4	14.7	18.6	26.3	98.5	8	19.3	0	3.1	18.6	6.8	8.4	28.2	14.5
0.9	27.7	36.9	30.1	85.6	71.6	51	14.9	41.7	39.6	1.1	85	8.4	30.4	16.1	40.6
0	22.5	12	84	64.4	69.6	25.7	72.8	22.6	13.4	20.5	67.6	27.6	36.9	45	86.4
82.6	14.4	58.4	33.6	78.6	42	65.3	31.7	31.7	84.9	19.6	36	74	6.2	38.5	7.3
36	62.3	53.2	50	20.5	64.5	48.9	20.7	61.6	13.8	5.8	12.6	38.8	41.5	38.4	39.4
32	29.4	36.6	22.3	52.1	13.8	25	51.3	75.7	91.7	7.2	16	29	96.4	107.4	41.1
33.4	65.6	60.3	41.7	10.9	22.7	26	7.2	87.6	96.6	7.8	50.6	32.2	42.1	31.6	97
36.8	43.1	29.8	9.8	21.1	19.6	1	12.2	51.6	46	34.4	68.2	23.8	5.9	24.9	32.3
6.2	65	35.6	20.2	63.9	7.4	13.5	18.6	110.7	60.7	27	17.4	22.8	16	7.2	103.6
468.7	448.4	381.2	347.1	482	617.4	405.3	260.1	573.3	591.8	215.7	488.8	442.6	336	406.3	610.5

84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99
225.7	281.7	266.1	300.2	334.7	317.4	286	306.2	277.4	239.6	301.2	243.9	274.5	313.6	250.3	304.1
227.8	241.8	218.5	262.4	266.6	263.2	201.8	274.5	207.1	221.7	213.9	239.4	229.7	250.2	233	239.7
180.7	185.7	214.4	203	202.4	161.7	206.2	219.4	199.9	166.9	176.8	209.7	203	196	223.1	170.5
95	105.7	119.9	131	114.6	74.2	102.7	119.5	122.1	132.6	137.6	109.4	105.6	126.5	108.1	107
62.2	67.2	54.9	72.6	59	38.5	64.1	72.6	51.3	70.2	100.1	49.9	66.4	64.7	73.3	73
50.9	35.5	34.5	41.7	38.5	21.5	35.6	45.9	27.5	44.2	59.1	45.4	48.1	45.1	50.6	40.2
41.6	53.5	36.7	49.9	39.4	30.2	42.9	40.8	46.4	43.1	62.4	42.8	36.6	53.2	37.6	52.7
73.9	61.6	68.5	56.7	74.7	47.7	65.6	83.2	63.6	81	90.7	93.6	75.2	82.4	67.7	75.4
95.5	104.2	86.9	124	124.9	103.9	111.4	118.8	95.9	100.7	143.6	120.3	124.2	101.4	100.8	134.5
171	178.2	140.1	175.9	223.7	183.8	194.9	220.2	138.4	148.3	206.9	192.8	193	204.1	177.6	162.4
233.8	211.1	224.8	261.7	247.8	244.6	264.8	252	170.6	229.4	249.7	203.5	240.2	257.7	229.7	223.8
285.5	225.3	282.8	320.3	253	300.5	322.3	261.8	195.9	240.6	325	280.8	300.9	300.3	319.1	251.5
1743.6	1751.5	1748.1	1999.4	1979.3	1787.2	1898.3	2014.9	1596.1	1718.3	2067	1831.5	1897.4	1995.2	1870.9	1834.8

65.8	277	243.4	298.6	305.2	274.2	264.3	286	253.3	208	300.9	138.3	177.3	272.6	206.3	238.6
214.7	241.6	216.6	228.9	259	256.8	174.4	274.5	161.7	182.3	161.4	228.2	200.1	247.2	208	230.3
172.4	118.9	201	197.4	173.2	-68.6	204.9	216.9	198.6	102.8	140.4	209.7	150.6	187.8	223.1	97.1
35.5	59	99.5	116.3	96	47.9	4.2	111.5	102.8	132.6	134.5	90.8	98.8	118.1	79.9	92.5
61.3	39.5	18	42.5	-26.6	-33.1	13.1	57.7	9.6	30.6	99	-35.1	58	34.3	57.2	32.4
50.9	13	22.5	-42.3	-25.9	-48.1	9.9	-26.9	4.9	30.8	38.6	-22.2	20.5	8.2	5.6	-46.2
-41	39.1	-21.7	16.3	-39.2	-11.8	-22.4	9.1	14.7	-51.8	42.8	6.8	-37.4	47	-0.9	45.4
37.9	-0.7	15.3	6.7	54.2	-16.8	16.7	62.5	2	67.2	84.9	81	36.4	40.9	29.3	36
63.5	74.8	50.3	101.7	72.8	90.1	86.4	67.5	20.2	9	136.4	104.3	95.2	5	-6.6	93.4
137.6	112.6	79.8	134.2	212.8	161.1	168.9	213	50.8	51.7	199.1	142.2	160.8	162	146	65.4
197	168	195	251.9	226.7	225	263.8	239.8	119	183.4	215.3	135.3	216.4	251.8	204.8	191.5
279.3	160.3	247.2	300.1	189.1	293.1	308.8	243.2	85.2	179.9	298	263.4	278.1	284.3	311.9	147.9
1274.9	1303.1	1366.9	1652.3	1497.3	1169.8	1493	1754.8	1022.8	1126.5	1851.3	1342.7	1454.8	1659.2	1464.6	1224.3

ATTACHMENT 2

Estimates for 60percentile years

1966 (YHL 1428mm)

Month	Wastewater	Rain	Etp	Woodlt 15 ha Kc	Crop 45 ha Kc	ET Wdlt ML	ET Crop ML	ON-ET ML	Storage
Jan	90.77	12.7	287.7	0.78	0.7	33.7	90.6	-33.5	
Feb	85.75	9.4	214.3	0.84	0.85	27.0	82.0	-23.2	
Mar	90.77	59.8	192.6	0.94	0.85	27.2	73.7	-10.1	
Apr	50.76	10.7	124.9	1.17	0.7	21.9	39.3	-10.5	
May	13.27	37.2	69.3	1.21	0.4	12.6	12.5	-11.8	
June	13.26	8.5	52.3	1.15	0.6	9.0	14.1	-9.9	
July	13.27	18.4	64.2	1.13	0.7	10.9	20.2	-17.8	
Aug	13.27	29	81.5	1.33	0.8	16.3	29.3	-32.3	
Sept	13.26	35.9	117	1.33	0.8	23.3	42.1	-52.2	
Oct	13.27	74	149.7	1.26	0.6	28.3	40.4	-55.4	
Nov	13.26	55.6	220.3	0.99	0.4	32.7	39.7	-59.1	
Dec	13.27	49.1	254.6	0.83	0.5	31.7	57.3	-75.7	
Total	424.18	400.3	1828.4			274.5	541.2	-391.6	

1996 (YHL 1455mm)

Month	Wastewater	Rain	Etp	Woodlt 15 ha Kc	Crop 45 ha Kc	ET Wdlt ML	ET Crop ML	ON-ET ML	Storage
Jan	90.77	97.2	274.5	0.78	0.7	32.1	86.5	-27.8	
Feb	85.75	29.6	229.7	0.84	0.85	28.9	87.9	-31.1	
Mar	90.77	52.4	203	0.94	0.85	28.6	77.6	-15.5	
Apr	50.76	6.8	105.6	1.17	0.7	18.5	33.3	-1.0	
May	13.27	8.4	66.4	1.21	0.4	12.1	12.0	-10.7	
June	13.26	27.6	48.1	1.15	0.6	8.3	13.0	-8.0	
July	13.27	74	36.6	1.13	0.7	6.2	11.5	-4.5	
Aug	13.27	38.8	75.2	1.33	0.8	15.0	27.1	-28.8	
Sept	13.26	29	124.2	1.33	0.8	24.8	44.7	-56.2	
Oct	13.27	32.2	193	1.26	0.6	36.5	52.1	-75.3	
Nov	13.26	23.8	240.2	0.99	0.4	35.7	43.2	-65.6	
Dec	13.27	22.8	300.9	0.83	0.5	37.5	67.7	-91.9	
Total	424.18	442.6	1897.4			284.2	556.5	-416.5	

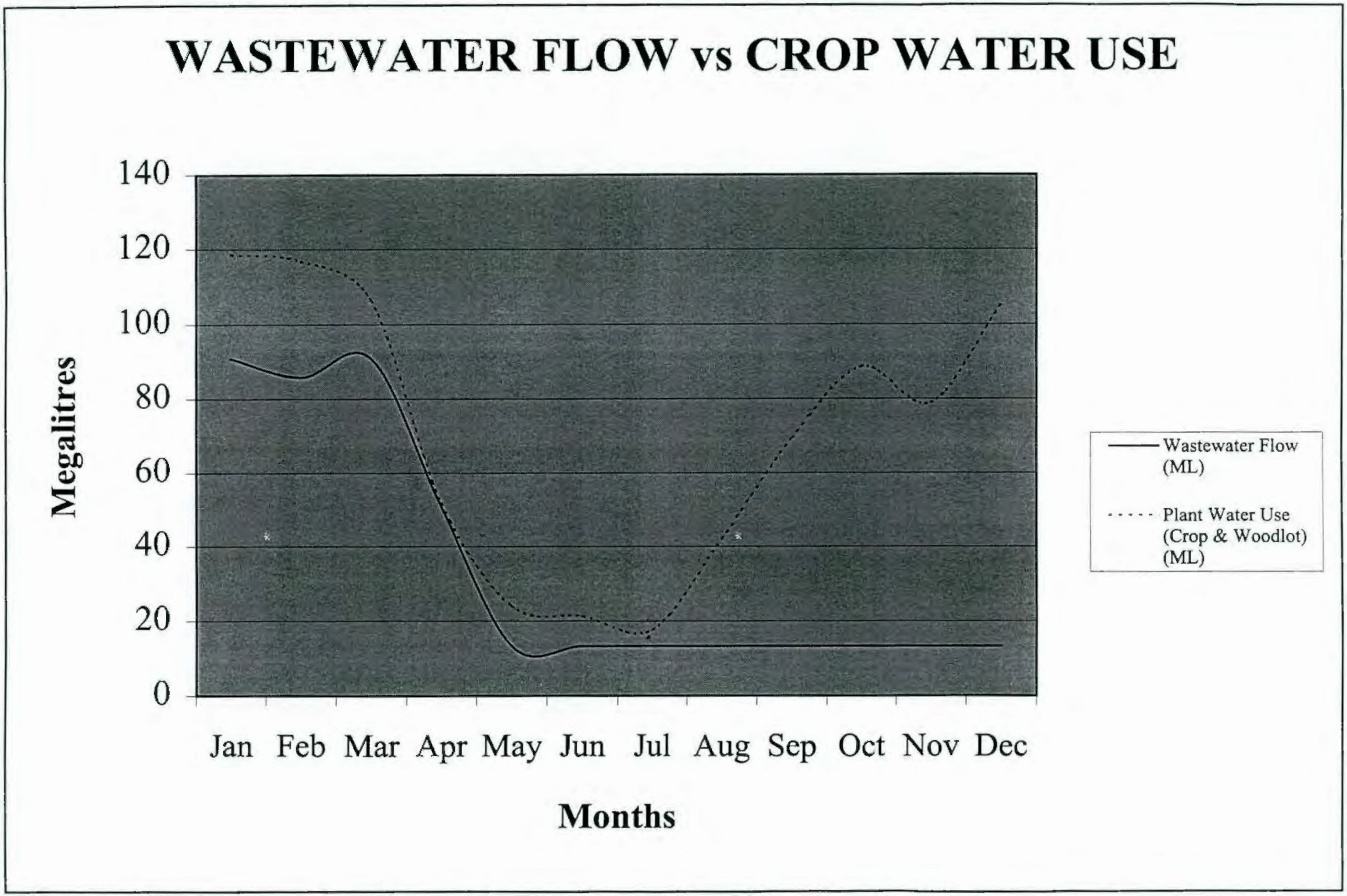
1998 (YHL 1465mm)

Month	Wastewater	Rain	Etp	Woodlt 15 ha Kc	Crop 45 ha Kc	ET Wdlt ML	ET Crop ML	ON-ET ML	Storage
Jan	90.77	44	250.3	0.78	0.7	29.3	78.8	-17.4	
Feb	85.75	25	233	0.84	0.85	29.4	89.1	-32.7	
Mar	90.77	0	223.1	0.94	0.85	31.5	85.3	-26.0	
Apr	50.76	28.2	108.1	1.17	0.7	19.0	34.1	-2.3	
May	13.27	16.1	73.3	1.21	0.4	13.3	13.2	-13.2	
June	13.26	45	50.6	1.15	0.6	8.7	13.7	-9.1	
July	13.27	38.5	37.6	1.13	0.7	6.4	11.8	-4.9	
Aug	13.27	38.4	67.7	1.33	0.8	13.5	24.4	-24.6	
Sept	13.26	107.4	100.8	1.33	0.8	20.1	36.3	-43.1	
Oct	13.27	31.6	177.6	1.26	0.6	33.6	48.0	-68.2	
Nov	13.26	24.9	229.7	0.99	0.4	34.1	41.3	-62.2	
Dec	13.27	7.2	319.1	0.83	0.5	39.7	71.8	-98.3	
Total	424.18	406.3	1870.9			278.5	547.8	-402.1	

1962 (YHL 1479mm)

				Woodlt 15 ha	Crop 45 ha	ET Wdlt ML	ET Crop ML	ON-ET ML	Storage

Month	Wastewater	Rain	Etp	Kc	Kc			
Jan	90.77	64.2	247	0.78	0.7	28.9	77.8	-15.9
Feb	85.75	1	221.7	0.84	0.85	27.9	84.8	-27.0
Mar	90.77	40.5	186.5	0.94	0.85	26.3	71.3	-6.9
Apr	50.76	5.3	125.3	1.17	0.7	22.0	39.5	-10.7
May	13.27	49.6	61.5	1.21	0.4	11.2	11.1	-9.0
June	13.26	20.5	48.9	1.15	0.6	8.4	13.2	-8.4
July	13.27	27.2	51.9	1.13	0.7	8.8	16.3	-11.9
Aug	13.27	56	74.4	1.33	0.8	14.8	26.8	-28.4
Sept	13.26	31.8	124.3	1.33	0.8	24.8	44.7	-56.3
Oct	13.27	30.5	176.1	1.26	0.6	33.3	47.5	-67.6
Nov	13.26	16.7	247.4	0.99	0.4	36.7	44.5	-68.0
Dec	13.27	9.8	267	0.83	0.5	33.2	60.1	-80.0
Total	424.18	353.1	1832			276.4	537.7	-390.0


WASTEWATER FLOW vs CROP WATER USE
140
120
100
80
60
40
20
0
Megalitres
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Months
Wastewater Flow (ML)
Plant Water Use (Crop & Woodlot) (ML)

ATTACHMENT 3

BORE_ID	Sp54	Jn55	Jn56	Jn57	Jn58	Jn59	Jn60	Jn61	Jn62	Jn63	Jn64	Jn65	Jn66	Jn67	Jn68	Jn69
G145	0.00	7.38	7.35	4.89	2.72	2.74	1.94	2.86	2.26	1.96	1.75	2.39	2.17	2.06	2.10	1.77
G1339									1.70	0.89	1.26	1.88	1.66	1.50	1.55	1.22
G1697											1.50	1.18	1.17	1.32	0.94	0.98
G1698											1.78	1.83	2.03	1.93	1.86	1.55
G1706											1.55	1.48	1.45	1.22	0.91	0.98
G1707											1.28	1.62	1.51	1.40	1.10	1.07
G1708											1.40	1.60	1.52	1.35	1.10	1.04
G1711											1.94	1.88	1.74	1.85	1.55	1.37
G1712											1.65	1.62	1.50	1.47	1.16	1.04
G1718											1.27	1.85	1.66	1.52	1.43	1.28
G1730											1.24	1.66	1.65	1.35	1.28	1.25
G1731											1.65	1.60	1.62	1.58	1.25	1.22
G1732											1.78	1.91	2.13	1.98	2.47	2.35
G1774												1.78	1.69	1.70	1.77	1.43
G2811																
G2841																
G3225																
G3226																
G3231																
G3233																
G3234																

ATTACHMENT 3

BORE ID	Jn70	Sp71	Sp72	Sp73	Sp74	Sp75	Sp76	Sp77	Sp78	Sp79	Ma80	Sp80	Ma81	Sp81	Ma82	Sp82
G145	1.65	2.26	2.01	1.5	1.56	2.2	1.91	1.8	1.45	1.48	1.35	1.82	1.29	1.58	1.65	2.05
G1339	1.16	1.71	1.43	0.84	0.99	1.45	1.43	1.2	0.85	1.25	0.75	1.17	0.47	0.99	1.15	1.28
G1697	0.76	1.31	1.49	0.57	0.52	1.3	1.45	1.52	0.33	0.94	0.86	1.05	0.21	0.33	0.8	1.07
G1698	1.43	2.04	2.44	1.35	1.24	2	1.95	2.24	1.04	1.2	1.48	1.83	1.06	0.97	1.39	1.99
G1706	0.98	1.37	1.49	0.38	0.45	1.3	1.25	1.16	0.55	1.35	0.39	0.67	0.5	0.39	0.4	1.19
G1707	0.85	1.28	1.31	0.43	0.64	1.22	1.31	1.28	0.56	0.8	0.55	1.12	0.67	0.79	0.4	1.45
G1708	0.88	1.31	1.31	0.45	0.66	1.34	1.17	1.09	0.57	0.8	0.54	1.15	0.6	0.82	0.43	1.48
G1711	1.37	1.92	2.07	1.2	1.22	1.88	2.06	1.86	0.93	1.37	1.03	1.55	0.78	0.86	1.38	1.74
G1712	0.98	1.58	1.68	0.66	0.71	1.42	1.55	1.55	0.57	0.85	0.78	1.13	0.45	0.58	0.67	1.39
G1718	1.10	1.71	1.43	0.91	1.02	1.45	1.31	1.33	1.15	1.9	0.85	1.25	0.85	1.08	1	1.55
G1730	1.10	1.55	1.28	0.55	0.89	1.32	1.45	1.27	0.76	0.9	0.82	1.1	0.51	0.78	1.07	1.32
G1731	1.04	1.62	1.77	0.8	0.72	1.53	1.73	1.54	0.57	1.24	0.92	1.28	0.56	0.58	0.93	1.4
G1732	2.01	2.26	2.44	1.59	1.5	2.23	2.33	2.3	1.2	2.58	2.4	2.65	0.75	0.7	1.9	1.95
G1774	1.25	1.89	1.68	1.15	1.14	1.75	1.58	1.45	1.05	1.55	1.05	1.48	0.95	1.25	1.35	1.78
G2811					0	1.35	1.55	1.33	0.55	1.53	0.47	1.22	0.9	0.8	1.06	1.67
G2841					0	1.3	1.83	1.55	0.62	1.15	0.9	1.28	0.5	0.7	1.25	1.53
G3225					0	0	0	0	0	0	0	0	0	0	0	1.22
G3226					0	0	0	0	0	0	0	0	0	0	0	1.38
G3231					0	0	0	0	0	0	0	0	0	0	0	1.29
G3233					0	0	0	0	0	0	0	0	0	0	0	1.5
G3234					0	0	0	0	0	0	0	0	0	0	0	1.65

ATTACHMENT 3

BORE ID	Ma83	Sp83	Ma84	Sp84	Ma85	Sp85	Ma86	Sp86	Ma87	Sp87	Ma88	Sp88	Ma89	Sp89	Ma90	Sp90
G145	1.75	1.46	1.12	1.62	1.66	2.17	1.6	1.81	1.5	1.61	1.35	1.21	1.38	0.91	1.35	1.03
G1339	1.2	0.68	0.39	0.95	1.25	1.62	1.08	1.26	0.82	0.96	0.76	0.48	0.6	0.3	0.69	1.09
G1697	1.02	0.43	0.1	0.64	0.64	1.3	0.95	1.15	0.47	0.96	0.61	0.51	1.14	0.28	0.27	0.33
G1698	1.47	1.24	1.34	1.75	1.45	1.88	1.4	1.63	1.53	1.52	1.8	1.2	1.88	1.25	1.4	1.03
G1706	0.4	0.16	0.57	0.76	0.95	1.3	0.2	0.62	0.75	0.75	0.95	0.6	0.2	0.23	0.28	0.29
G1707	0.77	0.42	0.41	0.78	0.48	1.38	0.79	1.04	0.65	0.77	0.35	0.69	1.11	0.36	0.39	0.42
G1708	0.4	0	0.61	0.77	0.59	1.27	0.42	0.78	0.85	0.75	0.41	0.63	0.76	0.28	0.31	0.32
G1711	1.13	0.83	0.77	1.28	1.09	1.97	1.29	1.62	1.25	1.46	0.88	1.12	1.8	0.76	0.78	0.52
G1712	0.68	0.38	0.44	0.99	0.66	1.46	0.93	1.05	0.76	0.94	0.37	0.65	1.1	0.4	0.24	0.5
G1718	1.74	1.26	0	1.57	0	2.16	1.68	1.88	1.58	1.53	0	1.36		1.05	1.49	1.1
G1730	0.89	0.62	0.72	1.1	0.82	1.51	0.8	1.14	1	0.96	0.53	0.81	0.82	0.46	0.76	0.57
G1731	1.08	0.52	0.47	0.95	0.93	1.56	1	1.3	0.83	1.15	0.9	0.86	1.07	0.62	0.68	0.64
G1732	1.9	1.9	0.81	1.99	2.01	3.15	1.47	2.31	3	2.84	1.62	1.21	2.06	1.43	1.54	1.7
G1774	1.45	1.16	0.74	1.26	1.34	1.84	1.33	1.57	1.15	1.26	1.05	0.83	1.06	0.61	1.02	0.74
G2811	0.8	0.72	0.88	1.21	0.97	1.27	0.5	0.89	0.86	0.77	0.58	0.5	0.64	0	0	0
G2841	1.1	0.68	0.48	1.02	0.8	1.73	1.16	1.45	1	1.29	0.8	0.85	1.57	0	0	0
G3225	0.45	0	0.33	0.72	0.59	1.32	0.4	0.86	0.5	0.15	0.37	0.65	0	0	0	0
G3226	0.41	0	0.66	0.88	0.92	1.28	0.48	0.8	0	0.82	0.7	0.75	0	0	0	0
G3231	1.5	0	0.44	0.82	0.71	1.38	0.5	0.94	0.6	0.86	0.5	0.71	0.7	0	0	0
G3233	0.85	0.48	0.5	0.97	0.73	1.54	0.47	1.19	0.88	1.04	0.36	0.55	1.24	0	0	0
G3234	1.2	0.66	0.59	1.09	0.73	1.7	0.44	1.08	0.73	0.89	0.15	0.66	1.32	0	0	0

ATTACHMENT 3

BORE ID	Ma91	Sp91	Ma92	Sp92	Ma93	Sp93	Ma94	Sp94	Ma95	Sp95	Ma96	Sp96
G145	1.46	1.97	1.55	1.97	1.28	1.62	1.27				0	0
G1339	1.35	1.92	1.46	1.57	0.85	1.35	0.84					
G1697	1.21	1.3	0.23	0.98	0.93	0.83	0.25					
G1698	2.02	2.15	2.23	2.24	1.93	1.93	1.88					
G1706	1.47	1.46	0.11	0.7	0.49	0.24	0.38					
G1707	0.75	1.45	0.55	1.06	0.84	0.95	0.44					
G1708		1.4	0.45	0.9	0.7	0.83						
G1711	1.62	1.77	0.73	1.56	1.39	1.44	0.85					
G1712	1.33	1.6	0.37	1.07	1.1	1						
G1718	1.53	1.98		1.95	1.5	1.62						
G1730	0.7	1.33	0.84	1.25	0.86	1.06	0.45					
G1731	1.45	1.63	0.57	1.26	1.05	1.02	0.65					
G1732	1.83	2.45	1.81	2.62	2.68	3.5	2.24	3.24	2.5	2.84	2.7	3.5
G1774	1.19	1.65	1.25	1.66	1.28	1.29	0.98					
G2811	0	0	0	0								
G2841	0	0	0	0								
G3225	0	0	0	0								
G3226	0	0	0	0								
G3231	0	0	0	0								
G3233	0	0	0	0								
G3234	0	0	0	0								

APPENDIX I

Baseline Soil and Groundwater Testing by Coffey Geosciences Pty Ltd

AWL6615/1 AE:MH
27 June, 2000

Parle Foods Pty Ltd
Farm 1059
GRIFFITH NSW 2680

Attention: Mr Anthony Parle

Dear Sir,

RE: BASE LINE SOIL AND GROUNDWATER DATA, PARLE FOODS PTY LTD, PROPOSED FOOD PROCESSING PLANT, FARM 1059, WILLBRIGGIE, NSW

To establish base line data in respect to existing soil and groundwater conditions at the above site Coffey Geosciences Pty Ltd carried out the following investigation work during March 2000:

- Four (4) groundwater monitoring wells were established around the perimeter of the site to enable the level of the groundwater to be recorded and samples of the groundwater to be sampled and tested to establish water quality parameters;
- Disturbed soil samples were taken from a total of thirty three (33) locations over the property at depths of 0.0 to 0.1m and 0.3 to 0.4m. The samples were then combined into a number of composite samples and tested to establish the chemical composition:
- Surface infiltration tests were performed at three locations within the property to provide guideline values;
- Subsurface porcolation tests were carried out adjacent to the above surface infiltration tests to establish the permeability characteristics of the sub soils.

A sketch showing the sampling and testing locations is enclosed as Figure A.

The results of the analytical testing are enclosed with this report.

Unit 1/151 Wytarra Drive
North Albury NSW 2640 Australia
PO Box 803 Albury NSW 2640 Australia
Telephone +61 2 **6040 3847**
Facsimile +61 2 6040 3861
Email albury@coffey.com.au

Groundwater and Soil Sampling and Testing Legend

Soils (Sampled by Coffeys on 16 and 17 March, 2000)

Three locations in each designated paddock area were sampled at depths of 0.0 to 0.1 and 0.3 to 0.4m. The samples were then composited, labelled and submitted for testing to Riverina Laboratories as shown below.

Paddock Number	Depth (m)	Coffey Sample No.	Riverina Laboratories Sample No.	Analysis
1, 4, 7	0.0 – 0.1	200255	0301	Exchangeable, Na, K, Ca, Mg, Available P, Total P, Nitrate N, TKN, pH, Ec, TOC
2, 5, 6	0.0 – 0.1	200256	0302	
3, 9, 12	0.0 – 0.1	200257	0303	
8, 11	0.0 – 0.1	200258	0304	
1, 4, 7	0.3 – 0.4	200259	0305	
2, 5, 6	0.3 – 0.4	200260	0306	
3, 9, 12	0.3 – 0.4	200261	0307	
8, 11	0.3 – 0.4	200262	0308	
1	0.3 – 0.4	200263	0309	Emerson Aggregate Stability Class Clay Dispersion %
2	0.3 – 0.4	200264	0310	
3	0.3 – 0.4	200265	3311	

Groundwater (Sampled by Coffeys on 29 March, 2000)

Location	Groundwater Depth 29/3/00	Coffey Sample No.	Riverina Laboratories Sample No.	Analysis
BH1	1.60m	200278	0349	pH, Ec, TSS, Total P, TKN, Nitrate N, BOD and TDS
BH2	1.75m	200279	0350	
BH3	2.05m	200280	0351	
BH4	0.75m	200281	0352	

Infiltration Tests

Location	Surface Infiltration	Percolate Rate
P1	2mm per hour	0.05m per day
P2	10mm per hour	0.06m per day
P3	7mm per hour	0.05m per day

The above testing was carried out by Coffeys on 17 March, 2000.

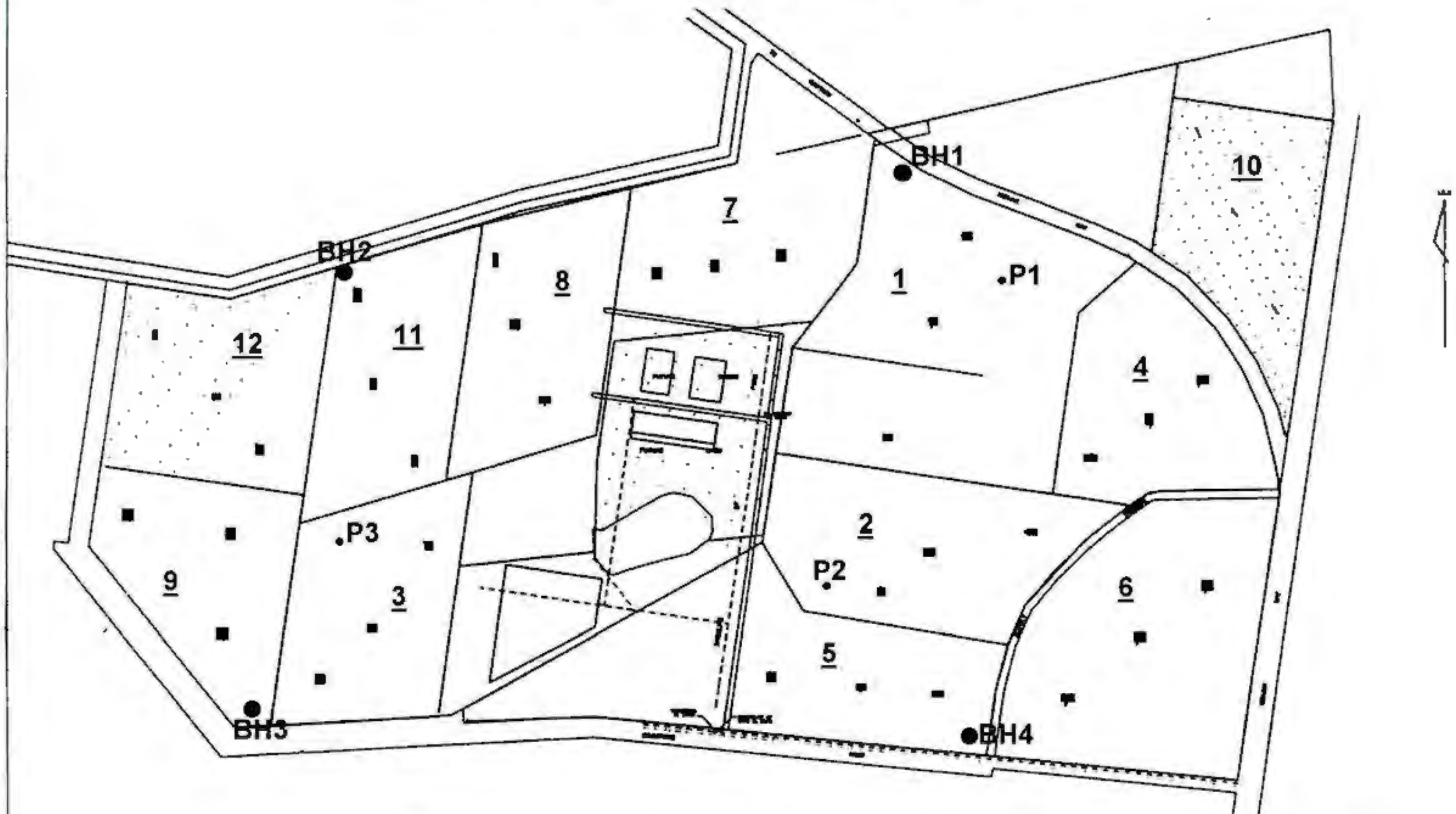
The infiltration tests were performed using the double ring infiltrometer method in accordance with ASTM D3385-75.

The percolation tests were performed in accordance with the method described in AS1547-1994, Appendix B, Procedure B4 and Calculation Method B5.1.

For and on behalf of
COFFEY GEOSCIENCES PTY LTD

A P EDWARDS
MANAGER

BASE LINE DATA SAMPLING PLAN



- • P1 Denotes approximate location and designated number of permeability and infiltration test
- 1 Denotes designated paddock number for the purpose of soil sampling
- ▪ Denotes location where soils were sampled at depths of 0.0 to 0.1m and 0.3 to 0.4m in each paddock
- ●BH1 Denotes location and designated number of groundwater monitoring well

Coffey Geosciences Pty Ltd

Geotechnical | Resources | Environmental | Technical | Project Management

Drawn	MH	PARLE FOODS PTY LTD BASE LINE SOIL AND GROUNDWATER DATA PROPOSED FOOD PROCESSING PLANT FARM 1059, WILLBRIGGIE, NSW	Drawing no: FIGURE A
Approved	AE		
Date	27/06/2000		
Scale	N.T.S		Job no: AWL6615/1

Coffey

RIVERINA LABORATORIES

95 Urana Road, Jindera
P.O. Box 59,
Jindera NSW 2642
Telephone (02) 6026 3666
Fax (02) 6026 3696

Chemical Testing and Consultation for Agriculture, Industry and Environment

LABORATORY REPORT

PAGE No

REPORT No.:00/201
DATE: 10/4/00

CLIENT: Coffey Geosciences P/L
PO Box 803
Albury 2640

ORDER No. / REFERENCE: AWL 6615/1 / 0309 to 0311

SAMPLE DESCRIPTION: Three Soils

DATE RECEIVED: 23/3/00

METHOD: Aust.Lab.Handbook of Soil Chemical Methods & N.S.W. Dept. of Ag.

RESULTS FOR 0309 to 0311

Tests	0309	0310	0311
Emmerson Aggregate Stability Class	5 (Stable)	3(1) (Stable)	3(1) (Stable)
Clay Dispersion %	9.7 (Low)	4.6 (Low)	3.7 (Low)

0309 - Soil 200263
0310 - Soil 200264
0311 - Soil 200265

CHEMIST FORWARDING RESULTS DATE 11 /4 /00

MANAGER PAUL WAREHAM BSC. SYDNEY UNI. DATE 11 /4 /00

RIVERINA LABORATORIES

95 Urana Road, Jindera
P.O. Box 59,
Jindera NSW 2642
Telephone (02) 6026 3666
Fax (02) 6026 3696

Chemical Testing and Consultation for Agriculture, Industry and Environment

LABORATORY REPORT

PAGE No

REPORT No.:00/196
DATE: 7/4/00

CLIENT: Coffey Geosciences
PO Box 603
Albury NSW 2640

ORDER No. / REFERENCE: AWL 6615 / 0349 to 0352

SAMPLE DESCRIPTION: Four Bore Waters

DATE RECEIVED: 30/3/00

METHOD: APHA 17th. EDIT.

RESULTS FOR SAMPLE No. 0349 to to 0352

Tests	0349	0350	0351	0352
pH	7.6	7.2	7.1	7.4
E.C. uS/cm	1,550	15,430	13,330	8,330
T.S.S. mg/l	1,039	10,338	8,931	5,581
Total P mg/l	<0.01	0.05	<0.01	0.05
TKN mg/l	1.1	1.1	0.8	<0.1
Nitrate - N mg/l	2	3	12	8
BOD mg/l	6	5	5	5
TDS mg/l	1,160	6,784	7,356	4,282

0349 - Water 200278 BH1
0350 - Water 200279 BH2
0351 - Water 200280 BH3
0352 - Water 200281 BH4

CHEMIST FORWARDING RESULTS DATE 7 /4 /00

MANAGER PAUL WAREHAM BSC. SYDNEY UNI. DATE 7 /4 /00

RIVERINA LABORATORIES

95 Urana Road, Jindera
P.O. Box 59,
Jindera NSW 2642
Telephone (02) 6026 3666
Fax (02) 6026 3696

Chemical Testing and Consultation for Agriculture, Industry and Environment

LABORATORY REPORT

REPORT No.:00/178
DATE: 29/3/00

CLIENT: Coffey Geosciences P/L
151 Wytarra Drive
Nth.Albury,2641

ORDER No. / REFERENCE: AWL 6615/1 / 301 to 308

SAMPLE DESCRIPTION: Eight Soils

DATE RECEIVED: 23/3/00

METHOD: Aust.Lab.Handbook of Soil & Water Chem. Methods.

RESULTS FOR 301 to 308

Tests	0301	0302	0303	0304	0305
pH (water)	6.0	6.9	6.8	6.5	7.4
E.C. dS/m	0.25	0.28	0.28	0.28	0.49
Avail.P (Olsen)mg/kg	23	20	8	12	3
Tot.P mg/kg	236	208	144	180	70
TKN %	0.12	0.11	0.15	0.14	0.04
Nitrate mg/kg	300	200	160	300	1
Exch. Na mg/kg	525	473	805	704	877
Exch.K mg/kg	570	513	334	427	455
Exch.Ca mg/kg	2,463	3,299	3,369	2,895	5,543
Exch.Mg mg/kg	778	466	1,072	998	1,447
Tot.Org.C %	1.6	1.2	1.9	1.7	0.4

0301 - Soil 200255
0302 - Soil 200256
0303 - Soil 200257
0304 - Soil 200258
0305 - Soil 200259

CHEMIST FORWARDING RESULTS DATE 29 /3 /00

MANAGER PAUL WAREHAM BSC. SYDNEY UNI. DATE 29 /3 /00

RIVERINA LABORATORIES

95 Urana Road, Jindera
P.O. Box 59,
Jindera NSW 2642
Telephone (02) 6026 3666
Fax (02) 6026 3696

Chemical Testing and Consultation for Agriculture, Industry and Environment

LABORATORY REPORT

PAGE No

REPORT No.:00/178
DATE: 31/3/00

CLIENT: Coffey Geosciences P/L
151 Wytarra Drive
Nth.Albury,2641

ORDER No. / REFERENCE: AWL 6615/1 / 301 to 308

SAMPLE DESCRIPTION: Eight Soils

DATE RECEIVED: 23/3/00

METHOD: Aust.Lab.Handbook of Soil & Water Chem. Methods.

RESULTS FOR 301 to 308

Tests	0306	0307	0308
pH (water)	7.7	7.5	7.4
E.C. dS/m	0.37	1.51	1.06
Avail.P (Olsen)mg/kg	3	2	4
Tot.P mg/kg	88	52	88
TKN %	0.03	0.03	0.04
Nitrate mg/kg	125	1	1
Exch. Na mg/kg	815	1,991	1,194
Exch.K mg/kg	279	266	265
Exch.Ca mg/kg	4,230	4,800	3,915
Exch.Mg mg/kg	1,098	1,865	1,429
Tot.Org.C %	0.3	0.4	0.6

0306 - Soil 200260
0307 - Soil 200261
0308 - Soil 200262

P. Ward

CHEMIST FORWARDING RESULTS DATE 31 / 3 /00

P Ward

MANAGER PAUL WAREHAM BSC. SYDNEY UNI. DATE 31 / 3 /00

Coffey Geosciences Pty Ltd ACN 056 335 516

Coffey

Engineering Log - Piezometer

Client:	PARLE FOODS PTY LTD	Borehole No.	BH1
Principal:	PROPOSED FOOD PROCESSING PLANT	Sheet	1 of 1
Project:	FARM 1059, WILLBRIGGIE, NSW	Office Job No.:	AWL6615/1
Borehole Location:	REFER FIGURE 1	Date started:	17.3.2000
		Date completed:	17.3.2000
		Logged by:	RB
		Checked by:	

drill model and mounting:	GEMCO HS7	slope:	-90°	R.L. Surface:	ESL m
hole diameter:	100MM	bearing:	-	datum:	NOT MEASURED

drilling information / **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	well details	RL	depth metres	graphic log	classification symbol	material (soil type: plasticity or particle characteristics, colour, secondary and minor components.)	moisture condition	consistency/ density index	structure and additional observations
ADV		NIL					0		CL	**TOPSOIL: Silty Sandy Clay**; medium plasticity, brown, sand fine to medium grained.	M	F	Rootzone/Topsoil
									CL-CH	**Silty Clay**; medium to high plasticity, red, trace sand fine to coarse grained.		St	Alluvium
							1		CL-CH	**Silty Sandy Clay**; medium to high plasticity, yellow, orange, sand fine to coarse grained.		VSt	
			29/03/2000				2 / 3						
									CL	**Silty Sandy Clay**; medium plasticity, yellow, grey, sand fine to coarse grained, trace gravel fine to coarse grained.	W	St	
							4 / 5						
										Borehole terminated at 5.2m			Piezometer Installed Screen 5.2 - 4.2m Gravel Filter 5.2 - 2.0m Bentonite Plug 2.0 - 0.0m Lockable Steel Cover Installed
							6 / 7 / 8						

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
HA	hand auger
DT	diatube
B	blank bit
V	V bit
T	TC bit

*bit shown by suffix e.g. ADT

support

T timbering N nil
C casing

penetration

1 2 3 4 no resistance ranging to refusal

water

10/1/98 water level on date shown
water inflow
water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm dia
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
V	vane shear (kPa)
P	pressure meter
Bs	bulk sample
R	refusal
E	environmental sample
PID	PID measurement
WS	water sample
PZ	piezometer

classification symbols and soil description

based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
Wl	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

Revision A

PIEZOMETER A6615.GPJ COFFEY.GDT 13.06.00

Coffey Geosciences Pty Ltd ACN 056 335 516

Coffey

Engineering Log - Piezometer

Client:	PARLE FOODS PTY LTD	Borehole No.	BH2
Principal:	PROPOSED FOOD PROCESSING PLANT	Sheet	1 of 1
Project:	FARM 1059, WILLBRIGGIE, NSW	Office Job No.:	AWL6615/1
Borehole Location:	REFER FIGURE 1	Date started:	17.3.2000
		Date completed:	17.3.2000
		Logged by:	RB
		Checked by:	

drill model and mounting:	GEMCO HS7	slope:	-90°	R.L. Surface:	ESL m
hole diameter:	100MM	bearing:	-	datum:	NOT MEASURED

drilling information / **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	well details	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	structure and additional observations
ADV		NIL					0		CL-CH	**Silty Clay**; medium to high plasticity, dark grey, trace sand fine to coarse grained.	M	VSt	Rootzone Alluvium
			29/03/2000				1		CH	**Silty Clay**; high plasticity, yellow, light brown, trace sand fine to coarse grained.			
							3		CH	**Silty Clay**; high plasticity, orange, yellow, grey, trace sand fine to coarse grained.	W		
							4		CL	**Silty Sandy Clay**; medium plasticity, yellow, grey, sand fine to coarse grained.	M	H	
							5.1			Borehole terminated at 5.1m			Piezometer Installed Screen 5.1 - 4.1m Gravel Filter 5.1 - 2.0m Bentonite Plug 2.0 - 0.0m Lockable Steel Cover Installed

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
HA	hand auger
DT	diatube
B	blank bit
V	V bit
T	TC bit

*bit shown by suffix e.g. ADT

support

T timbering N nil
C casing

penetration

1 2 3 4 — no resistance ranging to refusal

water

10/1/98 water level on date shown
water inflow
water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm dia
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
V	vane shear (kPa)
P	pressure meter
Bs	bulk sample
R	refusal
E	environmental sample
PID	PID measurement
WS	water sample
PZ	piezometer

classification symbols and soil description

based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
Wl	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

PIEZOMETER A6615.GPJ COFFEY.GDT 13.06.00

Revision A

Coffey Geosciences Pty Ltd ACN 056 335 516

Engineering Log - Piezometer

Client:	PARLE FOODS PTY LTD	Borehole No.	BH3
Principal:	PROPOSED FOOD PROCESSING PLANT	Sheet	1 of 1
Project:	FARM 1059, WILLBRIGGIE, NSW	Office Job No.:	AWL6615/1
Borehole Location:	REFER FIGURE 1	Date started:	17.3.2000
		Date completed:	17.3.2000
		Logged by:	RB
		Checked by:	

Coffey

drill model and mounting: GEMCO HS7 — slope: -90° — R.L. Surface: ESL m

hole diameter: 100MM — bearing: - — datum: NOT MEASURED

method	penetration 1 2 3	support	water	notes samples, tests, etc	well details	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	structure and additional observations
ADV		NIL					0		CL	**TOPSOIL: Silty Sandy Clay;** medium plasticity, brown, sand fine to medium grained.	M	St	Rootzone/Topsoil
									CL-CH	**Silty Clay;** medium to high plasticity, dark brown, trace sand fine to coarse grained.		St VSt	Alluvium
			29/03/2000				1–2						
							2		CH	**Silty Clay;** high plasticity, yellow, grey, trace sand fine to coarse grained.		VSt	
							3						
							4		CH	**Silty Clay;** high plasticity, orange, yellow, grey, trace sand fine to coarse grained, trace gravel fine to coarse grained.			
			►				5		CL	**Silty Sandy Clay;** medium plasticity, yellow, grey, sand fine to coarse grained.	W	St	
							6			Borehole terminated at 6m			Piezometer Installed Screen 6.0 - 5.0m Gravel Filter 6.0 - 3.0m Bentonite Plug 3.0 - 0.0m Lockable Steel Cover Installed
							7						
							8						

method
- AS auger screwing*
- AD auger drilling*
- RR roller/tricone
- W washbore
- CT cable tool
- HA hand auger
- DT diatube
- B blank bit
- V V bit
- T TC bit
- *bit shown by suffix
- e.g. ADT

support
- T timbering
- N nil
- C casing

penetration
1 2 3 4 — no resistance ranging to refusal

water
- 10/1/98 water level on date shown
- water inflow
- water outflow

notes, samples, tests
- U_{50} undisturbed sample 50mm dia
- D disturbed sample
- N standard penetration test (SPT)
- N* SPT - sample recovered
- Nc SPT with solid cone
- V vane shear (kPa)
- P pressure meter
- Bs bulk sample
- R refusal
- E environmental sample
- PID PID measurement
- WS water sample
- PZ piezometer

classification symbols and soil description
based on unified classification system

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- Wl liquid limit

consistency/density index
- VS very soft
- S soft
- F firm
- St stiff
- VSt very stiff
- H hard
- Fb friable
- VL very loose
- L loose
- MD medium dense
- D dense
- VD very dense

PIEZOMETER A6615.GPJ COFFEY.GDT 13.06.00

Revision A

Coffey Geosciences Pty Ltd ACN 056 335 516

Engineering Log - Piezometer

Client:	*PARLE FOODS PTY LTD*	Borehole No.	*BH4*
Principal:	*PROPOSED FOOD PROCESSING PLANT*	Sheet	1 of 1
Project:	*FARM 1059, WILLBRIGGIE, NSW*	Office Job No.:	*AWL6615/1*
Borehole Location:	*REFER FIGURE 1*	Date started:	*17.3.2000*
		Date completed:	*17.3.2000*
		Logged by:	*RB*
		Checked by:	

Coffey

drill model and mounting: GEMCO HS7 — slope: -90° — R.L. Surface: ESL m

hole diameter: 100MM — bearing: - — datum: NOT MEASURED

drilling information / **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	well details	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	structure and additional observations
ADV		NIL	29/03/2000 ▼						CL	**TOPSOIL: Silty Sandy Clay;** low to medium plasticity, orange, sand fine to coarse grained.	M	St	Rootzone/Topsoil
							1, 2, 3		CH	**Silty Clay;** high plasticity, orange, trace sand fine to coarse grained.		VSt	Alluvium
							4		CL	**Silty Sandy Clay;** medium plasticity, orange, sand fine to coarse grained.			
			►				5		CL	**Silty Sandy Clay;** low to medium plasticity, yellow, grey, sand fine to coarse grained.	W	St	
							6, 7, 8			Borehole terminated at 5.8m			Piezometer Installed Screen 5.8 - 4.8m Gravel Filter 5.8 - 2.0m Bentonite Plug 2.0 - 0.0m Lockable Steel Cover Installed

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
HA	hand auger
DT	diatube
B	blank bit
V	V bit
T	TC bit
*bit shown by suffix e.g.	ADT

support

T timbering — N nil

C casing

penetration 1 2 3 4 — no resistance ranging to refusal

water

▼ 10/1/98 water level on date shown

► water inflow

◄ water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm dia
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
V	vane shear (kPa)
P	pressure meter
Bs	bulk sample
R	refusal
E	environmental sample
PID	PID measurement
WS	water sample
PZ	piezometer

classification symbols and soil description

based on unified classification system

moisture

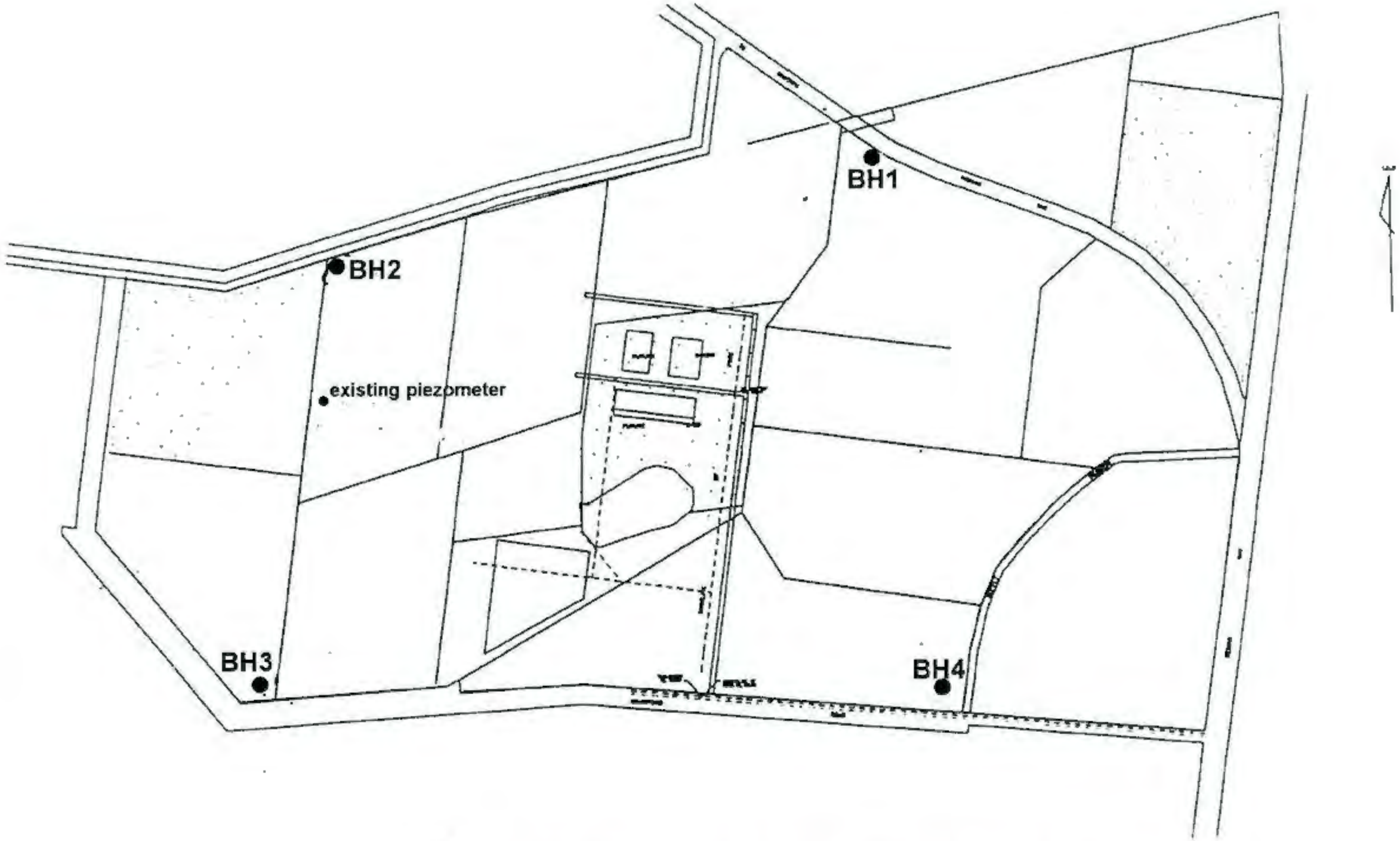
D	dry
M	moist
W	wet
Wp	plastic limit
Wl	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

PIEZOMETER A6615.GPJ COFFEY.GDT 13.06.00

Revision A



● BH1 Denotes approximate location and number of investigation borehole

Coffey Geosciences Pty Ltd ACN 056 335 516		Geotechnical | Resources | Environmental | Technical | Project Management	
Drawn	MH	PARLE FOODS PTY LTD PROPOSED FOOD PROCESSING PLANT FARM 1059, WILLBRIGGIE, NSW	Drawing no: FIGURE 1
Approved	AE		
Date	13/06/2000		
Scale	N.T.S		Job no AWL6615/1

[redacted]

Coffey

PARLE FOODS PTY LTD

ENVIRONMENTAL IMPACT STATEMENT,
PROPOSED FOOD PROCESSING PLANT,
FARM 1059, WILLBRIGGIE, NSW

AWL6615/1-BD

3 August, 2000

Coffey

Form 2

Submission of environmental impact statement (EIS)
prepared under the *Environmental Planning and Assessment Act 1979 Section* 78A(8)

EIS prepared by

name: Tony Edwards
qualifications: Graduate Diploma Environmental Management
Coffey Geosciences Pty Ltd
address: Unit 1, 151 Wytarra Drive
North Albury NSW 2640

in respect of

development application

applicant name: Parle Foods Pty Ltd
applicant address: 644 Mackay Avenue
GRIFFITH NSW 2680

land to be developed: Farm 1059 + Farm 1057, Hanwood

lot no, DP/MPS, vol/fol etc: Lot 77 and Lot 76 DP 751686
CT Folio 77/751686 + 76/751686

proposed development: Construction of vegetable and fruit processing and distribution facility.

or

☐ map(s) attached

environmental impact statement

☑ an environmental impact statement (EIS) is attached

certificate

I certify that I have prepared the contents of this Statement and to the best of my knowledge

- it is in accordance with clauses 54A and 55 of the *Environmental Planning and Assessment Regulation 1994*, and
- it is true in all material particulars and does not, by its presentation or omission of information, materially mislead

signature: [signature]
name: ANTHONY PARLE
date: 15/8/2000

AWL6615/1-BD
3 August, 2000

TABLE OF CONTENTS

LIST OF FIGURES

APPENDICES (Separate Document)

Executive Summary

Parle Foods Pty Ltd wish to establish a new modern high technology fruit and vegetable processing, packaging and distribution facility at a new site in the NSW Murrumbidgee Irrigation Area (MIA) at Willbriggie.

The new plant will enable Parle Foods to process up to 200,000 tonnes of fruit and vegetable produce annually from the growing areas in the MIA. The processed produce will then be canned and packaged for distribution to existing and new markets in both Australia and overseas.

Consideration has been given to the principles of Ecologically Sustainable Development (ESD) and specific measures have been incorporated into the development consistent with these principles:

The site for the proposed development covers an area of about 178 hectares referred to as Farm 1059 at Willbriggie, approximately 10kms to the south of the City of Griffith in central NSW. The site is currently zoned 1(a) RURAL (GENERAL) under the Griffith Local Environmental Plan 1994 and no change of zoning is required.

The site has the following characteristics that make it an ideal location for the proposed development:

- It has a current water use allocation from Murrumbidgee Irrigation and is serviced by a supply channel with water of an appropriate quality;
- It has B double and road train access via Kidman Way (MR351);
- It is centrally located between the main raw product source and the rail freight centre in Griffith through which a lot of the finished product will be deployed;
- A significant area of the site has been laser levelled for flood irrigation;
- The area of the site is sufficient for the plant infrastructure and for the economical disposal of the wastewater by irrigation;
- The site is accessible to the Griffith labourer market on a daily basis;
- The site is sufficiently large and remote to minimise visual, noise and potential odour impacts;
- The current zoning of the land under the Griffith Local Environmental Plan (1994) is appropriate for the development; and
- Natural gas and electricity availability.

Careful consideration has been given to the likely environment consequences of the development relevant to the development approval process. Regard has been given to the requirements of the Environmental Planning and Assessment Regulation, Section 79C of the Environmental Planning and Assessment Act and the requirements of the Director-General.

It is concluded that, having regard to the safeguards incorporated into the development and otherwise proposed, the development will have no significant adverse impact on the environment of the locality.

The consequences of not carrying out the proposed development would be that the project objectives, benefits and elements of sustainability outlined in Section 3 would not be achieved. The proposed development has the following benefits:

- It will eliminate wastewater, odour and traffic impacts at the existing plant in the City of Griffith;
- It will enable the business to expand its NSW presence;
- It will increase Australian export value;
- It will reduce water consumption at the site and improve the appearance and habitat value of the site; and
- It provides a clean, modem industry that complies with principles of ecological sustainability and has no significant adverse environmental impacts resulting from the processes involved.

In justifying the proposal, consideration has been given to the suitability of the site as described above and in Section 2, the environmental impacts considered in Section 6 and the elements of sustainability summarised in Section 3.4. It is considered that the proposal is justified in that:

- The site is appropriate and suitable for the proposed development;
- The objectives of the proposed are satisfied;
- The proposed development will not have any significant environmental impacts;
- The proposed development is consistent with the principles of ecologically sustainable development as set out in Section 3.4 in that:
    - The proposal incorporates current proven technologies with certainty of proven effectiveness. There are no threats of serious or irreversible environmental damage and consequently the development is consistent with the precautionary principle;
    - The proposal serves the needs of the present generation in a manner that does not deprive future generations of a healthy, diverse and productive environment;
    - The proposal is consistent with biodiversity and ecological integrity. It encourages efficiency in fruit and vegetable processing, packaging and distribution, establishes habitat on land previously cleared for irrigation of rice and employs processes that have no significant effect on the environment; and
    - Provides employment and growth opportunities in a regional area of NSW.

Having regard to the matters for consideration under Section 79C of the Environmental Planning and Assessment Act, and the Director General's requirements, it is considered that the proposed development is appropriate and should be approved.

1. INTRODUCTION

1.1 General

Parle Foods Pty Ltd proposes to establish a modern vegetable and fruit processing and distribution facility at Willbriggie in the Murrumbidgee Irrigation Area (MIA) of NSW.

The new facility will process fruit and vegetables from the MIA growing area and then package the finished product for distribution to both domestic and overseas markets.

Fundamentally the fresh fruit and vegetables will be transported to the site after which it will undergo a series of processes including initial preparation, such as de-husking in the case of corn, washing, cooking, dicing, preserving, canning/packaging and despatch.

The facility will represent a major capital investigation for Parle Foods Pty Ltd and will have a significant impact on the local economy in terms of initial construction and long term employment.

The estimated construction cost of the plant is $50 million excluding land costs and the estimated work force that will be employed at the site is one hundred and twenty (120).

1.2 The Applicant

The applicant of the development is Parle Foods Pty Ltd, a privately owned Australian company based in Griffith, NSW.

The company has been in operation in the Griffith area for approximately ten (10) years and currently employs about one hundred and twenty (120) personnel on its two irrigation properties and in its existing food processing plant in Griffith.

1.3 The Product

The plant will process, package and warehouse fruit and vegetables for distribution to domestic and overseas markets.

Produce to be processed at the plant will include:

- Sweet corn;
- Tomatoes;
- Gherkins;
- Capsicums;
- Celery;
- Carrots;
- Rice;
- Onions

The processed produce will be despatched on pallets of packages and cans, 200 litre drums and retail packs.

Distribution of the finished product will be via rail containers to Sydney from the Griffith freight centre and road transport containers to Melbourne and other centres.

1.4 Proposed Development

1.4.1 Summary of the Development

Consent is sought for the following development:

- Construction and operation of a food processing, packaging, freezing, storing and distribution facility;
- Bulk earthworks associated with the construction of a 100ML fresh water storage dam, a 4ML wastewater storage and treatment dam, a 5ML stormwater and reticulation dam and a 4ML ornamental lake which will also serve as a stormwater retention pond;
- Site works including a 4000m² product handling and hardstand area, employee and visitor car parking, *B* double and road train access road from Crawford Road to the plant area;
- Support infrastructure including a weighbridge and administration building;
- Package sewage treatment plants to service amenities for employees and visitors.

The development is described in detail in Section 4.

1.4.2 Designated Development

The Department of Urban Affairs and Planning (DUAP) have advised that the proposed development is designated development under Schedule 3 of the Environmental Planning and Assessment Regulation, 1994, as it involves the processing of more than 30,000 tonnes of produce per annum. Therefore, the proposal is an agricultural produce industry as defined in Schedule 3 of the Environmental Planning and Assessment Regulation:

"**Agricultural produce industries** that process agricultural produce (including dairy products, seeds, fruit, vegetables or other plant material) and:

1. crush, juice, grind, mill or separate more than 30,000 tonnes of produce per annum; or
2. release effluent, sludge or other waste:
    a. in or within 100 metres of a natural water body or wetlands; or
    b. in an area of:
        i. high watertable; or
        ii. highly permeable soils; or
        iii. acid sulphate, sodic or saline soils"

The Environmental Planning and Assessment Act, 1979 (the "EP & A Act") and the Environmental Planning and Assessment Regulation 1994 set down the procedures for designated development, including the preparation of an Environmental Impact Statement to accompany a development application for designated development.

1.4.3 State Significant Development

The Minister for Urban Affairs and Planning has agreed that this proposal be considered as State Significant Development under the provision of State Environmental Planning Policy No. 34 (SEPP 34) – Major Employment Generating Industrial Development.

State Environmental Planning Policy No. 34 – Major Employment Generating Development applies to the proposed development because the proposal:

- Would employ 100 or more persons on a full time basis after the construction stage;
- Has a capital investment value of $20 million of more (excluding land); and
- Is development for the purpose of food and beverage processing.

1.4.4 Integrated Development

The proposed development is integrated development and as such requires approvals under the following acts:

- Protection of the Environment Operations Act 1997 (S43);
- Roads Act 1993 (S.138-2);
- Environmental Planning and Assessment Act (1979);
- Native Vegetation Conservation Act (1997);
- Threatened Species Conservation Act (1995);
- Water Act (1912);
- National Parks and Wildlife Act (1974); and
- Native Title Act (1994).

1.4.5 Other Approvals

In addition to the approvals from integrated approval bodies, other approvals will be required prior to operation of the facility. These include:

- Construction certificate for State Significant Development under the Environmental Planning and Assessment Act;
- Approvals from servicing authorities for connections to services, electricity, gas etc;
- Griffith City Council approval in accordance with the Griffith Local Environmental Plan 1994;

1.5 Consent Authority

The Minister for Urban Affairs and Planning is the consent authority for the proposed development.

1.6 Scope of Environmental Impact Statement

This Environmental Impact Statement (EIS) accompanies a development application for the proposed development.

It has been prepared on behalf of the applicant and includes the matters referred to in Schedule 2 of the Environmental Planning and Assessment Regulation.

The EIS has been prepared having regard to Director Generals requirements obtained by consulting with the Director General as required under clause 55 of the Environmental Planning and Assessment Regulation. These requirements are included in Appendix A.

The Director General has also issued guidelines for the preparation of the environmental impact statement under clause 54 and 54A of the EPA Regulation-1994. These guidelines are also enclosed in Appendix A.

In assessing the impacts of the development, consideration has been given to the provisions of Section 79C of the Environmental Planning and Assessment Act.

2. THE SITE

2.1 Introduction

This section presents a general description of the site and the surrounding environment likely to be effected by the development.

2.2 Logistical Considerations

The site is located on a property approximately 10kms to the south of the City of Griffith. The 178 hectare property is commonly known as Farm 1059, Willbriggie, NSW.

A map showing the site relative to the City of Griffith and Village of Hanwood is enclosed as Figure 1.

Characteristics of the site that are beneficial for this development are:

- It has a current water use allocation from Murrumbidgee Irrigation and is serviced by a supply channel with water of an appropriate quality;
- It has *B* double and road train access via Kidman Way (MR351);
- It is centrally located between the main raw product source and the rail freight centre in Griffith through which a lot of the finished product will be deployed;
- A significant area of the site has been laser levelled for flood irrigation;
- The area of the site is sufficient for the plant infrastructure and for the economical disposal of the wastewater by irrigation;
- The site is accessible to the Griffith labourer market on a daily basis;
- The site is sufficiently large and remote to minimise visual, noise and potential odour impacts;
- The current zoning of the land under the Griffith Local Environmental Plan (1994) is appropriate for the development; and
- Natural gas and electricity availability.

2.3 Surrounding Land Uses

The land surrounding the site is zoned 1(a) Rural (general) under the Griffith L.E.P and is generally used for cropping under irrigation. The adjoining properties to the north of the site are owned by Bartter Enterprises and are operated in conjunction with their chicken and egg production business.

2.4 Access

Access to the site is via Crawford Road which is connected by a *T* intersection to Kidman Way (Main Road 351) which runs between Darlington Point and the City of Griffith. Crawford Road at this stage is an unsealed gravel road.

MR351 is rated for use by *B* double and road train transport and is under the control of the Roads and Traffic Authority, while Crawford Road falls under the control of the Griffith City Council.

2.5 Title Description

The title reference to the property is Lot 77 DP751686, Parish of Kamarooka, County of Cooper.

2.6 Physical Features

2.6.1 Topography

The site has in the past been laser levelled and used for crop production under irrigation. Typical slopes across the site fall between 1:1400 and 1:2000.

The only natural feature on the site was a low lying swamp area which covered approximately 4 hectare near the centre of the site. Some dead remnant vegetation occupied the swampy area.

2.6.2 Geology and Soils

The NSW Department of Mines 1:250,000 *Narrandera* Geological Series Sheet S1-55-10 depicts the site to be underlain by:

> Flood plains of black and red clayey silt, sand and gravel of the Quaternary period.

The soils logged during the geotechnical assessment of the site by Coffeys (report AWL6557/1-25 October 1999) supported the above generalised description and were summarised to comprise:

> Silty sandy clay, silty clay and clay topsoil of low to medium and medium plasticity to 0.2 to 0.5m overlying alluvial silty clays and clays of medium to high and high plasticity to at least 4.0m.

The logs of the soils encountered during the installation of groundwater monitoring piezometers at the site indicated that the above soils extended to depths of at least 6.0m.

2.6.3 Hydrogeology

The depth to groundwater encountered during the installation and subsequent monitoring of the piezometers at the site indicated that the level of the groundwater was between 0.7 and 3.0m below the existing ground surface level.

Given that the site has in the past been used for irrigation and is surrounded by properties that are periodically irrigated it is likely that the level of the groundwater will fluctuate in response to the irrigation activities. It is also notable that the highest level of groundwater was adjacent to the main supply channel in the south eastern corner of the site which is probably indicative of leakage from the channel and localised hydraulic mounding.

The apparent groundwater flow direction is to the north west.

2.6.4 Flora and Fauna

The flora and fauna on the site and in the local area have been investigated by Ettamogah Research Consultants and their report is contained in Appendix F.

The area surveyed encompassed a number of old terraced rice fields and a recently dredged irrigation channel which ran along the North, West and Southern edges of the site. Introduced plant species reached maximum diversity either side of the irrigation channel, where also a number of native Chenopod species were found. Overstorey species were present only along the fence line bordering the site and near a run down shed within the site. These trees consisted of scattered native Eucalypts, Acacias and introduced Willow species. A full flora species list can be found in Appendix 1 of Ettamogah Research Consultants report.

The flora within the site was dominated by tall growing species from the Asteraceae family and includes *Conyza albida, Lactuca serriola, Pichris echiodes, Aster subulatus* and *Cirsium vulgare*. The combination of these plants growing in a thick sward offers very little in the way of habitat for native animals. The structural diversity of the site is very low, consisting of only one stratum. Most avifauna, especially passerines are therefore restricted to the perimeter of the site where nesting animals, roosts and food can be found within the scattered line of trees. Structural and species diversity is greater at the perimeter and reflects this by supporting more birds. More vegetated layers rather than flora species diversity is seen to correlate with a higher bird diversity (Ford 1989; Recher, Lunney & Dunn 1996). Only one species of avifauna was found utilising the heavily infested area, this being a White-fronted Chat. It was likely that the bird was utilising this section of area in association with the large dam recently constructed near the centre of the site.

A total of 20 vertebrae fauna species were recorded in the study area including all species recorded during surveying times and incidental observations. Of these, three were introduced species. The majority of these species found within the study area are relatively tolerant to disturbances. A full species list can be found in Appendix 2 of Ettamogah Research Consultants report.

Additional species have been recorded in the Griffith region as a result of previous studies and database searches (NSW NPWS, Ettamogah Research Consultants and Murrumbidgee Field Naturalists). These records are from an extensive area and although it is possible that some of the more mobile species could be at the subject site on occasions, it is very unlikely that any species would solely rely on the resources provided by the site for their continued existence. This conclusion is to the fact that less disturbed habitat within the region of study area is available and more than ample landscape replicates of the resources offered by the study area are also available in the immediate region.

None of the flora or fauna species recorded during the survey are considered rare or threatened as listed under the *Threatened Species Act 1995*.

It has been determined by Ettamogah Research Consultants that the proposed development is *"unlikely to have a significant effect on threatened species, populations or ecological communities, or their habitats"*. However the eight factors of Section 5A must be taken into account by the consent or determining authority with considering a development proposal or development application, particularly in administering Sections 78, 79 and 112 of the EP & A Act. A formal section 5A Assessment of Significance, pursuant to the EP & A Act, is therefore not required for this proposal. However, the eight factors in section 5A have been considered with respect to those threatened biota and their habitats that could be present within the study area. The assessment below indicates that the proposed development is *'unlikely'* to impose a *'significant effect'* upon any such biota or their habitats and those species that may have been present or likely to occur within the study area. Therefore a Species Impact Statement is not required.

With respect to s.5A of the Environmental Planning and Assessment Act 1979 and in concurrence with the findings and recommendations of this report:

Part 1. No evidence for the presence of a *'viable local population'* occurring within the study area exists and there is no evidence that any such population in the vicinity of the study area would be resident on or dependent on the resources of the study site for their survival. Consequently, there is no likelihood that the proposed development would render any such populations, if they existed *'at risk of extinction'*.

Part 2. No evidence exists for the presence of *'an endangered population'* occurring within the study area. Consequently, there is no likelihood that the proposed development can be regarded as likely to involve any such populations *'likely to be significantly compromised'* even if individuals of that population use the study area.

Part 3. Given the nature and condition of the site, and the context of the proposed development, the proposal will not involve *'a significant area of known habitat'* for any biota *'being modified or removed'*.

Part 4. Given the location and state of the site, the proposed development will not involve *'an area of known habitat'* becoming *'isolated from currently interconnecting or proximate areas of habitat'*.

Part 5. No *'critical habitat'* as declared within NSW under the register of critical habitat will be affected by the proposed development.

Part 6. Whilst many *'threatened species, population or ecological communities, or their habitats are not adequately represented in conservation reserves or other similar protected areas'*, the proposed subdivision of the site is of no relevance in this regard.

Part 7. The proposed development is not *'of a class of development or activity that is recognised as a threatening process'*, pursuant to the *TSC Act 1995*. Clearing of native vegetation may constitute in some cases a *'threatened process'*. However the proposed development is still not considered a *'threatening process'* since no further clearing of native vegetation of the study site is necessary.

Part 8. No *'threatened species population or ecological community is at the limit of its known distribution'* on or in the vicinity of the study site.

2.6.5 Archaeological

The site has been significantly disturbed by the past laser levelling of the site for irrigation and the construction of irrigation drains and channels.

The Griffith Local Aboriginal Land Council carried out a heritage survey of the site during February 2000 and reported "no evidence of aboriginal artefacts or sites" within the designated site.

A copy of the land council report is enclosed in Appendix C.

2.6.6 Landscape

The site and the surrounding properties are all within the Murrumbidgee Irrigation Area which itself is on an old (quaternary period) flood plain, hence the whole area is relatively flat.

There are no native trees on the site and few on adjoining properties. Some small to medium trees are typically scattered in clumps along the road reserves between properties. Tree growth has typically been discouraged along irrigation channels to prevent root intrusion and to facilitate periodic access to the channels for cleaning.

Trees have also been removed to facilitate aerial spraying of irrigated crops in the area.

As a result of the above landscape horizontal views of building infrastructure is quite extensive.

2.7 Availability of Services

2.7.1 Water and Sewerage

Reticulated water and sewerage services are not available to the site, however the property has access to a Murrumbidgee Irrigation supply channel and has entitlements to draw up to 1084ML of high security and 1260ML of normal security supply from the channel.

It is proposed that package sewage treatment plants will be installed at the site to service the sewage disposal requirements.

2.7.2 Energy

The main source of energy to be used to run the boilers will be natural gas supplied by A.G.L from their main supply line that passes along the north eastern boundary of the site along Kidman Way.

Electricity for the refrigeration units and other plant will be supplied by Great Southern Energy (GSE) from their high voltage lines (33,000V) which also run along the Kidman Way reserve. The power will be transmitted to the site via an underground connection.

2.7.3 Communication

Hardline telephone services are available for connection to the site and the area is within mobile net coverage.

3. OBJECTIVES, SUSTAINABILITY AND ALTERNATIVES

3.1 Objectives

The proposed development has the following objectives:

- The establishment of a modern, high technology fruit and vegetable processing plant to supply product to markets in both Australia and overseas;
- To construct the processing facility as close as practical to the source of fruit and vegetables to reduce transport costs and in an area where a suitable transport network exists for product distribution;
- To establish the facility in an area where future expansion can be carried out;
- To construct a plant that will reliably produce a quality product with minimal waste outputs; and
- To construct a processing, packaging and distribution facility that will be ecologically sustainable.

3.2 Product Demand

The value of current imports of processed capsicum and corn alone is estimated to be at $25 million. The management of Parle Foods estimate that the product from the new plant will effectively replace imports to the domestic market worth $7 to $8 million annually. Additionally, potentially viable export markets for processed fruit and vegetables have been identified in New Zealand, Japan, Korea and other Asian countries which are undergoing economic expansion at a rate that cannot be met by their current processed food suppliers.

3.3 Project Benefits

The proposed development will have the following benefits:

- It is estimated that the new plant will employ an additional one hundred and twenty (120) personnel when the plant reaches full production. The increased employment will present opportunities for personnel in areas such as: processes workers, line supervisors, manager, engineering and administration. Some seasonal spikes or highs in employment are expected on a seasonal basis between February and April, however these are expected to be offset seasonally by employment demand in the fruit and vegetable production fields.

  Based on a commonly accepted ratio of 2.5:1 for indirect employment opportunities that arise as a consequence of a development such as is proposed, up to an additional three hundred (300) jobs could be expected. Typically indirect employment will be generated in the fields of transport, housing, support industries and agriculture.

- The development site has in the past been used for rice production and consequently has water entitlements from Murrumbidgee Irrigation to draw up to 1084 mega litres (ML) of high security and 1260 mega litres of normal security water annually from the existing channel system. It is estimated that the processing plant will draw up to 300 ML annually which will result in a significant conservation of water and will also reduce the hydraulic load on the relatively high water table in the area. In addition to the conservation of water, the wastewater from the plant will be used to irrigate crops and forestry that will be of financial and environmental benefit.

- The new site is significantly closer than the existing plant to the main sources of primary product, Kooba and Bringagee Stations, which will result in reduced transport impacts, reduced traffic congestion in Griffith and reduced noise impacts from both plant and traffic.

- The site, having been laser levelled for irrigation and rice production is essentially void of any native vegetation. The development as proposed will include the planting of native species trees which, among other things will enhance the aesthetics of the area, encourage some biodiversity of the area in terms of flora and fauna and help reduce water infiltration into the already high regional water table.

3.4 Ecologically Sustainable Development

The long term goal of Parle Foods is to develop a facility which will process, package and distribute fruit and vegetable produce which meets the current market demands without compromising sustainability principles.

In general the company is committed to:

- Protection of the natural environments;
- Water conservation;
- Energy conservation;
- Illustrating global standards of environmental responsibility (i.e. greenhouse gàs emissions); and
- Waste minimisation.

3.5 Consideration of Alternatives

3.5.1 Expansion of Existing Facilities

Parle Foods currently processes approximately 14,000 tonnes of fruit and vegetables from its existing facility in McKay Avenue, Griffith, NSW. The plant has been operating at this site for some four (4) years and currently employs up to 110 personnel on a full time and part time basis.

To upgrade and expand the plant on its current site is not considered feasible for a number of reasons:

- Distance from the main source of primary product;
- Vehicular access to the plant from the product growing areas is principally through the Griffith CBD;
- There is no *B* double or road train vehicle access to the plant;
- There are limits to the disposal of wastewater;
- Existing infrastructure is outdated;
- Noise restrictions to twenty four (24) hour operations;
- Insufficient land area;
- Odour complaints; and
- No opportunity to *value add* by irrigation of wastewater onto economically viable crops.

3.5.2 Consequences of Not Carrying Out the Proposal

The consequences of not being able to relocate the plant and expand the enterprise are:

- Inability to meet future contractual requirements in terms of quantity, quality and scheduling;
- Restrictions to employment growth;
- Loss of opportunities for the primary producers of fruit and vegetables in the area;
- Continued congestion of traffic accessing the existing plant;
- Restrictions to operations associated with odour and noise complaints; and
- Difficulty in achieving and implementing ecological sustainability principles.

3.5.3 Justification of the Proposal

In justifying the proposal, consideration has been given to the suitability of the site in terms of the project objectives, alternatives and sustainability as described in Section 3 and the environmental impacts discussed in Section 6. As a result of those considerations we recommend that the proposal is justified in that:

- The site is appropriate and suitable for the type of development;
- The proposed development will not have any significant environmental impacts;
- The proposed development is consistent with the principles of ecologically sustainable development as discussed in Section 3.4 in that the development:
    - Does not pose a threat of serious or irreversible damage to the environment;
    - Serves the needs of the present generation in a manner that is not detrimental to future generations in terms of the health and diversity of the environment;
    - Will reduce the volume of water currently being applied to the site and the consequential hydraulic loading on the groundwater in the area;
    - Will, with the establishment of tree plantations, establish habitat on what is currently a relatively barren site;
    - Reduce environmental impacts associated with the processing systems currently being carried out at Parle Foods existing Griffith plant.

4. DESCRIPTION OF THE PROPOSED DEVELOPMENT

4.1 Development Overview

Consent is sought for the erection of a fruit and vegetable processing, packaging and distribution facility and associated infrastructure on the Willbriggie site.

The location and design of the facility is focussed on being able to process fresh produce within two days of harvesting.

In essence, fresh fruit and vegetables will be transported by road transport to the site from growing areas in the Murrumbidgee Irrigation Area, they will then undergo a variety of processes depending on the type of product prior to being packaged and stored in either a dry store or freezer prior to being despatched by road transport.

Plans showing the infrastructure for which consent is sought are included with this application and include:

- Figure 2 – Schematic layout of the plant and proposed landscaping
- Figure 4 – Plant elevations
- Figure 5 – Process flow diagram
- Figure 6 – Traffic flow – truck deliveries and despatch
- Figure 7 – Forklift traffic flow
- Figure 8 – Pedestrian traffic flow
- Figure 9 – Process flow chart

4.2 Description of the Process

The processing of the fruit and vegetable typically includes:

- Initial preparation such as husking, washing, grading and inspection;
- Intermediate processes will include blanching, cooking, slicing etc;
- Final processing will include packaging, canning and with some product snap freezing.

A typical flow chart is shown in Figure 5.

Product will be despatched from the site in cans packaged in cardboard boxes, retail packs also in cardboard boxes and 200 litre drums. The cans, boxes and drums will be secured onto pallets and handled with fork lift vehicles.

The cans, packaging and drums will be transported to the site by road transport and the packaging materials and pallets will be recyclable and reusable.

4.3 Production Forecasts

It is projected that the proposed food processing plant will, within three (3) years of completion, process up to 200,000 tonnes of locally produced fruit and vegetables per annum. It is estimated that 95% of the primary product will be supplied from within the Murrumbidgee Irrigation Area (MIA) including from *Kooba* and *Bringagee* stations which are located within 20kms of the site at Willbriggie.

Finished product output from the plant when in full production is expected to total 40,000 tonnes per annum.

It is envisaged that most of the transports importing the raw produce will be road trains.

Solid vegetable waste material from the processing plant will be back loaded to Kooba Station for use as cattle fodder and fertilizer.

It is expected that up to 150,000 tonnes of raw product will be delivered to the plant over a three month period between December and March. This will result in peak daily traffic flows of up to thirty eight (38) road trains per twenty four (24) hour day with a peak hourly flow of four to five (4-5) road trains.

Proportionally this would equate to thirty six (36) road trains per day from Kooba Station along Kidman Way and Crawford Road and two (2) road trains per day from the west of Griffith.

Outputs of processed product from the plant is expected to total up to 40,000 tonnes per year and will be despatched in containers transported by semi trailers. Some of the finished product will be transported by truck to Melbourne and southern markets and some will be transhipped via the Griffith Rail Centre to Sydney.

The export of finished product from the site will be relatively constant throughout the year and, based on a five (5) day week, will average about eight (8) trucks per day.

4.4 Product Distribution

Finished product will be dispatched from the site via road transport to Melbourne and Southern outlets and to Sydney and overseas markets via the rail freight terminal in Griffith.

It is expected that 70% of the product will be absorbed into the Australian market and 30% to export.

4.5 Site Works

A geotechnical investigation was carried out at the site by Coffey Geosciences Pty Ltd in October 1999 (refer Coffey report AWL6557/1-AA, 25 October 1999).

In essence the investigation findings were that the:

- Soil conditions were generally uniform over the site;
- There was no significant fill on the site;
- The level of the groundwater below the site was generally between 1.0 and 3.5m;
- The clay soils that underlay the site were generally non dispersive and had a permeability rate of less than 1 x 10^{-11} m/sec when compacted to a relative density of approximately 98% of Standard compaction (AS1289 5.4.1, 5.1.1);
- The site was classified as "Class H" in accordance with AS2870-1996.

The principal earthworks that will be carried out at the site will include:

- The placement of shallow fill beneath the main infrastructure to raise the floor level and improve site drainage. The fill will be won from onsite excavations of stormwater and wastewater storage and treatment dams.
- The construction of access roads and hardstand areas which will again require some minor filling to facilitate drainage;
- The construction of stormwater and wastewater storage and treatment dams. These will be constructed by a combination of excavation below the natural surface level and embankment construction above natural surface level.
- The construction of low (<1m) berms around the wastewater irrigation areas of the site to prevent surface water run-off.

The hardstand areas and access roads will be constructed as flexible gravel pavements and will initially be unsealed.

Bulk earthworks volumes are estimated as follows:

- Topsoil stripping for roads, infrastructure and dams, approximately 30,000m^3;
- Filling below the freezer shed, dry storage shed and processing building, approximately 30,000m^3;
- Excavation volumes for the fresh water storage, wastewater storage and stormwater retention dam, approximately 60,000m^3;
- Embankment construction for the above dams, approximately 10,000m^3;
- Filling below roads and hardstand areas, approximately 6,000m^3;
- Construction of irrigation berms, approximately 4,000m^3.

The earthworks have been designed to achieve a balance of cut and fill. Topsoil stripped from the various infrastructure areas will be used for topdressing and landscaping.

Gravels for the road pavements and sub base layers below building slabs will need to be imported to the site from existing quarries.

The earthworks will be carried out in accordance with the recommendations given in the geotechnical report, which is enclosed in Appendix D.

4.6 Stormwater Management

As stated earlier the site is relatively flat and has in the past been bunded to form a series of flood irrigation paddocks. It is intended to maintain the existing bunding and construct further bunding around the areas where wastewater from the processing plant and sewerage treatment plants will be used for irrigation. The bunding will be designed and constructed to ensure water from the wastewater irrigation area is retained on site under the impact of a 1:100 year storm event.

Stormwater from non irrigated areas, such as run-off from around the plant and access road will be collected in surface drains and directed into the 5ML stormwater retention pond, which will be used as a source of irrigation water during dry periods.

Stormwater run-off of non irrigated areas of the property, not including the above infrastructure areas, will be via the existing drainage channel system operated by Murrumbidgee Irrigation.

4.7 Erosion and Sediment Control

To reduce the effects of wind or water erosion during the site works the following procedures will be implemented:

- Ground surface disturbance will be minimised;
- Disturbed ground surfaces will be top-dressed and vegetated as soon as practical; and
- Construction debris will be removed from site as soon as practical.

If construction is carried out during dry weather periods considerable dust could be generated by construction traffic. To minimise the generation of such dust a water cart will be available for dust suppression.

4.8 Aesthetics

The proponents of the development are keen to improve the aesthetic value of their investment. The site in its undeveloped state is essentially devoid of vegetation other than grass and weeds and is relatively flat.

The development infrastructure has been designed with consideration to its aesthetic value, roof lines of the infrastructure will have curved edges and the main structures will be clad with a pastel blue coloured sheeting.

The perimeter of the property will be planted with a variety of native trees and a tree lot will be established as part of the wastewater disposal system.

It is also proposed to landscape around the wastewater treatment lagoon, the storm water retention lagoon, the fresh water storage and plant infrastructure. Particular attention will be given to landscaping around the ornamental lake to provide amicable surrounds for staff to enjoy their work break periods.

A schematic layout of the proposed landscaping areas is shown on Figure 2.

4.9 Waste Management

4.9.1 Wastewater Disposal

The volume of wastewater output from the processing plant will vary throughout the year in both quantity and quality depending on the processing being undertaken at the time.

Estimates based on extrapolation of data from the existing plant suggest up to 318ML of wastewater will be generated during the January to April processing period and 106ML during the rest of the year.

The nutrient load in the wastewater stream will depend on the type of fruit or vegetable being processed at the time, estimates of the nutrient composition and load have been based on data obtained from the existing Parle processing plant in Griffith and a similar type operation in New Zealand.

The wastewater after processing will be pumped initially via a screening and filtration plant into a treatment lagoon of about 4ML capacity where it will be aerated to reduce the BOD prior to disposal by flood irrigation to a tree lot, crops and pasture on the property. The treatment lagoon will also act as a storage facility during peak storm periods when irrigation will be restricted to prevent surface run-off of wastewater.

The woodlot and tree planting areas will be project managed by Murray Riverina Farm Forestry.

The irrigation areas will be bunded to prevent any surface water run-off during a storm event.

The nearest natural water course to the site is Mirrool Creek at 2.5km to the south and the site has not in the past been effected by any flooding.

In the event of continuous heavy rainfall occurring during the peak production period harvesting of crops on Kooba Station and other resource areas will cease, this will result in a maximum of one days supply being in transit or at the plant before the plant itself would revert to the off peak level of processing that would produce less than 0.5ML/day of wastewater.

The site is not serviceable by a reticulated town sewage scheme and hence onsite package treatment plants will be used and the resultant wastewater will then be irrigated with the processing plant wastewater.

4.9.2 Process Wastes

The majority of solid waste materials from the plant will come from the corn line (husks, cobs) and tomato lines. Minor quantities will come from the gherkin, rice, capsicum, celery, carrot and onion processing.

All solid wastes from raw materials will be collected at the initial processing stage. From the collection points they will be elevated directly into trucks for transport to Kooba Station. Other solid waste materials from the various processing lines (refer to Process Flow Diagram Figure 5) will be collected in bins before being taken and emptied into trucks bound for Kooba Station. Solid waste materials from spillage and equipment wash down will be collected in catch drain screens located along floor drainage lines.

These will also be emptied into bins for transport.

Solid waste materials not collected in the catch drain screens will be flushed through the drainage system and collected in a fine contra-sheer. This screen will collect the materials in a small hopper for cartage to Kooba Station.

All solid waste is proposed to be transported by road to Kooba Station. This will be done utilising the road trains used to cart the raw materials to Parle Foods as the trucks will be returning empty.

Solid wastes transported back to Kooba Station from the proposed processing plant will be used for stock feed either in its raw material form or combined with other products and supplements. The transport, re-use and monitoring of the solid waste feed to stock will be carried out by the management of Kooba Station.

Herbicides and insecticides most commonly used on corn (90% of solid water material) have been investigated (MSDS – Material Safety Data Sheets) for possible chemical residues being passed on in the solid waste stock feed. Of the chemicals used, some have a fourteen day withholding period before they can be harvested or grazed. All the solid material is delivered post harvest and therefore outside the withholding period. Long term residual chemicals are not used in the cropping program.

The solid waste is comprised of vegetative matter and therefore could be composted as a fall back option to stock feed. This would involve considerably more labour and machinery. Composted waste would then be incorporated into the soils on Kooba Station. Although this option is technically feasible it would not easily form part of Kooba Station's current management strategy, however, it has the potential to be a fall back option without causing any environmental effects.

Sludge periodically dredged from the stormwater and wastewater storage and treatment dams will be spread over the irrigation area as fertiliser.

4.9.3 Solid Wastes

Solid wastes other than those from the raw product processing will be disposed of to the Griffith City landfill at Tharbogang by arrangement with the City Council.

4.10 Industrial and Utility Services

4.10.1 Electrical Power

Electrical power for the site will be transmitted from the 33,000kva mains along Kidman Way to the processing site boundary. From here, the lines will run underground to the electrical distribution room located on the eastern side of the cold store. The 33,000kva line will then run to a 500kva transformer at the cold store transformer at the cold store, a 300kva transformer at the dry store, a 150kva transformer on the wastewater dams, a 150kva transformer on the water supply dam and three (3) transformers for the processing plant.

4.10.2 External Lighting

External lighting will comprise low glare full cut off floodlights mounted and on poles around trafficable areas for safe vehicular movement. Task lighting will be provided to pedestrian pathways. External lighting will be designed to meet the requirements of AS4282 "Control of Obtrusive Effects of Outdoor Lighting" and AS/NZS 1158 "Road Lighting" where relevant. Photo sensors will be fitted.

4.10.3 Natural Gas

Natural gas for the powering of the boilers will be fed to the site from the main line along Kidman Way via a 200mm Poly PN80 underground pipe.

4.11 On Site Sewage Treatment and Effluent Reticulation Scheme

4.11.1 Scope

Parle Foods Sewage Treatment System will treat wastewater from the proposed development's employee amenity blocks located around the site. The proposal consists of the following:

- Wastewater Treatment System; and
- Effluent Reticulation to grass and wood lot areas over the Parle Foods development.

4.11.2 Proposed Sewage Treatment System

The proposed Sewage Treatment System will comprise a number of strategically located sewage resource recovery units. These units will be sited at each employee amenity block or administration area. The exact location will be determined by Government regulations and site surroundings. No unit will be located closer than 200 metres from any boundary of the property.

Each treatment system will comprise of two tanks, a minimum of 7,000 litres in capacity. The tank size and number is dependent upon the system demand at the site location. However each system will be sized by the manufacturer with excess capacity to allow for variations in the wastewater stream.

The tanks will be located substantially below ground leaving the tank access lids, control and alarm system above ground. The top of the tanks will be located above flood and storm water levels.

Treatment process

The individual commercial treatment units have been designed as compact, self-contained systems. The treatment process starts with the supply of wastewater via a gravity pipeline from the amenity blocks and laboratory to the treatment tank. The first tank in the process is for primary treatment where the wastewater settles and the sludge accumulates. This tank is baffled creating an environment for anaerobic treatment. The liquid effluent is then gravity fed to a second tank for aeration or secondary treatment. A small low powered 240volt air pump forces air into the effluent for aerobic digestion and treatment before the liquid passes into a second chamber within the tank for clarification and chlorination.

Once chlorinated, the water is pumped to a third tank for storage prior to final filtration and irrigation. This poly storage tank will be above ground along side the irrigation pump and filtration system.

The waste sludge collected in the primary treatment tank will be collected and transferred by road to Griffith Sewage Treatment plant. It is proposed to eventually transfer waste sludge to an onside bioreactor for treatment and harvesting of methane gas for energy generation.

Irrigation runoff caused by a combination of irrigation and high intensity rainfall will be contained within the on farm irrigation system due to bunding around the site and the drainage recirculation system. Irrigation runoff is expected to be minimal, owing to the use of drip irrigation and careful management of the flood system.

Disinfection

Disinfection is achieved through chlorination of the treated effluent. This is done through the use of chlorine tablets located between the clarifier chamber and the storage tank. This chlorination method complies with NSW Health Department Guidelines for effluent irrigation systems.

The chlorine tablets are checked and replaced every 3 months when each unit and the overall system is serviced by a licensed plumber.

Sludge Management

All solids separated from the effluent are collected in the primary treatment tank including activated sludge returned from the clarifier chamber. The tank will allow gravity thickening of the sludge ready for pump out and removal by a contractor every 3 to 5 years.

The thickened sludge will be transported by road to the Griffith Sewage Treatment plant for disposal in the interim period. It is anticipated in the future to install an on site bio-reactor and facultative lagoons to further treat the effluent and sludge for the purpose of harvesting methane gas. The gas would then be used to generate energy for the processing plant and associated infrastructure.

Effluent Re-Use Scheme

Affer effluent clarification and chlorination the raw water is pumped to an above ground 31,000 litre impact resistant UV stabilised polyethylene tank.

This tank will allow 3 days minimum raw water storage in peak summer season and 7 days for the remainder of the year.

A pump and filtration station will be constructed near the tank. Two low-pressure pumps (duty and standby) will provide irrigation flow to selected turf areas, the wood lot and the buffer zone trees around the plant site. Prior to drip or spray irrigation the raw water will be filtered to 125 micron as a back up to protect irrigation emitters from blockage.

The pump and filtration station will be operated by an automatic control system, allowing pre-programmed operation of the irrigation system at night. Back-flushing of the filters will also be controlled by the automatic system with back-flush water to be returned to the storage tank.

The irrigation system will distribute the effluent/raw water through a series of UPVC mains, sub mains and valves to trees and turf areas around the proposed site. The wood lot and buffer zone trees will be drip irrigated with integral drippers inserted internally of the polyethylene tubing at equal spacing along the tube. The tube will be laid on the surface for ease of maintenance with one line of dripper tube per tree row.

The turf areas will be irrigated with sprinklers either pop-up or fixed units. These will also operate predominantly at night on timer or irrigation controller.

All areas will be irrigated approaching but not exceeding plant evapotranspiration. This will avoid runoff and over irrigation.

Safety Measures and Instrumentation

The individual sewage treatment systems or the resource recovery units will have control circuitry. This is fully pre-programmed for automatic operation and requires no adjustment by the operators. The systems incorporate overload cut-off circuit breaker and an alarm for aerator and irrigation pump failure (pump for transfer of wastewater from treatment tank to irrigation storage tank).

The alarm will be located in the nearest adjoining building with the future possibility of joining them to a centrally located control panel.

All pumps and equipment will be housed in fully enclosed structures to avoid unauthorised access and added site noise.

4.11.3 Statutory Approvals

The proposed sewage treatments systems meet and exceed the requirements of all statutory bodies including Department of Health, Environmental Protection Agency (EPA), Standards Australia (AS1546 on the tanks) local councils and electrical supply authorities.

4.11.4 Operation and Maintenance

The treatment systems will operate well below their maximum wastewater flow conditions. It is not anticipated that the requirements of the processing plant and associated structures will have substantially increased growth in the near future therefore sustaining the existing excess in system capacity. Future growth will be met by adding treatment units to the existing modular system.

Maintenance and routine service is carried out every 3 months by trained technicians as part of an ongoing service contract with the supplier of the units. This routine service will check and maintain the disinfection system and assist in sludge management.

4.11.5 Energy Requirements

The proposed activated sludge process is energy efficient. All units require low current 240volt power supply excluding the irrigation pump. This pump requires 3 phase power. The power will be supplied by Great Southern Energy.

4.11.6 Construction

The Sewage Treatment System units are pre-fabricated and delivered to the site assembled ready to be installed, connected and commissioned. The units will be installed as the site is developed and buildings constructed. Installation will require the use of excavator and trenching equipment.

4.12 Water Supply

4.12.1 General

The water supply for the processing plant, site buildings and administration block will be provided by Murrumbidgee Irrigation through their existing channel system.

The site comprises Farms 1057 and 1059 with water entitlements of 1084 megalitres high security and 1260 megalitres normal security respectively. This water is available in an average year from September through to the end of May. During the winter months of June, July and August, Murrumbidgee Irrigation (MI) supply channels are emptied for maintenance works.

4.12.2 Storage dam

A 110 megalitre storage dam has therefore been constructed on the southern portion of the site to store fresh water for use during winter and as a buffer for supply during the summer season. This storage dam will be supplied from MI lateral 263.

80 megalitres of the possible 110 will be supplied under gravity through a pipeline under Crawford Road.

The remaining 30 megalitres will be pumped from the supply channel into the dam. A one-way or non-return valve will prevent water from the dam flowing back into the channel, particularly when full.

The water will be supplied under the normal operating conditions of MI. A storage capacity of 110 megalitres will provide approximately 30 days supply in summer without inflow or 200 days in winter without inflow. The bulk of processing is carried out during summer months hence the low winter water demand.

The dam will be constructed in accordance with the geotechnical recommendations provided in Coffey's report AWL6557/1 in Appendix D.

4.12.3 Raw & Potable Water

An electric pump and filtration station with backup generators will be located on the dam wall. This unit will filter a total of 3 megalitres per day of water for the site. 2.5 megalitres of raw water filtered down to 20 micron followed by chlorination and/or UV disinfection and 0.5 megalitres filtered further before chlorination and/or UV treatment to meet World Health Organisation and NHMRC Potable Water standards.

The potable water will then be stored in a tank of 500,000 litres capacity allowing buffer for equipment malfunction or breakdown. A tank of this capacity will provide storage for 24 hours water use in peak season and substantially more during winter months.

A multiple pump, pumping station will be located at the tank to distribute the pressurised water through a UPVC pipeline around the site. Copper branch lines will take the water from the main into the processing plant and buildings. The mainline and branch lines will have isolation valves for maintenance and breakdown.

The raw water supply will be taken directly from the initial pump station at the dam and transported through a separate UPVC pipeline around the site. Copper will also be used to connect between the mainline and the buildings with isolation the same as previously mentioned.

The various water supply pipelines running into the building will be coloured as per Australian Standards to identify the water quality contained within.

The potable water will primarily be used where water comes into contact with food product and for the boilers, with the remaining quantity used for drinking and in amenity blocks.

Raw water will be used for floor washdown, cooling towers and initial cleaning of raw food products. This supply source will also be used for fire services.

4.12.4 Fire Services

A minimum amount of 300,000 litres in the storage dam is dedicated for fire protection purposes. This water and all other required for fire fighting purposes will be pumped through the raw water system to hydrants and hoses. This system utilizes UPVC mains fed by multiple pumps with backup generators.

The raw water system will have proposed flow rate of 30 litres per second @ 600 kPa, well in excess of the minimum flow rate and pressure required for fire services.

Fire services throughout the site will comply with the requirements of NSW Fire Brigade and Rural Fire Services and relevant codes such as AS2419.1 - Fire hydrant installations and AS1221 – Fire hose reels. Once complete the site will be inspected by an independent body to certify compliance with the Building Code of Australia and the relevant standards. Discussions are currently in progress with NSW Fire Brigade Fire Safety section to meet these requirements.

4.13 Wastewater Storage

4.13.1 General

The wastewater storage dam has been designed with sufficient capacity (4megalitres) to cater for at least 1.5 days of full production output. This capacity will provide a buffer between cessation of irrigation due to storm events or breakdown and a shut down of the process line.

4.13.2 Wastewater System

The wastewater from the processing plant will be collected in a series of drains and then pumped through a 'Contra-Sheer' screen filter to the dam. The filter will remove particulate matter down to approximately 1mm in size.

The wastewater in the dam will be continually aerated to maintain the waste in an aerobic condition, which will minimise potential odour impacts prior to the wastewater being pumped to the designated irrigation area.

4.13.3 Wastewater Dam

The wastewater storage will be constructed by a combination and balance of cut and fill earthworks. The level of the groundwater in the area will restrict the depth of the dam to no more than 1.0m below the existing ground surface level.

Initially, the base and sides of the storage will be over excavated by a thickness of at least 0.9m to allow for the construction of a compacted clay liner to protect the groundwater from wastewater interaction. The clay liner will have an insitu coefficient of permeability of less than 1 x 10^{-9} m/sec (refer NSW EPA Environmental Guidelines: Solid Waste Landfills).

During the initial geotechnical assessment of the site by Coffeys a sample of the typical silty clay of high plasticity was tested for its dispersive and permeability characteristics. Based on the results of that testing it is anticipated that the clay soils at the site will meet the requirements for a wastewater storage liner (refer Coffey report AWL6557/1) Appendix D.

4.14 Solid Waste Management

4.14.1 Process Wastes

The majority of solid waste materials from the plant will come from the corn line (husks, cobs) and tomato lines. Minor quantities will come from the gherkin, rice, capsicum, celery, carrot and onion processing.

All solid wastes from raw materials will be collected at the initial processing stage. From the collection points they will be elevated directly into trucks for transport to Kooba Station. Other solid waste materials from the various processing lines (refer to Process Flow Diagram Figure 5) will be collected in bins before being taken and emptied into trucks bound for Kooba Station. Solid waste materials from spillage and equipment wash down will be collected in catch drain screens located along floor drainage lines. These will also be emptied into bins for transport.

Solid waste materials not collected in the catch drain screens will be flushed through the drainage system and collected in a fine contra-sheer screen. This screen will collect the materials in a small hopper for cartage to Kooba Station.

All solid waste is proposed to be transported by road to Kooba Station. This will be done utilising the road trains used to cart the raw materials to Parle Foods as the trucks will be returning empty.

Solid wastes transported back to Kooba Station from the proposed processing plant will be used for stock feed either in its raw material form or combined with other products and supplements. The transport, re-use and monitoring of the solid waste feed to stock will be carried out by the management of Kooba Station.

Herbicides and insecticides most commonly used on corn (90% of solid water material) have been investigated (MSDS – Material Safety Data Sheets) for possible chemical residues being passed on in the sold waste stock feed. Of the chemicals used, some have a 14 day withholding period before they can be harvested or grazed. All the solid material is delivered post harvest and therefore outside the withholding period. Long-term residual chemicals are not used in the cropping program.

The solid waste is comprised of vegetative matter and therefore could be composted as a fall back option to stock feed. This would involve considerably more labour and machinery. Composted waste would then be incorporated into the soils on Kooba Station. Although this option is technically feasibly it would not easily form part of Kooba Station's current management strategy, however, it has the potential to be a fall back option without causing any environmental effects.

4.14.2 Solid Wastes – Other

Solid wastes other than those from the raw product processing will be disposed of to the Griffith City landfill at Tharbogang by arrangement with the City Council.

4.15 Aesthetics

4.15.1 General

The proponents of the development are keen to improve the aesthetic value of their investment. The site in its undeveloped state is essentially devoid of vegetation other than grass and weeds and is relatively flat.

The development infrastructure has been designed with consideration to its aesthetic value, roof lines of the infrastructure will have curved edges and the main structures will be clad with a pastel blue coloured sheeting.

A schematic layout of the proposed landscaping areas is shown on Figure 2.

4.15.2 Proposed Landscape Plan

A 110 megalitre freshwater supply dam located near the southern boundary of the property will provide water for the majority of the landscaped areas. The sewage effluent will also be used to irrigate some turf and tree belt areas.

It is envisaged that all the land between the buildings and the roadways will be planted to turf grasses irrigated from the freshwater dam. Kikuyu will be the predominant variety because of its suitability to the climate and site and ease of establishment.

Roadways will be sealed in the future but not kerbed and guttered, surface runoff will therefore be absorbed by the grasses. Paved or concrete pathways will be established across lawn areas to facilitate all weather foot traffic across the site.

4.15.3 Site Grounds – Vegetation

The grounds will be extensively planted to trees and larger shrubs, as shown in Figure 2. This will primarily be for aesthetics and maintenance. Some tree plantings however will also be designed to provide summer shade for parked cars, buildings and people. It is envisaged that the species mix will be essentially natives with some exotic species included in areas of high aesthetic importance e.g. main office entrance. Species will be selected for their known tolerance to the conditions existing at the site. These may include:

- Ulmus Parvifolia
- Platanus and Acerifolius
- Corymbia Maculata
- C. Citriadura
- Fraxinus Spp.
- Pittosporum Spp.
- Nerium Oleander
- Acacia Baileyana
- A Cardiophylly
- Melaleura Spp.

- Chinese Elm
- Plane Tree
- Spotted Gum
- Lemon Scented Gum
- Ash
- Pittosporum
- Oleander
- Cootamundra Wattle
- West Wyalong Wattle
- Melaleuca

An extensive fully automated irrigation system will eventually look after the entire grounds and garden beds. This system will be zoned to irrigate like plants and soil types together avoiding surface drainage problems and over irrigation causing deep percolation.

4.15.4 Tree Lot Buffer Zone

A tree lot shelter belt and buffer zone has been designed to surround the processing plant site including all sheds, offices and carpark and fresh water storage dam.

The belt has been designed with 5 rows of trees and shrubs. The rows will be 5 metres apart with plants 3 metres apart giving a total belt width of 30 metres. It is proposed to plant the trees in rows to facilitate preparation, planing and maintenance. Ultimately as the plantings mature the rows will be less evident and will appear more natural and less contrived.

The trees will be Australian Natives endemic to this region and suitable to the soil types. The planting scheme of the trees and shrubs will be random so as to be less regimented and more natural in appearance. This will allow for strong microclimate development and resultant niche habitat creation for native Fauna.

The trees and shrubs will be established using drip irrigation with water from the freshwater storage dam.

Preparation of the ground, planting, maintenance and management will be done in accordance with best industry practice as outlined under Commercial wood lot establishment elsewhere in this EIS (Section 6.8.3).

The wildlife habitat values of the site will be significantly enhanced through the establishment of the tree lot shelter belts by establishing wildlife corridors. The visual effects of the development will also be substantially integrated into the surrounding environment particularly from the highway adjacent to the site.

Soil erosion and stability will be negated through ongoing development and implementation of the management plan particularly with regards to the previous land use.

4.16 Construction Guidelines

4.16.1 Traffic

During initial development of the site a significant increase in traffic is expected to be entering the site off Kidman Way prior to the construction of the new intersection being completed and the section of Crawford Road to the site entrance being upgraded.

To minimise the risk of accidents at the intersection with slowing and turning vehicles the RTA will be approached to erect appropriate signage.

To reduce the possible impacts of dust being created along Crawford Road prior to it being upgraded and sealed it will be watered as deemed necessary during dry periods.

4.16.2 Stormwater

Given the relative flat nature of the site as a result of past laser levelling (the site slopes at between 1:1400 and 1:2000) soil erosion from stormwater flows is not anticipated.

4.16.3 Erosion

To reduce the effects of wind or water erosion during the site works the following procedures will be implemented:

- ground surface disturbance will be minimised;
- disturbed ground surfaces will be top-dressed and vegetated as soon as practical; and
- construction debris will be removed from site as soon as practical.

4.16.4 Dust

If construction is carried out during dry weather periods, considerable dust could be generated by construction traffic. To minimise the generation of such dust a water cart will be available for dust suppression.

4.17 Chemical Storage and Handling

The NSW Workcover Authority is the responsible government body for the issuing of licences for the storage of dangerous goods in accordance with the NSW Dangerous Goods Regulation 1999. Subject to the dangerous goods class, volume and container type, a Workcover Licence may be required for storage of dangerous goods at the site.

Boiler water treatment chemicals will be stored in drums on the site in a concrete-lined and bunded area. Chemicals will include:

Polytreat 2635P (also known as Polytreat 4076) is an organic polymer dispersant and scale inhibitor which is not classified as a dangerous good under the Australian Code for the Transport of Dangerous Goods by Road and Rail (ACTDG).

Oxytreat 2777P is a boiler feedwater oxygen scavenger which is classified as a Class 3.2 Flammable Liquid Packaging Group III (UN:1824) dangerous good in accordance with the ACTDG.

Gas chlorine will also be used on the site associated with the sewage treatment plant.

Class 3.2 and Class 8 dangerous goods will be stored in accordance with the NSW Dangerous Goods Regulations 1999.

Other chemicals that will be stored and used onsite will be typical pesticides, herbicides and insecticides associated with crop growing on the property. These products will be stored in a secured storage area with a concrete floor and perimeter bunding. The shed that will house the above chemicals.will be located remote from the food processing plant and operations.

4.18 Social and Economic Factors

4.18.1 Hours of operation

It is proposed that during the period May to November the plant will operate between the hours of 7am and 5pm six (6) days per week. January to April inclusively which is the peak harvesting period the plant will be operated twenty-four (24) hours per day, seven (7) days per week on three (3) shifts per day basis.

Harvesting will generally be carried out during day light periods and majority of raw product deliveries will follow suit. However during the peak harvesting period some deliveries will occur during the night.

Finished product will generally be despatched from the site during day light hours.

4.18.2 Social

The proposed development will offer opportunities for both male and female employees and will employee people with a diversity of skills. The company has an in-house training policy and hence career opportunities will be available.

4.18.3 Employment

It is estimated that the new plant will employ an additional one hundred and twenty (120) personnel when the plant reaches full production.

The increased employment will present opportunities for personnel in areas such as: processes workers, line supervisors, manager, engineering and administration. Some seasonal spikes or highs in employment are expected on a seasonal basis between February and April, however these are expected to be offset seasonally by employment demand in the fruit and vegetable production fields.

Based on a commonly accepted ratio of 2.5:1 for indirect employment opportunities that arise as a consequence of a development such as is proposed up to an additional three hundred (300) jobs could be expected. Typically indirect employment will be generated in the fields of transport, housing, support industries and agriculture.

There will be opportunities for existing companies in the area to tender for contract work, particularly in the areas of transport, maintenance and supplies.

4.18.4 Economic

It is estimated that the wage input to the area from the food processing plant alone will initially be about $4million with potential to increase to over $9milliom by the year 2003.

5. CONSULTATION

5.1 Formal Procedures

The Environmental Planning and Assessment Act and Environmental Planning and Assessment Regulation set out procedures for consultation in the preparation and exhibition of the EIS. In preparing the EIS the Director General of the Department of Urban Affairs and Planning was consulted as to the requirements for the preparation of the EIS. In preparing such requirements the Director General consulted with integrated approval authorities and the Griffith City Council.

The Director General's requirements are included in Appendix 1.

5.2 Planning Focus Meeting

In accordance with DUAP procedures for State Significant Development, a Planning Focus Meeting (PFM) was convened by DUAP on 2nd February 2000 and the authorities who may have an interest in the development were invited.

The PFM enabled the integration of environmental, social and economic considerations into the formulation and design of the proposed development. It provided all interested authorities with an understanding of the proposed development and enabled the authorities to provide their requirements for the preparation of the application.

5.3 Public Authority Consultation

In addition to the authorities approached through the PFM, Coffey Geosciences have made contact with the Rural Lands Protection Board and the local Aboriginal Land Council.

6. ASSESSMENT OF ENVIRONMENTAL IMPACTS

6.1 Introduction

The assessment of environmental impacts of the development has been undertaken having regard to the provisions of Section 79C of the Environmental Planning and Assessment Act, Schedule 2 of the Environmental Planning and Assessment Regulation, and requirements obtained by consulting with the Director under clause 55 of the Environmental Planning and Assessment Regulation.

6.2 State and Local Planning Legislation

The state, regional and local planning policies and controls that are relevant to the development proposal are identified below. An assessment of the proposal's compliance with the policies and controls is also provided.

As noted in Section 1 the proposed development is designated development, State significant development and integrated development as defined in the Environmental Planning and Assessment Act and the Environmental Planning and Assessment Regulation. The Minister for Urban Affairs and Planning is the consent authority.

6.2.1 State Planning Policies

A number of State Environmental Planning Policies are relevant to the consideration of the application. These include the following.

State Environmental Planning Policy No. 34 – Major Employment –Generating Industrial Development (SEPP 34) applies to the proposed development.

> *"Promotes and coordinates the orderly and economic use and development of land, and the economic welfare of State, by facilitating certain types of major employment-generating industrial development of State significance, including labour-intensive rural industrial development".*

The SEPP identifies the Minister as the consent authority. Consideration of the Policy is provided in Section 1 of this report.

6.2.2 Local Planning Controls

Griffith Local Environment Plan 1994

The site is located within the boundary of the City of Griffith and as such is governed by the provision of the Griffith Local Environment Plan 1994 (LEP). The site is zoned 1(a) RURAL (GENERAL) under the above plan.

The aims and objectives for the above zoning are:

(a) To retain crop and pasture land where possible for the purpose of agriculture;

(b) To retain viability and productivity whilst permitting diversity and flexibility in the management of agricultural land;

(c) To prevent fragmentation of rural land and facilitate farm adjustments;

(d) To facilitate rural adjustment by permitting the orderly subdivision and development of rural land and controlling the erection of dwellings so as to ensure the economic base of the City is protected;

(e) To conserve, enhance and promote rural areas of scenic, tourist or agricultural significance to the benefit of the City;

(f) To prevent the degradation of rural and natural resources;

(g) To protect, enhance and conserve the water resource for use in the public interest;

(h) To enable the development of land within this zone for purposes which do not reduce the long term agricultural production potential of the land;

(i) To enable the development of the land for rural industries and associated activities where the Council is satisfied that the use will not detrimentally affect or be affected by nearby agricultural activities;

(j) To enable the development of land for other purposes compatible with agricultural practices in the area where the Council is satisfied that the use will not detrimentally affect of be affected by nearby agricultural activities.

The proposed development is consistent with the above aims and objectives and the relevant issues are discussed in Section 3, 4 & 6 the development is deemed not to contravene any of the "Special Provisions" of Part 3 of the LEP.

6.3 Air Quality

6.3.1 General

The air quality study was carried out by a Coffeys Environmental Scientist, Mr Anthony Stuart, and his report is enclosed in Appendix B.

The tasks undertaken as part of the air quality assessment included:

- Estimation of gaseous emissions (greenhouse and criteria pollutants) from the burner and heat plant with consideration of recent plant test results for an operationally similar plant operated by Parle in the region;
- Assessment of potential dust sources during plant construction and operation;
- Description of air pollution control equipment and operational procedures to minimise air quality impacts;

This study was based on the requirements of the Department of Urban Affairs and Planning and the Environment Protection Authority of NSW (EPANSW).

There are no air quality monitoring stations operated in the Griffith region and background air quality data is therefore not available. It is expected that the population and industrial base in the area is not large enough to produce significant regional air quality problems, although there is likely to be potential for localised elevated levels of air pollutants occurring, for example, in the vicinity of major roads in the region.

With regard to odours, there have been occasional complaints made by Hanwood residents to Griffith City Council (GCC) in the past (Mr M. Hebold, GCC, personal communication, 2000). These complaints may relate to the Bartter Enterprises poultry operation, which is located approximately 2 kilometres from the site of the proposed Parle plant.

6.3.2 Greenhouse Gas Emissions

The main gas emission sources in the new development will be from the natural gas fired boilers which will supply energy to the plant for cooking and heating.

The study used extrapolated data from the boiler configuration at the proponents existing processing plant in Griffith and data supplied by the boiler maker.

The analysis has been based on the new plant having boiler sizes of 5 megawatts (MW), 10MW and 15MW operating 24 hours per day 350 days per year.

Emissions of CO_2, CH_4 and N_20 from the burner and heat plant have been estimated using the Australian methodology recommended by the National Greenhouse Gas Inventory Committee (NGGIC, 1996). This method, endorsed by the Intergovernmental Panel on Climate Change (IPCC) involves the estimation of fuel consumption by each source and application of emission factors that relate the emission of greenhouse gas to the energy content of the fuel consumed. Greenhouse gas emissions from other sources such as transport trucks and forklifts are expected to be small in comparison with the boiler and heat plant and have not been estimated.

Emission factors for CO_2, CH_4 and N_20 for a natural gas fired industrial boiler are shown in Table 1. These emission factors, as used in the EIS, are currently recommended by NGGIC (1996) and are based on USEPA (1995) and IPCC (1995) data. The total carbon content of the fuel consumed is assigned to CO_2 emissions and solid products such as soot. Under operating conditions, however, a small proportion of the fuel carbon is released as CH_4, CO and other organic gases.

TABLE 1

GREENHOUSE GAS EMISSION RATES FOR NATURAL GAS

Compound	Emission Factor (kg/GJ)
CO_2	51.4
CH_4	0.0012
N_20	0.0001

a. NGGIC (1996)

Estimates of greenhouse gas emissions from the combustion of natural gas at the plant appear in Table 2. These are presented as mass emissions and as CO_2 equivalents that allow more meaningful comparison to be made between the greenhouse gases in relation to their relative effect on global warming. The global warming potential (GWP) of CH_4 and N_2O is expressed as a multiple of CO_2 equivalents and is reported to be 21 and 290 respectively (NGGIC, 1996).

TABLE 2

GREENHOUSE GAS EMISSIONS

Compound	Tonnes/year	CO_2 equiv. (tonnes)/year
CO_2	58454	58454
CH_4	1.36	29
N_20	0.11	33

Inventories of NSW greenhouse gas emissions established for 1988 and 1990 show total gross emissions of 202,000 and 212,000 Gg respectively. Linear extrapolation of these figures suggests that greenhouse emissions from the proposed plant would account for less than 0.03% of state emissions.

The proponent intends to establish a commercial tree plantation on the site, using treated wastewater for irrigation purposes. This represents an opportunity for carbon sequestration (carbon balancing) as carbon is taken from the atmosphere by plants through photosynthesis.

Photosynthesis will exceed respiration in actively growing plants until maturity, which will result in the plantation acting as a net carbon sink. Carbon is known to comprise around 50% of the dry weight of plant biomass. The amount of carbon sequestered will depend on a range of factors, including climate, soil types, tree species and life cycle stage (AGO, 1999).

At the outset of the project, a baseline air quality monitoring exercise would be undertaken to assess background levels of SO2, NO2, CO and PM at the boundary of the site. The emission estimates of this EIS would be compared against the monitoring data to ensure that additional pollutant loadings caused by plant operation do not result in breaches of applicable air quality goals.

Monitoring of these parameters would also be undertaken in the same location on an annual basis once the plant is operating at full capacity. Monitoring data would be used to verify the emission estimates of this study. All monitoring data would be submitted to EPANSW for review.

6.3.3 Particulate Matter

Dust or particulate matter (PM) is generated by the action of mechanical apparatus and wind on exposed surfaces. Dust particles that are fine enough to remain suspended in the atmosphere constitute a health risk and have aesthetic effects such as reducing visibility. Larger particles that are deposited can reduce amenity of an area by soiling surfaces and materials. The amount of dust produced can vary significantly according to a number of factors such as wind speed, rainfall, surface moisture and temperature.

Construction activities will include building, pavement construction, vegetation clearance and excavation/earthworks. The main impacts of dust emissions on air quality generally occur during topsoil stripping and excavation/earthworks.

Dust control measures implemented during the construction phase would be:

- watering of working and haulage areas to suppress dust generation;
- establishment of vegetation on cleared areas to reduce wind erosion;
- phased approach to clearing areas to minimise wind erosion;
- cessation of construction activities under meteorological conditions which favour generation and transport of dust. (dry and windy conditions).

During operation of the plant, the main sources of dust and particulate emissions would be from truck movements travelling to and from the site, product handling and stockpiling of raw materials. Whilst it is considered that the emissions potential of these sources are not large enough to impact on adjacent areas, the following management practices would be instigated:

- paving or stabilising the surface of all access roads travelled by heavy vehicles;
- paving of product handling areas;
- covering or wetting of material stockpiles to prevent wind erosion. Such stockpiles would include solid waste from vegetable processing.

Emissions of PM from the boilers were estimated using emission factors recommended by the United States Environmental Protection Agency (USEPA, 1995), based on operation of the three boilers at full load and 80% efficiency. The parameters used in the calculations are presented in Table 3.

TABLE 3. STACK PARTICULATE EMISSION PARAMETERS

Parameter (unit)	Value
Hourly Energy Usage (MJ/hr)	135,000
Natural Gas Energy Content (MJ/m3)	38.8
PM Emission Factor (kg/106 m3)	219
PM Daily Emission (kg/day)	18.3
PM Mass Emission Rate (g/s)	0.21

The SPECIATE database (USEPA, 1993) reports that approximately 95% of the particulate matter emitted from natural gas fired boilers is less than 10μm.

Stack testing and boiler maintenance would be carried out on an annual basis to ensure proper operation.

6.3.4 Odour

It is expected that the most significant odour source would be from the food processing effluent, which may have a high Biological Oxygen Demand (BOD) and associated high odour-producing potential. The proponent intends to initially treat the effluent by mechanical screening and filtering, it will then pass into an aerobic lagoon where it will be aerated prior to being irrigated onto the tree and crop growing areas. Given the area of the site, the remoteness of the irrigation area from occupied areas and the relatively low dosage rate (< 2 litres/m^2/day) compared with the soil infiltration rate (v 7 litres/m^2/day) significant odour impacts from the irrigation of the effluent are not expected.

Some odours are likely to occur at and around the aeration lagoon, however siting this down wind of the operational area of the plant should minimise local impacts.

Odour monitoring of the operational plant is not planned at this stage. It is recommended that Parle establish a community liaison group with the participation of Hanwood residents. Liaison group representatives would provide a pathway to alert plant management of any odour issues. It is noted that Bartter Enterprises operation may be an existing odour source in the region and detailed odour sampling and analysis may be required to establish odour sources in the event of continuing odour complaints.

6.3.5 Conclusions

The conclusion of the air quality study are:

- Air pollutant emissions resulting from normal plant operations are not expected to have a significant impact on ambient air quality in areas adjacent to the plant;
- The proposed air quality monitoring program will be used to verify that plant construction and operation does not degrade local air quality;
- Control of dust emissions will be achieved by wetting/covering of material stockpiles and paving of handling areas and access roads. Regular monitoring and auditing of wastewater treatment and disposal processes will be undertaken to ensure that the potential for odour impacts are minimised.

6.4 Archaeological

6.4.1 General

The site has in the past been used principally for flood irrigation of rice crops and as such has been cleared of native vegetation, subdivided into irrigation lots serviced by specially constructed water supply channels, ploughed and laser levelled (refer Figure 3).

All of the above works have effectively disturbed the whole of the areas ground surface to varying depths. The current property owner has no knowledge of any evidence of archaeological significance having been recorded at the site.

6.4.2 Cultural Heritage

Under the NSW Act covering aboriginal heritage *'it is recommended that an assessment be conducted of the aboriginal cultural values of the study area if the proposal involves disturbance of substantially unmodified ground surfaces'.*

Although as stated in Section 5.3.1 the area has been significantly disturbed the Griffith Local Aboriginal Land Council were asked to conduct a survey of the site and a copy of their report is enclosed in Appendix C.

6.4.3 Conclusions

There has been no evidence of archaeological significance recorded at the site, the area has been substantially disturbed and the local aboriginal land council *"advises that there is no evidence of Aboriginal artefacts or sites on this particular parcel of land"*.

If at any time during development of the site any artefacts are encountered that may be of archaeological significance the proponent will contact the NSW NPWS.

6.5 Traffic

6.5.1 General

Scott Wilson Nairn Pty Ltd, Transportation Planner, Engineering and Economists of Canberra were commissioned to carry out the traffic impact study for the proposed development.

During 1999, Scott Wilson Nairn had carried out a traffic and transport study for the Griffith City Council of the City and its hinterland. The simulation model used for the earlier study has been used to assess the traffic and environmental impacts of the Parle Foods proposed development.

As part of the traffic study, Scott Wilson Nairn Pty Ltd consulted with the NSW Roads and Traffic Authority in Wagga Wagga and the Griffith City Council to ensure there was a clear understanding of all the relevant traffic issues and potential impacts.

The traffic study report is enclosed in Appendix E.

Basis for the analysis

During 1999 Scott Wilson Nairn (formerly R J Nairn & Partners Pty Ltd) carried out a traffic and transport study of Griffith and its hinterland for the City of Griffith. During the study a traffic simulation model was developed and calibrated to predict future traffic flows on the Griffith Street system and assist in preparing a traffic management plan.

This simulation model has been used to assess the traffic and environmental impacts of the agro-industry plant being developed by Parle Foods. Traffic flows are simulated with the new development and compared with the traffic flows without the development.

It is assumed that the employment, which is created by the development is absorbed by the existing population and that there is no short-term increase in population as a direct result of the development.

Proposed changes to roads in the influence area of the development

The above traffic study proposed that, in the longer term, a bypass be sought for Hanwood town as trucks from Bartters and McWilliams plants travel through the town. Trucks from the Parle Foods development will add to this traffic. However, no action has yet been taken. Short-term improvements to several intersections were also proposed, but none of these are currently in urgent need of attention.

Existing Traffic

An RTA traffic counting station is located at Willbriggie not far from the intersection of Crawford Road and the Kidman Way (Hanwood Road) and RTA reports an AADT of 2,456 vehicles per day in 1997 on the Kidman Way. In recent years, it has been growing at about 10% per annum.

6.5.2 Potential Impacts

Truck traffic generated by the development

Deliveries of raw materials (corn, tomato and peach paste, pickles, capsicum, celery, carrot, rice and onion) will mainly enter Crawford Road from Kooba Station, south along the Kidman Way. They are expected to total 150,000 tonnes per year but be delivered over a 3month period. They will be carried in 40tonne road trains and the peak daily traffic this generates will be a maximum of 38 road trains per day.

The deliveries will not be pre-scheduled but will be accepted 24hours each day and therefore could bunch, but will not exceed 4-5 road trains in the peak hour.

About 5% or 7,500 tonnes of this raw agricultural produce will be delivered from farms at Northtown and Tabbita, West of Griffith, and will travel through the town and is of primary concern to this impact analysis. This traffic will not exceed 2 road trains in the peak hour and will travel along Hillston Road, Kookora Street, Willandra Avenue and Hanwood Road.

The output from the plant will total about 40,000 tonnes per year and will be carried in 20foot containers on normal semi-trailers from the plant, along Hanwood Road to the railhead via Crossing Street. This traffic will be relatively constant throughout the year, five days per week and average about 8 trucks per day.

The alternative location for a rail goods loading yard has now been sold and will not proceed.

General supplies will not cause excessive truck deliveries. Fuel for the plant is piped LPG and electricity and deliveries of cans and packaging do not add much truck traffic.

The residual material from the processing plant will be carted away in the same vehicles that deliver the raw materials, the bulk of this material being husks to be used as stockfeed and fertiliser at Kooba Station.

Commuters and visitor traffic generated by the development

It is proposed that 120 new jobs will be provided be the development. The plant will work 24hours each day, but there will be seasonal peaks in handling deliveries. No accommodation is being provided on site.

The worst-case commuter scenario assumes that there will be no bus service to the site and that all employees will travel from Griffith to the site during the normal Griffith traffic peak hour. This is the assumption used for the traffic simulation and intersection analysis.

It is expected that there will be some visitors to the site, including tourists, salesmen and deliveries. These have also been estimated and included in the simulation. There is ample space for commuter and visitor parking on site.

Public Transport

There is no pubic transport service to the site at present. The analysis shows that there is no adverse effect on public transport model share due to the development. On the contrary, the development provides an opportunity for a bus company to provide a commuter service from Griffith to the site.

Pedestrians

The site is rural and there are no special pedestrian or cyclists facilities between the site and Griffith. There is not expected to be any pedestrian or cyclist travel demand to or from the site.

Site Access and Intersection Works

All other major intersections in Griffith, which are influenced by the traffic impacts of the development, have been analysed to determine if these impacts are sufficient to create the need for immediate intersection improvement works.

In particular, the following intersections, which had earlier been identified as requiring improvement to roundabout standard within the next five years, were fully analysed.

Estimated Degree of Saturation at Intersections in year 2003

Intersection	Before	After
Willandra Avenue/Kookora Street	0.22	0.23
Murrumbidgee Avenue/Kookora Street	0.20	0.21
Mackay Street/Yenda Road	0.33	0.34

Source: TRANSTEP flow predictions and INTANAL analysis

The additional traffic flows at no intersection exceeded 3% of the traffic without the Parle Foods development and no intersection suffered appreciably worse level of service, delays or queue lengths as a result.

The intersection between Crawford Road and MR 321 the Kidman Way must be improved to type AUR right turn treatment with 100kph truck acceleration and deceleration lanes from the North and the South. It has been agreed that this intersection and the access road to the site will be designed and constructed by the City of Griffith, who will thereby take responsibility for the safe and efficient design and construction of the intersection. Refer figures 6, 7 & 8.

Internal traffic arrangements

A detailed site layout drawing has been supplied by Parle Foods. An examination of this drawing shows that the internal traffic arrangements are quite adequate for trucks, commuters and visitors and there is ample parking available on site. Refer Figures 6, 7 & 8.

Additional Road Maintenance Costs

Apart from the annual cost of maintaining Crawford Road to the site access road from the Kidman Way, the added annual costs of road maintenance on other roads in the network due to increased traffic on them, is estimated to be negligible (about $1,000 per annum).

Motor Vehicle Accidents

The annual value of motor vehicle accidents in Griffith, including the value of time lost by all vehicles delayed by accidents, is expected to increase by about $46,000 as a result of the additional commuter and truck travel generated by the development. Intersection accidents are not expected to increase appreciably (less than $500 extra costs) and the accident increase will be on rural roads.

Hanwood Town

Traffic levels will increase through Hanwood town, which has already been identified as in eventual need of a bypass route. At present the traffic level, even with the new development, will not approach the normal thresh-hold at which street calming is considered essential to protect pedestrians and residents. However, the pedestrian refuge island in Hanwood should be improved to provide more positive protection.

Noise

The development does not increase the noise level of any further part of the Griffith road network above 68dBA, which is considered to be the maximum suitable for residential areas. The noise level on about 1.5 kilometres of road is increased into the 63dBA – 68dBA range.

Noise levels through Hanwood town have been investigated in detail. The Hanwood School is approximately 50 metres from the road and noise levels in the peak hour will rise to a maximum of 53dBA, which is considered to be quite acceptable for schools.

Noxious Gas Emissions

The traffic impacts from the development have been assessed to ascertain the additional noxious gas emissions generated from transport sources.

The added daily emissions are estimated to be as follows:

Total Daily Transport Emissions of Griffith Network(Grams)

Emission	Before	After	Difference
Hydro-Carbons	1361.80	1373.17	12.63
Carbon Monoxide	8478.21	8543.79	56.58
Nitrogen Oxides	2131.84	2154.01	22.17
Sulphur Dioxide	49.88	50.34	0.46
Particulates	58.88	59.43	0.55
Lead	3.51	3.54	0.03
Acetaldhy	1.89	1.91	0.02
Acetone	0.07	0.07	0.00
Benzene	4.45	4.48	0.03
Butadyene	0.53	0.54	0.01
Ethyl Benzine	3.53	3.55	0.02
Formaldehyde	4.86	4.91	0.05
Hexane	0.79	0.79	0.00
Meth Eth K	0.07	0.07	0.00
PAH	0.04	0.04	0.00
Toluene	9.46	9.53	0.07
Xylene	4.67	4.70	0.04

Source: Griffith TRANSTEP model

These added transport emissions are located in areas where emission intensities are low and the increased emission intensities are not sufficient to present any known risk to health. The greenhouse (Carbon Dioxide) emissions from transport sources increase by 104 Kilograms daily.

Carriage of Hazardous Goods

The only hazardous chemical identified to be in use by the development is acid for pH control of the landscape works. The will be transported from Sydney and need not travel on urban streets. It does not present any serious hazard to residents or road users.

Dust

The only dust hazards will arise on the site itself until the internal part of the approach road is sealed. It is at present gravelled and does not present a dust hazard, but it will need to be maintained to reduce future dust risk.

6.5.3 Conclusions

While the food processing plant generates considerable truck traffic, most of this traffic approaches from the south of Crawford Road where it does not cause severe traffic impact problems.

That generated traffic, which passes through Hanwood and Griffith, has been comprehensively analysed and produces negligible adverse effects. No intersections in Griffith require accelerated improvements. Noise levels and noxious gas emissions are not brought up to hazardous levels. Vehicular accident costs will continue to grow commensurate with the development, but there is no increase in accident hazards which is directly attributable to the development.

6.6 Flora and Fauna

6.6.1 General

The flora and fauna component of the EIS was carried out by *Ettamogah Research Consultants (ERC)* who operate from Albury in southern NSW.

The principles of the *ERC* are qualified with Bachelor of Applied Science, Park Recreation and Heritage Degrees from Charles Sturt University and are licensed by the animal care and ethics committee (ACEC) of Charles Sturt University and NSW National Parks and Wildlife Service.

The *ERC* flora and fauna assessment report is enclosed in Appendix F.

6.6.2 Methodology

Information was collected on those threatened species and other species known to occur in the Griffith region. Information sources used in order to obtain an accurate inventory of threatened species and other species in the area include:

- NSW NPWS Wildlife Database Atlas
- Griffith City Council
- Murrumbidgee Irrigation, Griffith
- Murrumbidgee Field Naturalists
- Birds Australia, Database Atlas
- NSW Department of Agriculture
- Rare or Threatened Plant Species Database (ROTAP).
- Other relevant literature.

Time Frame and Potential Limitations

The fauna survey was conducted on the 23rd of March 2000. The weather and the timing of the study during late summer probably reduced the ability to detect the presence of some native biota, because climatic conditions and season particularly affect the movements and activity patterns of both native flora and fauna alike. The majority of introduced pasture species have already seeded at this time of the year making it difficult to determine the exact extent of weed invasion upon the site and the total number of weed species found at the site. Likewise most native flowering plants would also already have flowered. Time constraints and other limitations were also placed upon the assessment. Ideally the assessment should have been conducted during the initial stages of the proposal in order to minimise potential impacts of the development.

Despite these potential limitations and taking into consideration the nature of the proposal and condition of the site the survey effort and duration were likely to be extensive enough to reduce the influence of these factors on the results obtained.

Flora

To determine the vegetation communities and associated habitat types occurring at the site two methods were used:

- Aerial photograph interpretation; and
- Field surveys of the vegetation of the area.

Prior to undertaking detailed ground surveys, mapping of basic vegetation communities was undertaken by aerial photograph interpretation (Figure 2 aerial photograph of site) involving several steps:

- Undisciplined pattern typing involving the division of landscape into component parts by delineation of boundaries. Areas are examined to show the same basic pattern;
- Establishing relationships involving the comparison of areas for similarities of pattern. Each pattern area is compared to all others to determine if any are essentially the same. Diagnostic factors include colour tone, texture and topography; and
- Each pattern is then assigned a code, now classified as vegetation types. These vegetation types were then checked against field guides and other relevant literature for the region.

Field surveys of the vegetation of the area of the proposed development were then conducted in order to ground truth and verify the selection of vegetation types determined from the aerial photograph. Sample sites were chosen with the aim of representing the range of vegetation communities and visually different habitats eg. irrigation channels, drains, depressions etc. These sites were then surveyed for the presence and absence of floral species and suitable habitat characteristics such as availability of foraging substrate, suitable shelter in the form of hollows, feed trees etc. Other factors taken into consideration included the possible association with threatened fauna and flora species.

A broad survey was conducted of the vegetation situated along the boundaries outside of the study area. This involved recording some flora species, vegetation communities and suitable habitat characteristics such as availability of foraging substrate, suitable hollows, feed trees etc.

The vegetation types/communities for the study area and surrounds were classified according to Specht's classification system 1981.

Field guides used to identify flora specimens included, Greig (1999) Field Guide to Australian Wildflowers, Cronin 1998 Key Guide To Australian Wildflowers, Costermans (1998) Native Trees and Shrubs Of South-Eastern Australia. Marriott, N. & Marriott, J. (1998) Grassland Plants of South-Eastern Australia, Auld, B.A. & Medd, R.W. (1997) Weeds, An illustrated botanical guide to the weeds of Australia, Brooker, M.I.H. & Kleinig, D.A. (1999) Field Guide to Eucalypts, Volume 1 South-eastern Australia (second edition).

Fauna

In order to determine if the threatened species were present at the site, specific methodologies were used to target threatened species and habitat characteristics of these species during the course of the field survey. These techniques were used to maximise results, considering the season and time limitations imposed upon the survey.

Throughout the survey particular attention was paid to the presence of threatened fauna, which could potentially be in the region. The NSW National Parks & Wildlife Service Wildlife Atlas and current records from the Murrumbidgee Field Naturalists were reviewed as part of this process. Habitat and other resources, which could be used by rare or threatened species, were also identified.

Birds

Diurnal Surveying and Opportunistic Sampling

Surveys of diurnal bird species were undertaken whilst conducting vegetation surveys of the site. Opportunistic sampling also includes indirect searches for birds, such as searches for whitewash and regurgitation pellets of owls, particularly in close proximity to mature trees with large hollows. Sampling of nocturnal birds is also undertaken when spotlighting for amphibians.

Mammals

Diurnal Searches

Searches for indirect evidence to suggest the presence of a species, including scats and examination of burrows, tracks and diggings were also conducted during vegetation surveys of the study site. Nocturnal searches were also undertaken whilst conducting amphibian spotlighting searches of the study area.

Reptiles and Amphibians

Diurnal searches for reptiles were undertaken across the study area while undertaking other activities. Searches were made beneath ground litter, such as scrap metal and sheets of iron, fallen timber, leaf litter, decorticated bark stones and tufts of vegetation. These searches covered the entire area of the study site.

Nocturnal searches for amphibians were conducted within the study area. Searches involved spotlighting and quiet listening to identify calls and locations along irrigation channels around the perimeter of the study area and the large dam located near the centre of the study area.

6.6.3 Results

New South Wales Threatened Species

The following threatened species list is compiled from the NSW NPWS Wildlife Atlas 10km by 10km search centred on the following co-ordinates, Zone 55 Eastings 401000 to 411000 and Northings 6205000 to 6215000.

Threatened species found in the region as a result of previous field studies conducted by the Murrumbidgee Field Naturalists were also taken into consideration. As a result the following species (table 1) were considered to possibly occur in and around the region of the study area, and so were specifically considered during the study design and implementation.

None of the listed species of threatened flora and fauna identified from the various database sources were recorded on the study site during the current field investigations. It is *very unlikely* that any of these threatened flora and fauna species would occur within the study area.

Flora of the study area

The area surveyed encompassed a number of old terraced rice fields and a recently dredged irrigation channel which ran along the North, West and Southern edges of the site. Introduced plant species reached maximum diversity either side of the irrigation channel, where also a number of native Chenopod species were found. Overstorey species were present only along the fence line bordering the site and near a run down shed within the site. These trees consisted of scattered native Eucalypts, Acacias and introduced Willow species. A full flora species list can be found in Appendix 1.

The flora within the site was dominated by tall growing species from the Asteraceae family and includes *Conyza albida, Lactuca serriola, Pichris echiodes, Aster subulatus* and *Cirsium vulgare.* The combination of these plants growing in a thick sward offers very little in the way of habitat for native animals. The structural diversity of the site is very low, consisting of only one stratum. Most avifauna, especially passerines are therefore restricted to the perimeter of the site where nesting materials, roosts and food can be found within the scattered line of trees. Structural and species diversity is greater at the perimeter and reflects this by supporting more birds. More vegetated layers rather than flora species diversity is seen to correlate with a higher bird diversity (Ford 1989; Recher, Lunney & Dunn 1996). Only one species of avifauna was found utilising the heavily infested area, this being a White-fronted Chat. It was likely that the bird was utilising this section of area in association with the large dam recently constructed near the centre of the site.

TABLE 1: THREATENED FLORA AND FAUNA

Species	Survey	Legal Status and/or Risk Code	Likelihood to occur at the site
Lomandra patens	NP	3RCa	No
Litoria raniformis Southern Bell Frog	NP	Endangered (Schedule 1-part1)	Unlikely
Burhinus grallarius *Bush Stone-curlew*	NP	Endangered (Schedule 1-part1)	No
Pachycephala fogularis Red-lored Whistler	NP MF	Endangered (Schedule 1-part1)	No
Pedionomus torquatus Plains Wanderer	NP	Endangered (Schedule 1-part1)	No
Leipoa ocellata Mallee fowl	NP OS	Endangered * (Schedule 1-part1)	No
Xanthomyza phrygia Regent Honeyeater	NP	Endangered * (Schedule 1-part1)	No
Calyptorhynchu lathami Glossy Black-Cockatoo Riverina population	NP MF	Endangered (Schedule 1-part2)	No
Limosa limosa Black-tailed Godwit.	NP MF	Vulnerable (Schedule 2)	No
Pandion haliatus Osprey	NP	Vulnerable (Schedule 2)	No
Falco hypoleucos Grey Falcon	NP MF	Vulnerable (Schedule 2)	Unlikely
Grus rubicundus Brolga	NP MF	Vulnerable (Schedule 2)	No
Rostratula benghalensis Painted Snipe	NP MF	Vulnerable (Schedule 2)	No

Species	Survey	Legal Status and/or Risk Code	Likelihood to occur at the site
Botaurus poiciloptilus Australasian Bittern	NP MF	Vulnerable (Schedule 2)	No
Anseranas semipalmate Magpie Goose	NP MF	Vulnerable (Schedule 2)	No
Strictonetta naevosa Freckled Duck	NP MF	Vulnerable (Schedule 2)	Unlikely
Oxyura australis Blue-billed Duck	NP MF	Vulnerable (Schedule 2)	Unlikely
Cacatua leadbeateri Major Mitchell Cockatoo	NP MF	Vulnerable (Schedule 2)	Unlikely
Calyptorhynchus lathami Glossy Black-Cockatoo	NP MF	Vulnerable (Schedule 2)	No
Neophema pulchella Turquoise Parrot	NP	Vulnerable (Schedule 2)	No
Polytelis swainsonii Superb Parrot	NP MF	Vulnerable (Schedule 2)	No
Ninox connivens Barking Owl	NP	Vulnerable (Schedule 2)	Unlikely
Drymodes brunneopygia Southern Scrub-robin	NP OS	Vulnerable (Schedule 2)	No
Hylacola cauta Shy Heathwren	NP	Vulnerable (Schedule 2)	No
Certhionyx variegatus Pied Honeyeater	NP	Vulnerable (Schedule 2)	No
Grantiella picta Painted Honeyeater	NP MF	Vulnerable (Schedule 2)	No
Cinclosoma castanotus Chestnut Quail-thrush	NP	Vulnerable (Schedule 2)	No
Pachycephala inornata Gilbert's Whistler	NP	Vulnerable (Schedule 2)	No
Lathamus discolor Swift Parrot	NP	Vulnerable * (Schedule 2)	No
Nyctophilus timoriensis Greater Long-eared Bat	NP	Vulnerable (Schedule 2)	No

Legal Status: This identifies the legal status of the species within NSW, under the Threatened Species Conservation Act 1995 or the National Parks and Wildlife Act 1974 (* denotes species that are listed under the Commonwealth's Endangered Species Protection Act, 1992).

ROTAP Risk Code: refers to the conservation status code for rare or Threatened Australian Plants (Briggs and Leigh 1996).
3RCa
3 Species in Australia with a geographic range of greater than 100km,
R Rare: taxon which is rare in Australia and hence usually the world, but which currently does not have any identifiable threats. May be represented by a large population in a very restricted area or by smaller populations spread over a wide range or some intermediate combination of distribution pattern.
C Reserved, has at least one population within a National park, conservation reserve, area dedicated for protected flora. The taxon may or may not be considered adequately conserved within the reserve(s)
Size class of reserved populations (a) 1000 plants or more are known to occur within a conservation reserve(s)
Survey NP – NPWS Wildlife Atlas Database
MF – Murrumbidgee Field Naturalists
OS – other sources **Morcombe, M. (1986).** ***The great Australian bird finder***
Likely to occur at the site – No (no suitable habitat on site, or surrounding site) **Unlikely** (some suitable habitat in region and surrounding areas of the site) **Likely** (recorded in the region, close to the site, suitable habitat on site), **Yes** (recorded at site)

Fauna of the study area

A total of 20 vertebrate fauna species were recorded in the study area including all species recorded during surveying times and incidental observations. Of these three were introduced species. The majority of these species are typical of those found in cultivated landscapes of the area, largely comprising of a single stratum, which in turn provides very little suitable habitat for native species. The majority of species found within the study area are relatively tolerant to disturbances. A full species list can be found in Appendix 2.

Additional species have been recorded in the Griffith region as a result of previous studies and database searches (NSW NPWS, Ettamogah Research Consultants and Murrumbidgee Field Naturalists). These records are from an extensive area and although it is possible that some of the more mobile species could use the subject site on occasions, it is very unlikely that any species would solely rely on the resources provided by the site for their continued existence. This conclusion is to the fact that less disturbed habitat within the region of the study area is available and more than ample landscape replicates of the resources offered by the study area are also available in the immediate region.

Birds

A total of 15 native species and two introduced species were recorded at the study site. A full species list can be found in Appendix 2.

Generally larger and more aggressive wide- ranging birds, which are relatively tolerant to disturbances were typically recorded on the site. These species may forage over the site on occasions and include the Eastern Rosella, Magpie –lark, Willy Wagtail, Australian Magpie, Australian Raven and the Galah.

It is likely that the irrigation channels bordering the entire site do provide feeding opportunities for a number of bird species. Even though at the time the surveys were conducted the channels had been recently dredged, removing most of the vegetation. These channels still however supported large numbers of Spotted Marsh Frog *Lymnodynastes tasmaniensis* and Yabbies, which are staple food items for many largely aquatic bird species including Ibis, White-faced Heron, Egrets and Spoonbills.

It is most likely that a number of common bird species from the region may frequent the site on occasions, particularly during different seasons and when different plant species are in flower

A total of 27 threatened bird species as listed under the *TSC Act 1995* were recorded in previous studies from the region, but none were recorded during this investigation of the study area, or have been recorded within the study area previously. Although several species have the potential to occur within the study area on occasions it is considered very *'unlikely'* that these species are solely dependent upon the resources within the study area for their survival. These species are discussed further in section 5.3.

Mammals

Only a single Rabbit *Oryctolagus cuniculus* was recorded during the current field investigations. No other mammal species were recorded during the current survey of the study area. Likewise very little suitable habitat was recorded for native mammal species within the study area at the time of the field investigation.

No evidence was found to suggest that any threatened mammal species occurred within the site at the time of the field investigation. It is considered *'unlikely'* that any would occur on the site, with the exception of the more mobile, widely ranging micro chiropteran bat species which may occur within the study area on an occasional basis.

Reptiles

No reptile species were recorded during the current survey of the study site, neither was suitable habitat found for reptiles. No evidence was found to suggest that any threatened reptile species occurred within the study area at the time of the field investigation. It is considered *'unlikely'* that any would occur within the study area.

Amphibians

Two amphibian species were frequently recorded throughout the entire survey. Both species were heard calling during the day whilst conducting vegetation surveys and at night when conducting spotlighting surveys. Both species are identified as common and can be found throughout most of eastern Australia.

The Spotted Marsh Frog *Lymnodynastes tasmaniensis*, was recorded frequently in and around the irrigation channels and the large dam near the centre of the site. It was recorded so frequently that in excess of 100 individuals would have been recorded within both areas. It is a very adaptable species and is often the first frog to take advantage of new dams, ditches and water-covered areas on disturbed ground (Cogger 2000 and Robinson 1998). It can be found in woodland, shrub land and grassland from the east coast through to the interior. It is usually found under cover near water by day. After rain, it breeds among the shallow grassy borders of both temperate and permanent watercourses. (Cogger 2000 and Robinson 1998).

The Plain's Froglet, *Crinia parinsignifera*, was also recorded throughout the study area, but not as frequently as *Lymnodynastes tasmaniensis*. It is usually found in areas of woodland, which are covered with water, open areas and disturbed sites (Cogger 2000 and Robinson 1998). It calls from grasses within and fringing temporarily inundated areas, usually after rain. It can be heard calling year round, often during the day (Cogger 2000 and Robinson 1998).

Litoria raniformis, Green or Warty Swamp Frog or Southern Bell Frog is distributed across the south-eastern slopes and plains of NSW, across all of Victoria to southeast South Australia and Tasmania (Cogger 2000). It is usually found in permanent lagoons, lakes, ponds and dams, especially those with bulrush and emergent vegetation. It is often found under debris on low, oft-flooded river flats, being frequently active by day (Cogger 2000 and Robinson 1998). It breeds during the summer months with the males calling whilst floating in the water from August to April (Cogger 2000 and Robinson 1998). The large dam recently constructed near the centre of the site did provide some habitat for the above mentioned species. The dam however has very little emergent vegetation and vegetation around the banks. The surrounding irrigation channels had also been recently dredged. Given the nature and condition of the study area in relation to it providing suitable resources for *Litoria raniformis*, it is very unlikely that it would be found within the study area.

Flora and Fauna of Conservation Significance

Falco hypoleucos Grey Falcon

The Grey Falcon is also a vulnerable bird that is found over open country and wooded areas of tropical and temperate Australia (Olsen et al. 1993; Higgins & Davies 1996). Predominantly occurs in arid to semi-arid zones which have a mean annual rainfall <500 mm. It is also found near and over swamps and waterholes.

The breeding range has contracted since 1950s due to clearing and farming in the semi-arid zone and from over-grazing in the arid zone. Estimated total population is 1000 pairs and probably fewer than 5000 individuals. Within NSW it is sparse within the Murray-Darling Basin, with records from Fivebough Swamp and Tuckerbil Swamp in Leeton (Taylor & Glazebrook 1998) and the Brobenah Hills southeast of Leeton (Murrumbidgee Field Naturalists 1999d). It is not likely that there would be any *'significant effect'* on this species as a result of the proposal, even if it did occasionally occur within the study area.

Strictonetta naevosa Freckled Duck

It has been recorded from wetlands across southern Australia with the major concentrations in the Coopers Creek and Bulloo River catchments. Outside this area, breeding also records include the Murray-Darling catchment, notably those along the Paroo and Lachlan rivers, as well as swamps within the Millicent Basin of South Australia and Victoria. During extensive inland droughts, permanent wetlands in the Murray River Basin, south-eastern Queensland, eastern New South Wales and southern South Australia can become important refuge areas during inland drought conditions (Marchant and Higgins, 1990). In inland eastern Australia, Freckled Ducks breed in freshwater wetlands thickly vegetated with Lignum *Muehlenbeckia cunninghamii*, within which the birds build their nests (Braithwaite1976). It is very unlikely that the Freckled Duck would rely solely upon the resources offered by the study area for it to survive. It may in the future use the recently constructed dam of the study area for a temporary foraging site or a refuge. However even if it did occur within the study area it is unlikely that the proposed development would have *'significant effect'* upon this species.

Oxyura australis Blue-billed Duck

This species can be found on terrestrial wetlands of southeast and southwest Australia. It prefers deep water in large, permanent wetlands, especially lakes, swamps and sewage ponds (Higgins & Davies 1996). The bird is regarded as vulnerable due to freshwater habitats being destroyed or modified by drainage, clearing, grazing, increased salinity and groundwater extraction (Higgins & Davies 1996). In New South Wales it is widespread, but mostly found within the Murray-Darling Basin. It has been observed frequently at Fivebeugh Swamp near Leeton (Taylor & Glazebrook 1998; Murrumbidgee Field Naturalists 1999e; 1999f) and at Nericon Swamp and Campbells Swamp (64+ birds) within the Lake Wyangan Wetlands, Griffith (Murrumbidgee Field Naturalists 1999c). It may in the future use the recently constructed dam of the study area for a temporary foraging site or a refuge. However even if it did occur within the study area it is unlikely that the proposed development would have *'significant effect'* upon this species.

Ninox connivens Barking Owl

Found sparsely distributed through temperate and semi-arid regions from Cooktown, Qld, to Flinders Ranges, S. A., extending inland to the Lake Eyre, Bulloo and Murray Darling Basins. The present general distribution is as above but local declines or extinctions have been recorded in the Herbert River district, Qld (Young and de Lai 1997) and through much of New South Wales (Debus 1997), Victoria (Silveira 1997) and South Australia (Parker 1988; Higgins 1999) as well as in south-west Australia (Johnstone and Storr 1998).

Population in Victoria estimated at 50 pairs (Silveira *et al* 1997). The southern subspecies of Barking Owl *N. connivens connivens*, occurs primarily in dry sclerophyll woodland, nesting in large hollows in live eucalypts, often near open country (Higgins 1999; NSW NPWS 1999). Much of the habitat of the southern subspecies of Barking Owl has been cleared (Silveira 1997; Higgins 1999; NSW NPWS; 1999) and forestry practices, particularly those that include the felling of old-growth forests or over-mature trees, further threaten the species (Kavanagh *et al* 1995b).

On private land, much of the remaining habitat is fragmented and subject to further clearing, firewood collection and grazing, and there has been little regeneration (Barrett *et al* 1994; Robinson and Traill 1996; Debus 1997; NSW NPWS 1999). It is not likely that there would be any *'significant effect'* on this species as a result of the proposal, even if it did occasionally occur on the subject site.

6.6.4 Potential Impacts

The suite of survey techniques used in this study are believed to have revealed the presence of the majority of species present within the study site during the time of the survey, except for the possible limitations as described earlier. None of the flora or fauna species recorded during the survey are considered rare or threatened as listed under the *Threatened Species Act 1995.*

In general terms, the removal of this vegetation is not regarded as of particular consequence, because of its disturbed and degraded state, lack of significant resources and habitat features required by native flora and fauna and its relatively small size. Disturbances associated with this proposal will almost entirely be limited to previously cultivated areas. Given the nature of the proposed development and condition of the study area and the proposed future revegetation of the site it is not likely that the proposal will involve a significant loss of vegetation in either local or regional terms.

It is *very unlikely* that a *'significant component of habitat'* for any of the native flora and fauna found within the region (including threatened species) will be affected.

The proposed works will affect some species. Yet it is *very unlikely* that the proposed works will have a *'significant effect'* upon the survival of any of the native species mentioned in this report or those that may otherwise use the study site as part of their overall habitat area.

Although the removal of vegetation from the study site will not constitute a significant loss of vegetation in local or regional terms, the proposed development should be conducted in a manner, which minimises or ideally avoids the imposition of adverse impacts on any native revegetation within the study area.

It is more than likely that once the proposed works have been completed and the study area has been revegetated, a higher proportion of native species and probably a greater composition will be encouraged back into the area. The site may eventually be used as a wildlife corridor, temporary refuge, as a foraging area and possibly as a breeding site for a variety of native fauna.

6.6.5 Conclusions

It has been determined by Ettamogah Research Consultants that the proposed development is *"unlikely to have a significant effect on threatened species, populations or ecological communities, or their habitats"*. However the eight factors of Section 5A must be taken into account by the consent or determining authority when considering a development proposal or development application, particularly in administering Sections 78, 79 and 112 of the EP&A Act.

A formal section 5A Assessment of Significance, pursuant to the EP&A Act, is therefore not required for this proposal. However, the eight factors in section 5A have been considered with respect to those threatened biota and their habitats that could be present within the study area. The assessment below indicates that the proposed development is *'unlikely'* to impose a *'significant effect'* upon any such biota or their habitats and those species that may have been present or likely to occur within the study area. Therefore a Species Impact Statement is not required.

With respect to s.5A of the Environmental Planning and Assessment Act 1979 and in concurrence with the findings and recommendations of this report:

Part 1. No evidence for the presence of a *'viable local population'* occurring within the study area exists and there is no evidence that any such population in the vicinity of the study area would be resident on or dependent on the resources of the study site for their survival. Consequently, there is no likelihood that the proposed development would render any such populations, if they existed, *'at risk of extinction'*.

Part 2. No evidence exists for the presence of *'an endangered population'* occurring within the study area. Consequently, there is no likelihood that the proposed development can be regarded as likely to involve any such populations *'likely to be significantly compromised'* even if individuals of that population use the study area.

Part 3. Given the nature and condition of the site, and the context of the proposed development, the proposal will not involve *'a significant area of known habitat'* for any biota *'being modified or removed'*.

Part 4. Given the location and state of the site, the proposed development will not involve *'an area of known habitat'* becoming *'isolated from currently interconnecting or proximate areas of habitat'*.

Part 5. No *'critical habitat'* as declared within NSW under the register of critical habitat will be affected by the proposed development.

Part 6. Whilst many *'threatened species, populations or ecological communities, or their habitats are not adequately represented in conservation reserves or other similar protected areas'*, the proposed subdivision of the site is of no relevance in this regard.

Part 7. The proposed development is not *'of a class of development or activity that is recognised as a threatening process'*, pursuant to the *TSC Act 1995*. Clearing of native vegetation may constitute in some cases a *'threatening process'*. However the proposed development is still not considered a *'threatening process'* since no further clearing of native vegetation of the study site is necessary.

Part 8. No *'threatened species population or ecological community is at the limit of its known distribution'* on or in the vicinity of the study site.

In keeping with the broad recommendations of the flora and fauna study and the proponents desire to improve the aesthetic value of the area and to dispose of wastewater by evapotranspiration, native tree lots will be established at the site and will include at least a 20m wide buffer zone around the site.

The surrounds of the fresh water supply dam, the wastewater treatment pond, the ornamental lake, stormwater retention pond and the general plant surrounds will be landscaped and vegetated with a variety of native grasses, shrubs and trees.

A weed control program will be incorporated into the farm management plan in conjunction with crop growing on the site and the maintenance of the tree plantation to maximise growth and wastewater nutrition uptake.

6.7 NOISE

6.7.1 Introduction

Noise and Sound Services was requested by Coffey Geosciences Pty Ltd, Albury, to carry out a Noise Impact Statement (NIS) for a proposed food processing plant for Parle Foods Pty Ltd. This NIS is in line with the requirements of the Department of Urban Affairs and Planning (letter ref S9901625 dated 28.2.00) and the Environment Protection Authority (EPA) (letter ref: GF22/GFF2317 dated 28.2.00).

This NIS is part of the Environmental Impact Statement (EIS) for the development.

The noise and sound services report is enclosed in Appendix E.

6.7.2 Site and Development Description

This section describes the location site for the development and provides a detailed description of the proposed working activity of the development.

Site Description

It is proposed to construct a food processing plant at Lot 1059, DP 751686, Pt 77 Millis Road, Willbriggie, near Griffith, NSW. This is to replace and expand upon the two existing factory sites in Griffith, these are a Paste Plant at 42 – 44 Bridge Road and a Vegetable Processing and Canning Factory at 644 Mackay Avenue.

The area for the proposed development is a quiet rural area and is surrounded by farms and farmland as shown on the site plan (Figure 1). Many of the farms are 'Bartters' chicken farms. The neighbouring residential properties are also shown in Figure 1. Approximate distances from the proposed development and these residences are shown in Table 2 below:-

TABLE 2. APPROXIMATE DISTANCES FROM NEIGHBOURING RESIDENCES TO THE PROPOSED DEVELOPMENT.

Neighbouring Residence (See Figure 1)	Approximate Distance from the Proposed Development (metres)
Bartters Farm No 13	800
Bartters Farm No 14	800
Bartters Farm No 53	1400
Ross Mantarro Farm	1500
Bartters Farm No 63	1500
Bartters Farm No 1061	1300
Roy Dussin Farm 1060	1000
Dick Thompson Farm 1054	1500

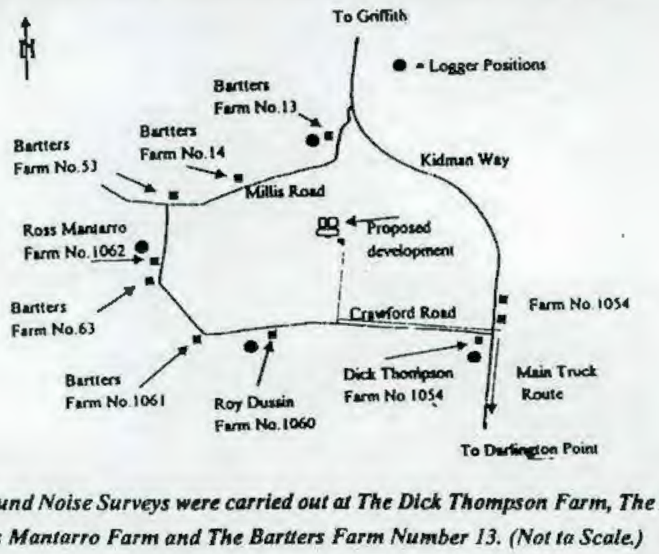


Figure 1. Site Plan. Background Noise Surveys were carried out at The Dick Thompson Farm, The Roy Dussin Farm, The Ross Mantarro Farm and The Bartters Farm Number 13. (Not to Scale.)

Development Description

The proposed development is a food processing plant by Parle Foods Pty Ltd at farm 1059 Willbriggie, NSW. The proposed development consists of a processing plant, a cold storage structure, and a dry storage structure all without windows, and an administration building.

Cold Storage Structure

The cold storage structure will comprise of a semi-enclosed shed with thermal insulation to the walls and roof. Located on the eastern side of the building will be two air/fan ducts, cooling towers and a compressor room. A two-bay loading dock is located on the western side of the shed at the southern end.

The dimensions are approximately 66 m by 104 m as shown in Figure 2 with a height of 8.4 m to the gutter and 12.1 m at the roof apex.

Dry Storage Structure

The dry storage structure facility will consist of an enclosed colorbond shed with a loading dock at the southeastern corner. This shed will house the canning line and storage area for finished canned produce. The dimensions are approximately 80 m by 100 m as shown in Figure 2 with a height of 8.4 m to the gutter and 12.1 m at the roof apex.

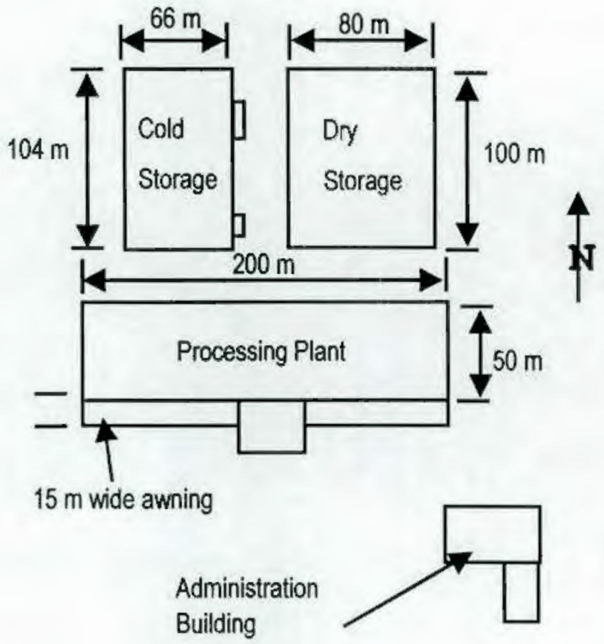


Figure 2. Site Plan of the Proposed Development. (Not to Scale.)

Processing Plant

The processing plant facility will consist of an enclosed colorbond shed with a 15 metre wide awning along the southern side of the building. This will house all the processing equipment and accept deliveries of raw produce. Initial raw material handling and sorting will be done outside under the awning. The remaining equipment including blast tunnels will be inside the shed. There will be three boilers (5000 kW, 10000 kW and 15000 kW) which will be housed in a colorbond-clad room located in the middle of the southern side of the shed. A roller door on the southern side will give access to the room. Evaporators and cooling towers will be located under the awning on the southern side of the development. The overall dimensions of the processing plant are approximately 50 m by 200 m with a 15 m by 200 m awning as shown in Figure 2 with a height of 8.4 m to the gutter and 12.8 m at the roof apex. Figure 3 shows a plan with the position of the potential noise sources identified.

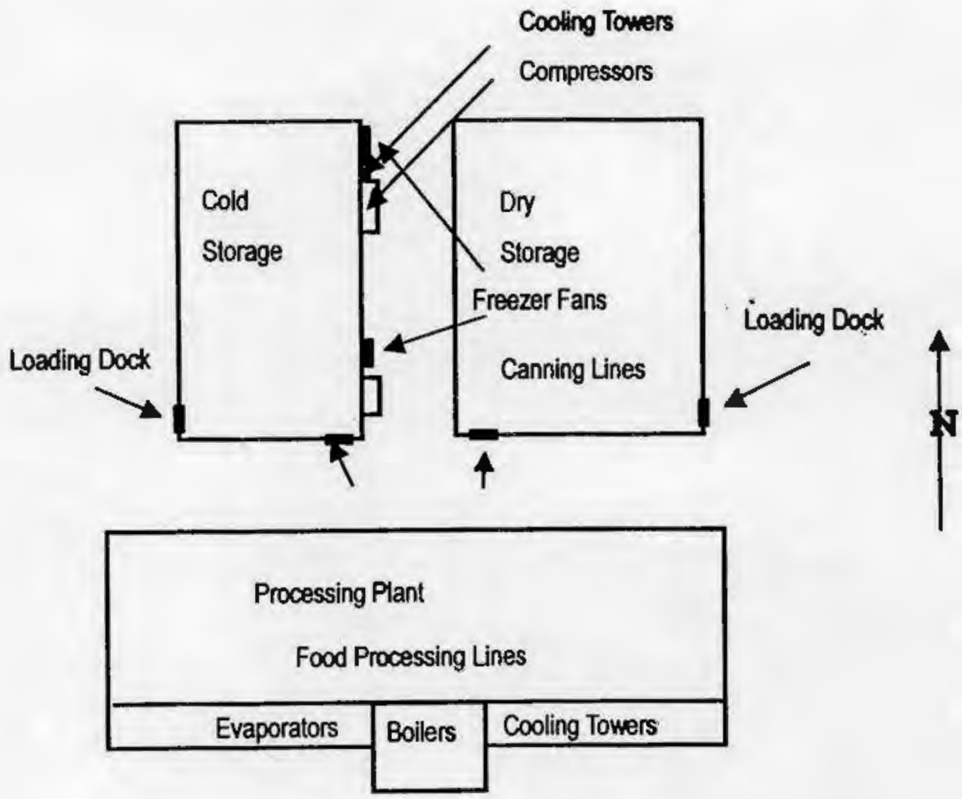


Figure 3. Site Plan of the Proposed Development with Potential Noise Source Identification. (Not to Scale.)

Mobile Plant Movements

The majority of the raw product delivered to the proposed plant will be during the main production period from January to April every year. Deliveries during this time will be 24 hours per day and 7 days per week. Virtually all in-coming deliveries will be by road trains, a total of 3000 during this period. The majority of trucks and road trains will come from the Darlington Point direction (south). The remaining trucks will come from the north. All vehicles will enter and leave the plant via Crawford Road and Kidman Way passing within 85 metres of the Dick Thompson Farm. The road trains are likely to arrive on a consistent basis over the 24-hour period depending upon harvesting operations. This gives an average rate of 1.1 road trains per hour including night time over a 16 to 17 week period every year.

Semi-trailers or B-doubles will transport out-going produce between the hours of 8 am and 5 pm, 5 days per week, 52 weeks per year. A total of 2000 truck movements based on semi-trailers.

There will also be occasional courier truck deliveries and forklifts operating between the three sheds.

6.7.3 Criteria

Noise criteria are provided by the Environment Protection Authority, NSW (EPA) which are generally in line with criteria given in other States of Australia and many Countries of the World. This includes the EPA Environmental Noise Control Manual (1994) and the Industrial Noise Policy (2000). These cover noise in urban, suburban and rural areas. Although specific local conditions can affect the criteria, convincing justification must be given for any variation to EPA guidelines.

EPA Environmental Noise Control Manual, Chapter 24

Chapter 24 of the EPA Environmental Noise Control Manual provides details for approval of new works on scheduled premises. This includes site details, times of operation, noise level predictions, noise control measures and assessments of noise impact, all of which are included in this statement. Chapter 24 also mentions that background noise levels (L_{A90}) are to be taken over a period of at least 20 minutes. However in line with more current guidelines (eg the EPA's Industrial Noise Policy – 2000) background noise levels are to be taken over a period of 15 minutes. In practice the difference would not be significant. Where sites contain areas which are particularly undulating and may affect noise propagation Chapter 24 recommends that a noise contour plan is prepared. This site is not particularly undulating and the topography will not have a particular affect on noise propagation. Hence noise contours are not considered to be required, although the effects of temperature inversions, air and ground absorption have been taken into account in the noise modelling (see section 6 of the NIS).

Industrial Noise Policy

The assessment procedure for industrial noise sources given in the EPA's Industrial Noise Policy (2000) has two components:-

- Controlling intrusive noise impacts; and
- Maintaining noise level amenity;

In assessing the noise impact of industrial or commercial noise sources all components must be taken into account for residential receivers, but, in most cases, only one will become the limiting criterion.

The project-specific noise goals reflect the most stringent noise level requirement. It is derived from intrusive and amenity criteria and this is used to set a benchmark against which noise impacts and the need for noise mitigation are assessed.

Intrusive Noise Impacts

The Environment Protection Authority, NSW (EPA) in their Industrial Noise Policy (2000) states that:- *'The intrusiveness of an industrial noise source may generally be considered acceptable if the equivalent continuous (energy-average) A-weighted level of noise from the source (represented by the L_{Aeq} descriptor) measured over a 15 minute period, does not exceed the background noise level measured in the absence of the source by more than 5 dB.'* Thus, when considering the environmental consequence of noise from a specific source, any increase above the background sound pressure level, which exceeds 5 dB, may be offensive.

The perception of noise and its level of offensiveness depends greatly on the broader situation within which it occurs. Noise that might intrude into a resting or sleeping place may be found offensive whereas the same noise occurring in a market place or noisy working area may pass unnoticed. The concept of *'background + 5 dB'* derives from this consideration.

The EPA state that where the existing background noise level at the receptor is less than 30 dBA, as may occur in a quiet suburban or rural area, then 30 dBA should be assumed to be the existing background noise level.

Where the noise source contains characteristics such as prominent tonal components, impulsiveness, intermittency, irregularity or dominant low-frequency content adjustments to the measured level are applied to allow for the increase in the annoyance value.

Protecting Noise Amenity

In the EPA's Industrial Noise Policy it is stated that *'To limit continuing increases in noise levels, the maximum ambient noise level within an area from industrial noise sources should not normally exceed the acceptable noise levels specified in Table 2.1."*

The relevant parts of the EPA recommended levels are given in Table 2 below:-

TABLE 2 – RECOMMENDED NOISE LEVELS FROM INDUSTRIAL NOISE SOURCES.

Type of Receiver	Indicative Noise Amenity Area	Time of Day	Recommended L_{Aeq} Noise Level (dBA)	
			Acceptable	Extreme
Residence	Rural	Day	50	55
		Evening	45	50
		Night	40	45
Residence	Suburban	Day	55	60
		Evening	45	50
		Night	40	45
Residence	Urban	Day	60	65
		Evening	50	55
		Night	45	50

Type of Receiver	Indicative Noise Amenity Area	Time of Day	Recommended L_{Aeq} Noise Level (dBA)	
			Acceptable	Extreme
Residence	Urban/Industrial Interface – for existing situations only	Day	65	70
		Evening	55	60
		Night	50	55
Commercial premises	All	When in use	65	70
Industrial premises	All	When in use	70	75

Hence the acceptable noise level ANL (L_{Aeq}) for rural areas is 50 dBA day time; 45 dBA evening time and 40 dBA night time. Day time is defined as 07:00 to 18:00 hours, evening is 18:00 to 22:00 hours and Night time is defined as 22:00 hours to 07:00 hours. Modifications are made to the ANL to account for the existing level of industrial noise. These are shown in Table 3 below:-

TABLE 3. MODIFICATIONS TO THE ACCEPTABLE NOISE LEVEL TO ACCOUNT FOR THE EXISTING LEVEL OF INDUSTRIAL NOISE.

Total existing L_{Aeq} noise level from Industrial sources, dBA	Maximum L_{Aeq} noise level from new sources alone, dBA
Acceptable noise level plus 2	Existing noise level minus 10
Aeeeptable noise level plus 1	Acceptable noise level minus 8
Acceptable noise level	Acceptable noise level minus 8
Acceptable noise level minus 1	Acceptable noise level minus 6
Acceptable noise level minus 2	Acceptable noise level minus 4
Acceptable noise level minus 3	Acceptable noise level minus 3
Acceptable noise level minus 4	Acceptable noise level minus 2
Acceptable noise level minus 5	Acceptable noise level minus 2
Acceptable noise level minus 6	Acceptable noise level minus 1
Acceptable noise level minus 6	Acceptable noise level

Modifying Factor Adjustments

Where a noise source contains certain characteristics, such as tonality, impulsiveness, intermittency, irregularity or dominant low-frequency content, there is evidence to suggest that it can cause greater annoyance than other noise at the same sound pressure level. A correction should be applied to both the intrusive and the amenity measurement before a comparison is made with the criteria.

An abbreviated version of the correction factors is shown in Table 4 below:

TABLE 4 – MODIFYING FACTOR CORRECTIONS

Factor	Assessment/ Measurement	When to Apply	Correction	Comments
Tonal Noise	One-third octave band or narrow band analysis	Level of one third octave band exceeds the level of the adjacent bands by 5 dB or more (above 400 Hz)	+ 5 dB	Narrow band frequency analysis may be required to precisely detect occurrence
Low frequency noise	Measurement of C-weighted and A-weighted Level	Measure/assess C and A-weighted levels over same time period. Correction to be applied if the difference between the two is 15 dB or more	+ 5 dB	C-weighted is designed to be more responsive to low frequency noise
Impulsive noise	Time weighting fast and impulse	If the difference in the A weighted maximum levels between 'fast' and 'impulse' are greater than 2 dB	Apply the difference in measured levels as the correction up to a maximum of 5 dB	Impulse time weighting is characterised by a short rise time (35msec) compared to 125msec for 'fast'.
Intermittent Noise	Subjectively Assessed	Level varies by more than 5 dB	+ 5 dB	Adjustment to be applied for night time only

EPA Criteria for Road Traffic Noise

The EPA has produced criteria for road traffic noise *'Environmental Criteria for Road Traffic Noise'* (May 1999). This provides criteria for land use developments with potential to create additional traffic on local roads. Here the criteria is 55 $L_{Aeq,\ 1hr}$ for day time (7:00 hours until 22:00 hours) and 50 $L_{Aeq,\ 1hr}$ for night time (22:00 hours until 07:00 hours). Although maximum noise level criteria are not given for sleep disturbance, the EPA document adds that "Maximum noise levels during each hour of the night time period should be assessed and reported to give an indication of the likelihood of awakening reactions".

6.7.4 Noise Impacts

Measurements were taken of:

- the existing background noise levels using four noise loggers for a two week period from Wednesday 12 April 2000 until Wednesday 26 April 2000; and
- the major existing noise sources on Wednesday 12 and Wednesday 26 April 2000.

Existing Background and Ambient Noise Measurements

This section describes the instrumentation used for the existing background and ambient noise measurements, the measurement procedure and the results. The measurement locations are shown in Figure 1 and were chosen to be representative of the four directions for the proposed development where existing residential properties are situated.

Instrumentation

The instrumentation used during the noise survey consisted of four 'Acoustic Research Laboratories Pty Ltd' - Type 1 Environmental Noise Loggers.

These loggers conform to Australian Standard 1259 "Acoustics - Sound Level Meters", (1982) as a type 1 precision sound level meter and has an accuracy suitable for field use.

The loggers calibration was checked before and after the measurement period with a Brüel and Kjær acoustical calibrator model 4230. No significant system drift occurred over the measurement periods.

Measurement Procedure

The measurements commenced on Wednesday 12 April 2000 and finished on Wednesday 26 April 2000. The full results are shown in graphical form in Appendix A. The 'fast' time weighting and 'A' frequency weighting were used. All measurements were taken at a height of approximately 1.2 metres. The results are necessarily a "snapshot" of the noise levels on the particular days of the survey. Noise levels can vary with time due to different weather or traffic conditions, also low level measurements can be affected by animal or insect noises. However, during the noise survey it was understood that the noise levels were typical.

Measurement Results

The assessment background noise level ABL (L_{A90}) is determined by the tenth percentile method for each period (i.e. day, evening and night) for each day is shown in Tables 5 to 8 below. The rating background noise levels RBL (L_{A90}) over the monitoring period found from the median ABL value for the day time, evening time, and night time respectively is shown in Table 9. The full statistical noise measurement results are shown in graphical form in Appendix A. The weather (recorded with a metrological logger) was dry with the exception of Friday 14 April and Sunday 16 April 2000 which had reasonably constant precipitation. These dates have been excluded from the overall results (RBL's). The wind at the microphone positions was below 5 metres per second for the measurement period.

TABLE 5 – EXISTING NOISE LEVELS – Location 1 Bartters Farm No 13.

Date	Time of Day	Assessment Background Noise Levels (L_{A90})	Existing Ambient Noise Levels (L_{Aeq})
12/04/00	Day	42	54
12/04/00	Evening	33	45
12-13/04/00	Night	34	48
13/04/00	Day	42	53
13/04/00	Evening	35	46
13.14/04/00	Night	33	47
14/04/00	Day	45	55
14/04/00	Evening	36	47
14-15/04/00	Night	34	47
15/04/00	Day	37	54
15/04/00	Evening	38	46
15-16/04/00	Night	35	46
16/04/00	Day	38	55
16/04/00	Evening	38	43
16-17/04/00	Night	37	48
17/04/00	Day	37	56
17/04/00	Evening	39	48

Date	Time of Day	Assessment Background Noise Levels (L_{A90})	Existing Ambient Noise Levels (L_{Aeq})
17-8/04/00	Night	38	50
18/04/00	Day	36	62
18/04/00	Evening	37	49
18-19/04/00	Night	36	50
19/04/00	Day	35	55
19/04/00	Evening	37	47
19-20/04/00	Night	35	51
20/04/00	Day	38	51
20/04/00	Evening	34	51
20-21/04/00	Night	31	48
21/04/00	Day	40	52
21/04/00	Evening	34	55
21-22/04/00	Night	39	49
22/04/00	Day	37	51
22/04/00	Evening	39	45
22-23/04/00	Night	39	49
23/04/00	Day	35	52
23/04/00	Evening	37	44
23-24/04/00	Night	37	50
24/04/00	Day	39	51
24/04/00	Evening	39	44
24-25/04/00	Night	38	49
25/04/00	Day	36	51
25/04/00	Evening	36	49
25-26/04/00	Night	34	51
26/04/00	Day	39	54

TABLE 6 – EXISTING NOISE LEVELS – Location 2 Ross Mantarro Farm 1062

Date	Time of Day	Assessment Background Noise Levels (L_{A90})	Existing Ambient Noise Levels (L_{Aeq})
12/04/00	Day	33	42
12/04/00	Evening	31	43
12-13/04/00	Night	32	55
13/04/00	Day	34	51
13/04/00	Evening	30	41
13.14/04/00	Night	28	45
14/04/00	Day	31	53
14/04/00	Evening	29	59
14-15/04/00	Night	26	39
15/04/00	Day	28	50
15/04/00	Evening	32	42
15-16/04/00	Night	32	41
16/04/00	Day	29	50
16/04/00	Evening	29	49
16-17/04/00	Night	29	48
17/04/00	Day	31	50
17/04/00	Evening	31	51
17-8/04/00	Night	29	50
18/04/00	Day	29	51
18/04/00	Evening	30	45
18-19/04/00	Night	29	53

Date	Time of Day	Assessment Background Noise Levels (L_{A90})	Existing Ambient Noise Levels (L_{Aeq})
19/04/00	Day	30	52
19/04/00	Evening	30	51
19-20/04/00	Night	30	45
20/04/00	Day	29	50
20/04/00	Evening	28	51
20-21/04/00	Night	28	38
21/04/00	Day	33	68
21/04/00	Evening	32	41
21-22/04/00	Night	30	44
22/04/00	Day	33	47
22/04/00	Evening	32	55
22-23/04/00	Night	30	42
23/04/00	Day	30	46
23/04/00	Evening	32	53
23-24/04/00	Night	31	46
24/04/00	Day	31	46
24/04/00	Evening	32	51
24-25/04/00	Night	31	40
25/04/00	Day	30	47
25/04/00	Evening	33	57
25-26/04/00	Night	31	48
26/04/00	Day	31	51

TABLE 7 – EXISTING NOISE LEVELS – Location 3 Roy Dussin Farm 1060

Date	Time of Day	Assessment Background Noise Levels (L_{A90})	Existing Ambient Noise Levels (L_{Aeq})
12/04/00	Day	34	47
12/04/00	Evening	32	38
12-13/04/00	Night	33	43
13/04/00	Day	35	50
13/04/00	Evening	33	38
13.14/04/00	Night	32	41
14/04/00	Day	37	56
14/04/00	Evening	33	42
14-15/04/00	Night	31	42
15/04/00	Day	31	49
15/04/00	Evening	35	41
15-16/04/00	Night	29	42
16/04/00	Day	34	53
16/04/00	Evening	33	39
16-17/04/00	Night	31	42
17/04/00	Day	32	47
17/04/00	Evening	30	38
17-8/04/00	Night	30	43
18/04/00	Day	31	48
18/04/00	Evening	30	37
18-19/04/00	Night	29	38
19/04/00	Day	29	48
19/04/00	Evening	29	41
19-20/04/00	Night	30	43

Date	Time of Day	Assessment Background Noise Levels (L_{A90})	Existing Ambient Noise Levels (L_{Aeq})
20/04/00	Day	32	45
20/04/00	Evening	30	49
20-21/04/00	Night	28	43
21/04/00	Day	32	46
21/04/00	Evening	29	34
21-22/04/00	Night	28	44
22/04/00	Day	29	45
22/04/00	Evening	28	40
22-23/04/00	Night	27	39
23/04/00	Day	29	45
23/04/00	Evening	28	42
23-24/04/00	Night	27	41
24/04/00	Day	29	45
24/04/00	Evening	28	35
24-25/04/00	Night	28	47
25/04/00	Day	30	47
25/04/00	Evening	29	37
25-26/04/00	Night	30	44
26/04/00	Day	33	49

TABLE 8 – EXISTING NOISE LEVELS – Location 4 **Dick Thompson Farm 1054**

Date	Time of Day	Assessment Background Noise Levels (L_{A90})	Existing Ambient Noise Levels (L_{Aeq})
12/04/00	Day	43	54
12/04/00	Evening	29	51
12-13/04/00	Night	29	50
13/04/00	Day	42	55
13/04/00	Evening	35	51
13.14/04/00	Night	31	49
14/04/00	Day	43	56
14/04/00	Evening	33	50
14-15/04/00	Night	30	48
15/04/00	Day	34	54
15/04/00	Evening	36	51
15-16/04/00	Night	30	48
16/04/00	Day	38	55
16/04/00	Evening	33	50
16-17/04/00	Night	31	49
17/04/00	Day	34	54
17/04/00	Evening	32	54
17-8/04/00	Night	27	51
18/04/00	Day	35	53
18/04/00	Evening	31	52
18-19/04/00	Night	27	51
19/04/00	Day	36	54
19/04/00	Evening	30	53
19-20/04/00	Night	28	52
20/04/00	Day	36	54
20/04/00	Evening	30	52
20-21/04/00	Night	25	51
21/04/00	Day	37	59

Date	Time of Day	Assessment Background Noise Levels (L_{A90})	Existing Ambient Noise Levels (L_{Aeq})
21/04/00	Evening	28	45
21-22/04/00	Night	26	47
22/04/00	Day	34	52
22/04/00	Evening	27	49
22-23/04/00	Night	26	49
23/04/00	Day	32	52
23/04/00	Evening	27	47
23-24/04/00	Night	26	47
24/04/00	Day	33	53
24/04/00	Evening	27	49
24-25/04/00	Night	26	49
25/04/00	Day	40	53
25/04/00	Evening	28	52
25-26/04/00	Night	27	52
26/04/00	Day	39	55

Notes all levels rounded to the nearest whole decibel

TABLE 9 – SUMMARY OF EXISTING NOISE LEVELS – All Locations

Location	Time of Day	Rating Background Noise Levels (L_{A90})	Log Average Existing Ambient Noise Levels (L_{Aeq})
Bartters Farm No 13	Day	**37**	**54**
Bartters Farm No 13	Evening	**37**	**47**
Bartters Farm No 13	Night	**35**	**49**
Ross Mantarro Farm	Day	**30**	**50**
Ross Mantarro Farm	Evening	**31**	**51**
Ross Mantarro Farm	Night	**30**	**47**
Roy Dussin Farm 1060	Day	**31**	**49**
Roy Dussin Farm 1060	Evening	**30**	**41**
Roy Dussin Farm 1060	Night	**30**	**43**
Dick Thompson Farm 1054	Day	**36**	**55**
Dick Thompson Farm 1054	Evening	**30**	**51**
Dick Thompson Farm 1054	Night	**30**	**50**

Noise Source Measurements

Instrumentation

The instrumentation used during the noise source survey consisted of a Brüel and Kjær sound level meter model 2260 (serial no. 2063202). This meter conforms to Australian Standard 1259 "Acoustics - Sound Level Meters", (1982) as a type 1 precision sound level meter and has an accuracy suitable for both field and laboratory use.

The meter calibration was checked before and after the measurement period with a Brüel and Kjær acoustical calibrator model 4231. No significant system drift occurred over the measurement periods.

The sound level meter and calibrator have been checked, adjusted and aligned to conform to the Brüel and Kjær factory specifications and issued with a conformance certificate (December 1998). The internal test equipment used is traceable to the National Measurement Laboratory at C.S.I.R.O., Lindfield, NSW, Australia.

Measured Noise Levels

The main measurements were carried out on Wednesday 12 and 26 April 2000. The results are shown in Table 10 below. All measurements were taken in terms of 15 minute, octave band (except where noted) and 'A' frequency weighted energy average (L_{Aeq}) sound pressure level. The results are necessarily a "snapshot" of the noise levels on the particular days of the survey. Noise levels can vary with time due to operating under different loads and conditions, product being handled, manufactured or processed, ageing of machine components and when other changes are made. However, during the noise survey the machines were understood to be operated under normal loads and speed conditions.

TABLE 10 – NOISE MEASUREMENT RESULTS

Plant at 7 metres	Octave Band Centre Frequency (Hz) 31	63	125	250	500	1 k	2 k	4 k	8 k	Overall 'A' Weighted
Compressor	72	79	77	78	79	75	75	67	56	81
Cooling Towers	70	75	77	74	74	68	64	58	50	74
Freezer Fan	71	72	74	71	72	64	60	54	46	71
Boiler	70	68	70	66	64	62	51	46	39	65
Evaporator	75	76	74	72	74	72	67	65	59	76
Corn processing	Not Available									82
Truck	92	87	83	79	82	83	80	75	78	87*
B Doubles	94	89	83	78	84	88	78	73	70	89*
Road Train	96	91	85	81	85	90	80	75	72	91*
Large Forklift	Not Available									82

Notes:

- These measurements are sound exposure level (L_{AE}) the Road Train is estimated from B Double measurements;
- All measurements are rounded to the nearest whole decibel;
- Sound power levels are approximately the levels at 7 m plus 25 dB.

6.7.5 Noise Goals

It is important to note that the goals given below are for the noise level solely from the factory in question and do not include extraneous noise from other sources.

Intrusive Noise Goals

For intrusive noise the goal is 5 dB plus the background noise level (L_{A90}). Hence for the first location, Bartters Farm No 13, the L_{Aeq} goal is **42 dBA day time, 42 dBA evening time** and **40 dBA night time**. For the second location, Ross Mantarro Farm, the L_{Aeq} goal is **35 dBA day time, 36 dBA evening time** and **35 dBA night time**. For the third location Roy Dussin Farm 1060 the L_{Aeq} goal is **36 dBA day time, 35 dBA evening time** and **35 dBA night time**. For the fourth location Dick Thompson Farm 1054 the L_{Aeq} goal is **41 dBA day time, 35 dBA evening time** and **35 dBA night time**.

Noise Amenity Goals

For the amenity noise the goal is dependent upon the existing ambient noise level (L_{Aeq}). Hence for the first location, Bartters Farm No 13, the existing ambient is above the acceptable EPA noise level (see Table 2) hence the L_{Aeq} goal is 10 dBA below the existing noise levels (see Table 3) i.e. **44 dBA day time, 32 dBA evening time** and **39 dBA night time**.

For the second location, Ross Mantarro Farm, the existing ambient meets the EPA acceptable level for day time and hence the goal is 8 dB below the acceptable level of 50 dBA. For the evening and night time the existing level is above the acceptable EPA noise level hence the L_{Aeq} goal is 10 dBA below the existing noise levels. The goals are **42 dBA day time, 41 dBA evening time** and **37 dBA night time**.

For the third location Roy Dussin Farm 1060 the existing ambient is below the EPA acceptable noise level for day time and evening time by 1 dB and 4 dB respectively. Hence the goals are the acceptable level (50 dBA) minus 8 dB for day time and the acceptable level (45 dBA) minus 2 dB for evening level. The existing night time level is 3 dB above the EPA acceptable level hence the goal is the existing level minus 10 dB. The L_{Aeq} goals are **42 dBA day time, 43 dBA evening time** and **33 dBA night time**.

For the fourth location Dick Thompson Farm 1054 the existing ambient is above the acceptable EPA noise level (see Table 2). Hence the L_{Aeq} goal is 10 dBA below the existing noise levels i.e. **45 dBA day time, 41 dBA evening time** and **40 dBA night time**.

Overall Project Specific Noise Goals

In summary, the project specific noise goals are as shown for each location in Tables 11 to 14 below:-

Note: The goals in bold apply.

TABLE 11 – NOISE GOALS FOR LOCATION 1 – BARTTERS FARM NO 13.

Period	Intrusive Criterion	Amenity Criterion
Day	**42 dB $L_{Aeq, 15 minutes}$ (37 + 5)**	44 dB $L_{Aeq, Days}$
Evening	42 dB $L_{Aeq, 15 minutes}$ (37 + 5)	**32 dB $L_{Aeq, Evening}$**
Night	40 dB $L_{Aeq, 15 minutes}$ (35 + 5)	**39 dB $L_{Aeq, Night}$**

TABLE 12 – NOISE GOALS FOR LOCATION 2 – ROSS MANTARRO FARM.

Period	Intrusive Criterion	Amenity Criterion
Day	**35 dB $L_{Aeq, 15 minutes}$ (30 + 5)**	42 dB $L_{Aeq, Days}$
Evening	**36 dB $L_{Aeq, 15 minutes}$ (31 + 5)**	41 dB $L_{Aeq, Evening}$
Night	**35 dB $L_{Aeq,15 minutes}$ (30 + 5)**	37 dB $L_{Aeq, Night}$

TABLE 13 – NOISE GOALS FOR LOCATION 3 – ROY DUSSIN FARM 1060.

Period	Intrusive Criterion	Amenity Criterion
Day	**36 dB $L_{Aeq, 15 minutes}$ (31 + 5)**	42 dB $L_{Aeq, Days}$
Evening	**35 dB $L_{Aeq, 15 minutes}$ (30 + 5)**	43 dB $L_{Aeq, Evening}$
Night	35 dB $L_{Aeq, 15 minutes}$ (30 + 5)	**33 dB $L_{Aeq, Night}$**

TABLE 14 – NOISE GOALS FOR LOCATION 4 – DICK THOMPSON FARM 1054

Period	Intrusive Criterion	Amenity Criterion
Day	**41 dB $L_{Aeq, 15 minutes}$ (34 + 5)**	45 dB $L_{Aeq, Days}$
Evening	**35 dB $L_{Aeq, 15 minutes}$ (35 + 5)**	41 dB $L_{Aeq, Evening}$
Night	**35 dB $L_{Aeq, 15 minutes}$ (34 + 5)**	40 dB $L_{Aeq, Night}$

6.7.6 Noise Modelling and Assessment

This section provides details of the noise modelling procedure and gives an assessment of the noise levels.

Noise Modelling Specifications

The source noise has been modelled using the International Standard ISO 9613-2 (1996(E)) '*Acoustic – Attenuation of sound during propagation outdoors Part 2 General method of calculation*'. This Standard specifies methods for the description of noise outdoors in community environments. The method described in the Standard is general in the sense that it may be applied to a wide variety of noise sources, and covers the major mechanism of attenuation. The method allows for downwind propagation conditions namely:-

- wind direction within an angle of ± 45° of the direction connecting the centre of the dominant sound source and the centre of the specified receiver region with the wind blowing from source to receiver, and
- wind speed between approximately 1 m/s and 5 m/s measured at a height of 3 m to 11 m above the ground.

In addition, an estimation of the noise increase due to temperature inversions has been included. This is taken from the EPA Industrial Noise Policy Appendix D assuming a winter temperature of 12° C and humidity of 85%. From a knowledge of the Griffith area, significant temperature inversions are likely approximately 25 winter nights per year.

Basic Noise Modelling Equations

The equivalent continuous downwind sound pressure level (L_{Aeq}) at each receiver point has been calculated for each point source using the equation below:-

$$L_{Aeq} = L_w + D_c - A$$

Where:

L_w is the sound power level of the noise source;

D_c is directivity correction; and

A is the attenuation that occurs during the propagation from source to receiver.

The attenuation term A in the equation above is given by:-

$$A = A_{div} + A_{atm} + A_{gr} + A_{bar} + A_{misc}.$$

Where:

A_{div} is the attenuation due to geometric divergence;

A_{atm} is the attenuation due to atmospheric absorption;

A_{gr} is the attenuation due to the ground effects;

A_{bar} is the attenuation due to a barrier; and

A_{misc} is the attenuation due to miscellaneous other effects.

The last term generally refers to miscellaneous propagation through foliage, industrial sites and areas of houses. As none of these miscellaneous terms are applicable for the site in question this factor is not used in this NIS.

Assessment

The assessment results for constant operation of the proposed plant are shown in Tables 15 to 19 and Figures 4 to 8. There will be an increase in these noise levels by approximately 2 dBA when the forklifts are in regular use. This will mainly affect the southern area.

TABLE 15 – PREDICTED NOISE LEVELS AT THE NEAREST NORTHERN RESIDENCES.

Time of Day	Noise Goal	Predicted Level		Exceedance	
		Without Temp Inversion	With Temp Inversion	Without Temp Inversion	With Temp Inversion
Day	42	35	N/A	-	-
Evening	32	35	N/A	3	-
Night	39	35	40	-	1

TABLE 16 – PREDICTED NOISE LEVELS AT THE NEAREST WESTERN RESIDENCES.

Time of Day	Noise Goal	Predicted Level		Exceedance	
		Without Temp Inversion	With Temp Inversion	Without Temp Inversion	With Temp Inversion
Day	35	22	N/A	-	-
Evening	36	22	N/A	-	-
Night	35	22	26	-	-

TABLE 17 – PREDICTED NOISE LEVELS AT THE NEAREST SOUTHERN RESIDENCES.

Time of Day	Noise Goal	Predicted Level		Exceedance	
		Without Temp Inversion	With Temp Inversion	Without Temp Inversion	With Temp Inversion
Day	36	29	N/A	-	-
Evening	35	29	N/A	-	-
Night	35	29	34	-	-

TABLE 18 – PREDICTED NOISE LEVELS AT THE NEAREST SOUTHEASTERN RESIDENCES.

Time of Day	Noise Goal	Predicted Level		Exceedance	
		Without Temp Inversion	With Temp Inversion	Without Temp Inversion	With Temp Inversion
Day	41	25	N/A	-	-
Evening	35	25	N/A	-	-
Night	35	25	29	-	-

TABLE 19 – PREDICTED NOISE LEVELS AT THE NEAREST SOUTHEASTERN RESIDENCES FOR ROAD TRAINS.

Time of Day	Noise Goals		Predicted Level ($L_{Aeq,15\,min}$) or ($L_{Aeq,\,1\,hour}$)		Exceedance* (two road trains in any 15 minute period, four trains in any one hour)	
	Ind.	Traf.	Without Temp Inversion	With Temp Inversion	Without Temp Inversion	With Temp Inversion
Day	41	55	40	N/A	-	-
Evening	35	N/A	40	N/A	5	-
Night	35	50	40	41	5	6

*No exceedance of the Traffic Noise Goals is predicted.

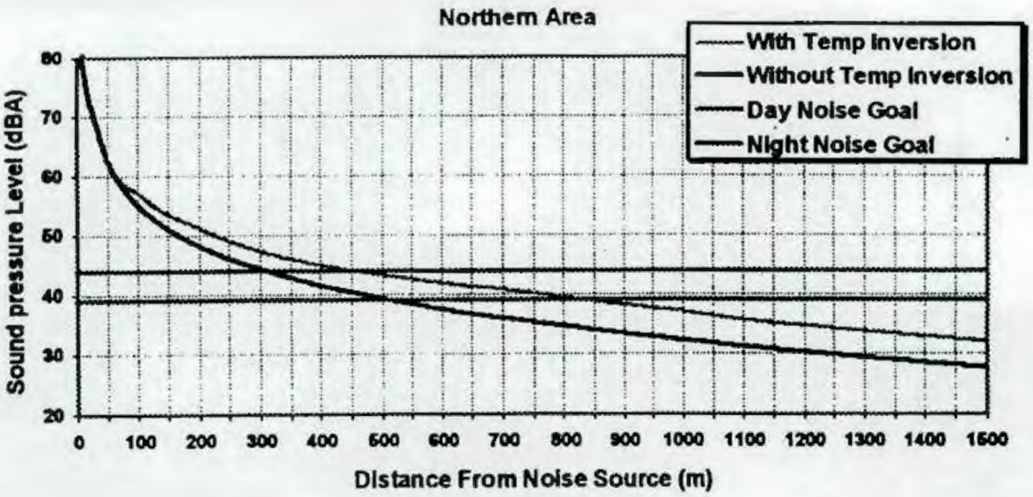


Figure 4. The Noise Level Reduction with Distance in the Northern Direction compared to the Day Time and Night Time Noise Goals.

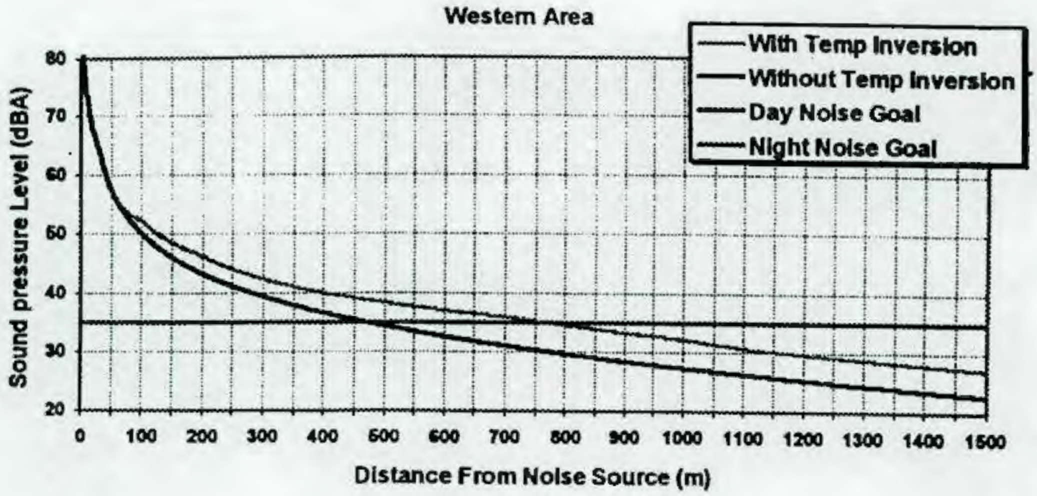


Figure 5. The Noise Level Reduction with Distance in the Western Direction compared to the Day Time and Night Time Noise Goals.

(35 dBA for both).

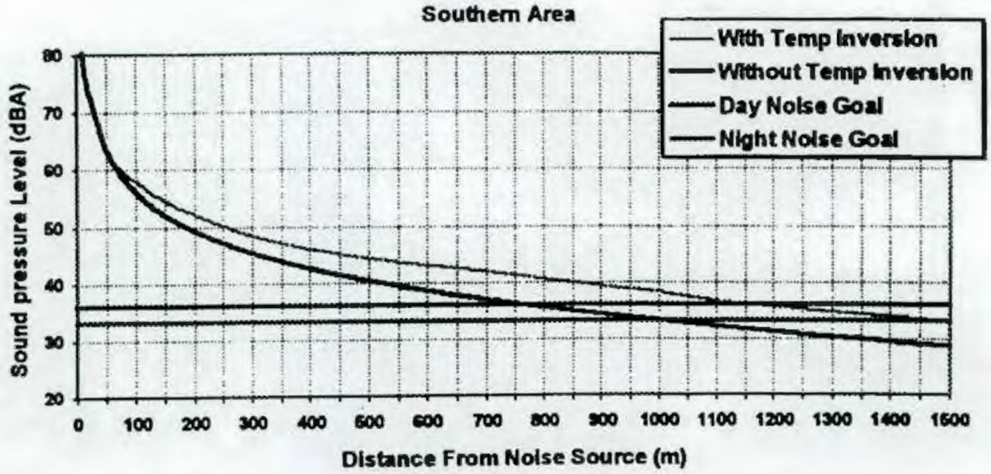


Figure 6. The Noise Level Reduction with Distance in the Southern Direction compared to the Day Time and Night Time Noise Goals.

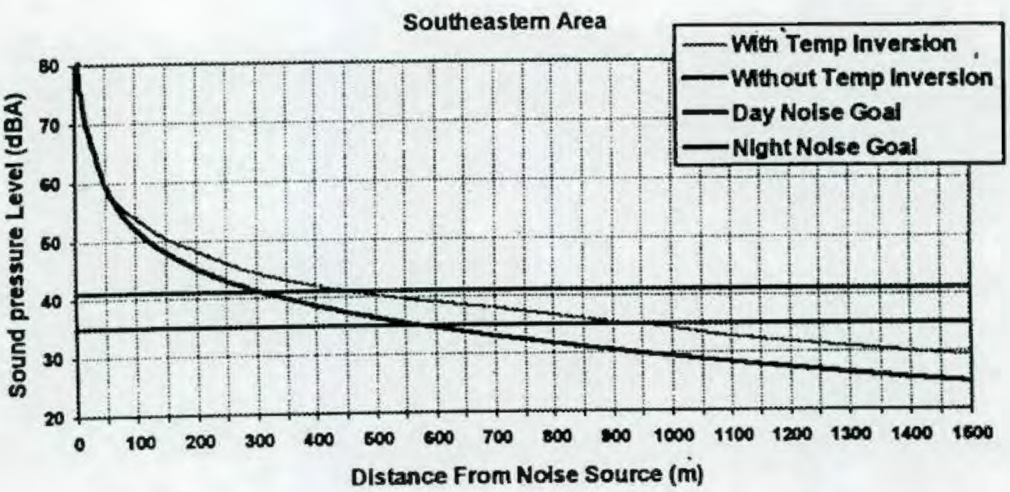


Figure 7. The Noise Level Reduction with Distance in the Southeastern Direction compared to the Day Time and Night Time Noise Goals.

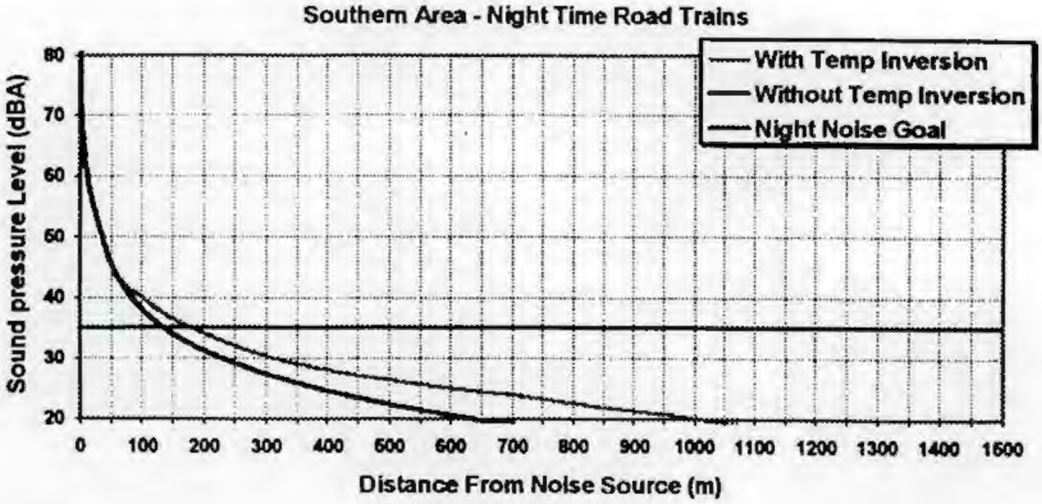


Figure 8. The Noise Level Reduction with Distance in the Southeastern Direction for Road Trains compared to the Day Time and Night Time Noise Goals.

6.7.7 CONCLUSIONS

It can be seen from the assessment results that the EPA noise criteria will generally be met for the continuous noise from the proposed development. Minor exceedances are expected at the northern residences (Bartters Farms), These are for the evening time by 3 dBA to 5 dBA and night time, during temperature inversions by 1 dBA and up to 3 dBA when in rare cases forklifts are in regular use. The impact is expected to be negligible due to the very stringent evening criterion (32 dBA), the marginal exceedance (3 dBA) and irregular occurrence of the worst case night time noise.

The effect of the road trains is expected to cause a night time noise impact at, at least one residential property, with exceedances of the EPA industrial noise criterion by 5 dBA to 6 dBA although the EPA traffic noise criteria will not be exceeded. This assumes no more than two road trains (or B- double) pass by in any 15-minute period and four road trains in any hour. The maximum noise level will exceed the background by 25 to 26 dBA which could cause some sleep disturbance. These exceedances will only regularly occur during four months of the year and the level of impact will need to be balanced against the social and economic benefits derived from the proposed development.

6.8 Wastewater Management

6.8.1 General

The issue of wastewater management was raised as being a key issue at the planning focus meeting (PFM) by DUAP, EPA, DLWC, MI and the Griffith City Council.

To address the wastewater and farm management issues Mr Warren Muirhead a private practising research agronomist from Griffith was commissioned. Mr Muirhead has considerable experience working in the M.I.A in his capacity as an agronomist and prior to becoming a private consultant was employed by the C.S.I.R.O.

Mr Muirhead's study addressed the wastewater management in three components:

- Site characteristic;
- Wastewater quantity and quality; and
- Water balance.

Data and discussions supporting Mr Muirheads findings are enclosed in Appendix H.

6.8.2 Site Characteristics

Climate

The climate of the area is warm temperate with hot and dry summers and mild winters with a number of frosty nights. The 423 mm of rain is spread uniformly throughout the year but very variable from year to year. The annual evaportranspiration is 1800mm and varies from 270 mm in December and January to a low of about 45 mm in June and July.

Topography and Geology

The landscape is gently sloping to the west with a gradient of less than 1 in 3000. The site is located on an extensive alluvial fan of low relief that has formed where the Murrumbidgee river enters the open Riverine plain.

The depth of sedimentary deposits is of the order of 100 m and these deposits consist of very variable layering of sands and clays (van Dijk (1961). The sand layers are generally associated with prior streams and the sand layers are often poorly connected. The surface of the present landscape is largely parna, an aeolian deposit.

Soil Types

Van Dijk (1961) has mapped the soils on the property. Generally, the soils are classified as red-brown earths or transitional red-brown earths. The main variation is in the depth of the A horizon. All of the soil types have moderately dense to dense plastic clay subsoils.

The area that will be devoted to cropping is predominantly classed as the Coree series and is surrounded by the Willbriggie series. The Coree series is the grey counterpart of the Willbriggie series and, except for colour, has very similar physical and chemical properties (Standard 1970). The puff component of the Coree series is the Wunnamurra clay and at this site occupies about 20% of the landscape.

A typical profile description for a Coree clay loam is:

Depth	Characteristics
0 - 8 cm	Grey loam, brittle and compact, sporadic bleaching in the subsoil
8 - 30 cm	Dark grey heavy clay, medium to coarse angular blocky structure
30 - 60 cm	Grey heavy clay, massive, slight concretionary lime
60 - 100 cm	Grey-brown medium clay, slight concretionary lime and crystalline gypsum

The Coree and Willbriggie series were classified by van Dijk (1961) as unsuitable for horticultural crops. The site has been used for rice culture for many years.

These soils are considered suitable for rice because of their low saturated infiltration rates (average 0.25mm/day over a 16 week period - van der Lelij and Talsma 1978). Consequently, deep percolation to the groundwater will be low.

The north east corner of the site is dominated by soils of the Beelbangera Association. The typical soil type is the Beelbangera clay loam that is similar to the Willbriggie clay loam but the A horizon is up to 20 cm deep. Because of the deeper topsoil, it is classified as a red-brown earth and considered suitable for some horticultural crops. Red-brown earths are considered to have higher saturated infiltration rates than transitional red-brown earths.

The south east corner of the property that is on a slight rise, is characterised by the Thulabin Association, predominantly Thulabin clay loam (van Dijk 1961). It forms part of a recent prior stream course. The profile is similar to the Beelbangera clay loam but has a brown sandy loam averaging 20 cm in depth. Because this area was not easily commanded for gravity irrigation, it has not been cropped.

Soil characteristics

Surficial (0.0 to 0.1m) soil samples were collected by Coffeys from a total of 33 locations over the property and combined to form 5 composite samples which were then analysed by Riverina Laboratories of Jindera and the information is summarised in Table 1.

Table 1. Chemical properties of the topsoils at the Parle Foods property.

Analysis	301	302	303	304	305	Average
pH (water)	6.0	6.9	6.8	6.5	7.4	6.72
EC (dS/m)	0.25	0.28	0.28	0.28	0.49	0.32
Olsen P (mg/kg)	23	20	8	12	3	13.2
Total P (mg/kg)	236	208	144	180	70	167.6
TKN (%)	0.12	0.11	0.15	0.14	0.04	0.11
Nitrate (mg/kg)	300	200	160	300	1	192.2
Exch Na (mg/kg)	525	473	805	704	877	676.8
Exch K (mg/kg)	570	513	334	427	455	459.8
Exch Ca (mg/kg)	2460	3300	3370	2890	5540	3512
Exch Mg (mg/kg)	778	466	1070	1000	1450	952.8
Total Organic C (%)	1.6	1.2	1.9	1.7	0.4	1.36

The pH of the topsoil is near neutral and can tolerate the application of wastewater that is slightly acid. The EC of the topsoil is relatively low (assuming the values are equivalent to the saturated extract) and may be due to leaching if the soil was sampled soon after rain. The available P level is low although quite variable between sites. The value would need to be increased to about 20 mg/kg to ensure that P was not limiting crop growth. Again, Total Kjeldahl Nitrogen (TKN) is variable and very low at one site, but consistent with the organic C levels. Nitrate levels are high at all sites except Site 305 where it is very low. This nitrogen would be at risk to loss through denitrification. The exchangeable sodium percentage (ESP), an indication of possible structural instability caused by sodicity, is high at 17% and indicates that the irrigated area will require gypsum to reduce crusting. The desirable level of ESP is 5% (Rengasamy and Churchman (1990).

Soil samples were also collected by Coffeys from the subsoil (0.3 m to 0.4 m) at the same locations as the surficial samples and composited and tested in the same manner and the analytical results are shown in Table 2.

Table 2. Chemical properties of the subsoil at the Parle Foods property.

Analysis	306	307	308	Average
PH (water)	7.7	7.5	7.4	7.53
EC (dS/m)	0.37	1.51	1.06	0.98
Olsen P (mg/kg)	3	2	4	3
Total P (mg/kg)	88	52	88	76
TKN (%)	0.03	0.03	0.04	0.03
Nitrate (mg/kg)	125	1	1	42.33
Exch Na (mg/kg)	815	199	1190	735
Exch K (mg/kg)	279	268	265	271
Exch Ca (mg/kg)	4230	4800	2910	3980
Exch Mg (mg/kg)	1100	1860	1430	1460
Total Organic C (%)	0.3	0.4	0.6	0.43

As would be expected, the pH of the subsoil (7.5) is higher than the topsoil and again will provide buffering for the application of slightly acidic wastewater. The EC has risen but is not a concern if it represents the EC of the saturated paste. The TKN is very low as would be expected at this depth. Nitrate is very variable but generally low. The ESP, as would be expected has increased to 23.3%.

The results of the laboratory analytical testing are enclosed as Appendix I.

Groundwater

The property is located in an area that has historically had high water tables. For example, bore G1718 and G1730 averaged a depth to the groundwater of 1.25m in June 1965 and averaged 1.34 when last measured in September 1993 (Attachment 3 in Appendix 4). The groundwater level in the deep aquifer observation bore 36576 (installed at 78m) at Hanwood fluctuates seasonally by 1 to 1.5m with a declining long-term trend in response to pumping to the south and south-west (Lawson and Webb 1998). Here, the aquifer pressure is about 9 m beneath the soil surface.

Four (4) shallow monitoring wells were established at the site by Coffeys during the course of the EIS study and the water from the bores were sampled in late March 2000 and analysed by Riverina Laboratories of Jindera, the composition of the water is shown in Table 3. The results of the analytical testing are enclosed in Appendix I. The water is slightly alkaline and the average salinity is 9.6 dS/m. The salinity is very variable and ranges from 1.5 to 15.4 dS/m. This can be attributed to samples being taken from a bore located in an intake area (1.5 dS/m) and discharge areas (15.4 dS/m). The Total P, TKN and BOD levels are generally low.

Table 3. Composition of the water in the 4 shallow bores at Parle Foods property.

Analysis	349	350	351	352	Average
PH	7.8	7.2	7.1	7.4	7.38
EC (dS/m)	1.55	15.4	13.3	8.33	9.65
TSS (mg/L)	1040	10340	8930	5581	6470
Total P (mg/L)	0.01	0.05	0.01	0.05	0.03
TKN (mg/L)	1.1	1.1	0.8	0.1	0.78
Nitrate-N (mg/L)	2	3	12	8	6.25
BOD (mg/L)	6	5	5	5	5.25
TDS (mg/L)	1160	8780	7360	4280	5395

Conclusions

The soils on the property, and particularly where irrigation will be carried out, are transitional red-brown earths with low saturated hydraulic conductivities and classified suitable for rice culture. The pH of the topsoil is near neutral. Available phosphorus is medium to low for optimum crop growth. Although nitrate levels are high, this form of mineral nitrogen is at risk to loss through denitrification. Total nitrogen and organic matter is low. The exchangeable sodium percentage in the topsoil is high and the surface soil is at risk to dispersion and crusting with rain and irrigation. This can be ameliorated in the short term with gypsum and in the longer term by building up organic matter in the soil.

Shallow aquifers have pressures with levels that fluctuate between 1 and 2 m below the surface. However, the deep aquifer pressure appears to be dropping. Water tables are saline and very variable in concentration, suggesting intake and discharge areas within the property. This can be managed by removing rice from the property and irrigating to achieve more even intake of water.

6.8.3 Woodlot Management

A 15 ha woodlot will be established between the processing plant and the northern boundary of the property. This will assist in managing the wastewater. The woodlot will comprise of Australian native eucalyptus to be operated along the lines of a commercial woodlot with the trees harvested for pulpwood or commercial saw logs.

The land on which the woodlot is located has been landformed previously to a grade of approximately 1:1500.

The general management of the woodlot will be based on the guidelines prepared by Meyers et al (1999) for establishing, growing and harvesting productive plantations.

Species and spacing

Eucalyptus grandis (Flooded Gum) is frequently used to manage wastewater (Meyer et al 1995) and is proposed to be used in this plantation along with Corymbia maculate (Spotted Gum), Eucalyptus camaldulensis (River Red Gum) and Eucalyptus occidentals (Swamp Yate). This is a mix of local and non-local indigenous species. Wood from these species can be used as building frames, joinery, plywood, panelling, boat building, furniture and flooring, fencing posts, poles, pulping and firewood.

The trees will be planted at a density of the order of 1000 to 1200 stems/ha, typically 3 m between trees and 3 to 5 metres between rows. Sequential thinning will take place until the density is reduced to about 200 stems/ha.

Site Preparation

The rows will be ripped to a depth of 40 cm and gypsum applied to improve soil structure. The soil along the row will be mounded to a height of about 30 cm. Weed growth on the mound will be controlled but the area between the rows will be sown with pasture to increase evapotranspiration. Stock will not be on the property so grazing of the trees will not be a problem. Replanting will be carried out if plant mortality is greater than 15%.

Planting

A planting machine will be used due to the size of the woodlot. This tractor mounted machine will open up the planting trench, place the plant in the trench, add a small amount of fertilizer and close the trench around the plant.

The young trees will have tree guards to protect the young seedling from frost and predators, whilst providing an ideal microclimate for the initial growth stages.

Post Planting
Pasture between the rows will be periodically harvested, weeds around the trees will ultimately be controlled by tree canopies and via rook competition for water and nutrients. Applications of pre-emergent herbicides will control weeds until this stage is reached.

Tree guards will be removed at the point when the trees and shrubs have outgrown them. This should occur in the first 12 months.

Irrigation
Initial irrigation will be carried out by flood/furrow irrigation. This will water the trees and the inter-row pasture. Once the woodlot reaches canopy closure the installation of a fully automated drip irrigation system is proposed. The system will be programmable to operate when required with the ability to shut down after a predetermined quantity of rainfall has been received. The system will also be able to alarm operators in the event of malfunction and automatically shut down. Additional trace elements can also be added through the system.

In the first year, irrigation scheduling will be based on routine measurements of resistance blocks located in the root zone. In addition, water balance estimates will be carried out to ensure that the crop is not stressed. In the second and subsequent years, the monitoring will be re-evaluated to ensure that the irrigation strategy will ensure rapid canopy closure and optimum evapotranspiration rates.

Winter and Summer Forage Crops
A 45 ha area of border check irrigation has been laser levelled to ensure uniform grades with no reverse grades. This area designated for summer cropping is divided into two blocks, one block containing 7 bays (slope 1:1400) and the other block with 4 bays (slope 1:2000).

Timetable of operations
Table 4 summarises the operations required to prepare the site for sowing in November

Date	Activity
Aug -Sept 00	Prepare 45 ha border check area for sowing and irrigation
Early Nov 00	Apply gypsum to ameliorate sodicity
Mid Nov 00	Pre-irrigate site with supply water
Late Nov 00	Sow to forage maize
Dec 00	Irrigate using a water budget to develop deep root system
Jan to Apr 01	Irrigate with wastewater and channel supply to maintain growth and avoid over-watering
Mid Apr 01	Harvest crop with a forage harvester and ensile harvested material Sod seed in annual ryegrass and sub clover.
Oct 01	Harvest annual pasture with forage harvester

Irrigation
The irrigation of the bays will aim to apply the water in 6 to 8 hours and drain excess water from the bay in a similar time. The existing bays may need to be split to ensure that the ratio of bay width (m) to flow (ML) is no less than 6 m/ML (Rahman and Damley-Naylor 1994). Wastewater will be transported from the storage facility to the bays by supply channel. Bay outlets will control the water flow from the supply channel to the bays.

A tailwater recirculation system will quickly remove excess water from each bay returning it to the supply channel or storage facility.

Irrigation scheduling will be based on soil observations, soil water balance and a limited number of resistance meters in the crop.

6.8.4 Water Balance

Rainfall and Evaporation

The rainfall and evaporation data used was collected at CSIRO, Griffith Laboratory that is located about 10 km from the site. The data was collected between January 1962 and December 1999 and the monthly totals are shown in Appendix 1. The potential evapotranspiration was calculated using a modified Penman equation that is described by Meyer (1999).

The average yearly rainfall for the 38 years was 4% higher than recorded by the Bureau of Meteorology for the period from 1914 to 1989 (Table 1).

Table 1. Comparison of the rainfall for the period used (1962 to 1999) and 1914 to 1989.

Month	1962 - 1999	1914 – 1989
January	37.2	29.6
February	26.3	27.8
March	35.5	34.4
April	34.4	33.0
May	39.9	37.8
June	35.6	37.2
July	35.2	33.2
August	37.4	40.4
September	39.7	32.6
October	44.0	41.3
November	27.2	28.5
December	30.9	30.7
Total	423.3	406.5

Maximum Hydraulic Loading

The maximum hydraulic loading was calculated for the 37 years as outlined in EPA NSW (1995). The value for each year is shown in Attachment 1 in Appendix H and the mean, median and 60 percentile values are summarised in Table 2.

The mean annual rainfall for the period is 423 mm and the mean annual potential evapotranspiration is 1815 mm. The mean and median yearly maximum hydraulic loading (YHL) for the period are very similar at 1391 mm. The 60 percentile value for YHL is 1457 mm.

The minimum area that is required to manage the effluent is 31 ha (424ML/y) wastewater and potential ETp of 13.91ML/ha/y in a year of average rainfall and 39 ha in a 10 percentile wet year.

Table 2. The mean, median and 60 percentile values for the monthly and total rainfall, evapotranspiration (ETp) and maximum hydraulic loading (MHL) for the period from1962 to 1999.

Month	Rainfall (mm)			ETp (mm)			MHL (mm)		
	Mean	Median	60 Percentile	Mean	Median	60 Percentile	Mean	Median	60 Percentile
January	37.2	26.8	33.9	275	274.1	281.9	237.8	252.1	262
February	26.3	11.8	23.6	229	228.8	236.7	202.7	215.7	228.3
March	35.5	29.6	36.2	187.4	188.3	195.4	151.9	163.8	172.4
April	34.4	19.9	33.3	112	111.8	115.8	77.6	91.7	97
May	39.9	34.8	39.8	65.2	64.7	66.6	25.3	35	41.1
June	35.6	27.8	37.1	43.3	44.7	46	7.7	11.2	16.1
July	35.2	34.5	37	48.9	47.4	52	13.8	14	24.8
August	37.4	38.3	41.4	74.4	74.6	76.6	36.9	37.2	40.9
September	39.7	32.5	37.5	111.8	111.3	115.2	72.1	81.5	87.2
October	44	32.8	41.2	172.5	177.9	181.8	128.5	143.9	160.9
November	27.2	23	29.9	225.2	231.7	233.4	198	200.3	215.5
December	30.9	21.5	30.9	270.1	269.9	279.7	239.2	243	257.6
Total	423.2	405.8	449.3	1814.7	1831.8	1855.8	1391.5	1390.8	1456.8

Storage Facility

The wastewater is classified as a low strength effluent for nitrogen and phosphorus, but at the low end of the intermediate strength for BOD (Parle wastewater BOD 303 mg/L and intermediate strength effluent 40 to 1500 mg/L). Consequently, the 60 percentile storage requirement is used to establish the storage area.

The analysis of the nutrient loading concluded that 15 ha of wood lot and 45 ha of summer forage maize followed by winter grass/clover pasture would be sufficient area to manage the nutrients in the wastewater. This area of irrigated crop will be used in the calculations of wastewater application in excess of evapotranspiration losses.

The monthly crop factors for the wood lot (Table 3) are those recommended at Wagga by Myers et al (1999). It is assumed that the wood lot will reach canopy closure in 3 years when these figures are applicable. When the trees are young, pasture will be sown between the tree rows to maintain evapotranspiration losses and when necessary, removed with a forage harvester. In the first and possibly second year, the factory will not be operating at the potential and the quantity of wastewater will be less than used in the calculations.

The crop factors for the forage maize and winter pasture (Table 3) are based on the values in the MIA and District Land and Water Management Plan (Meyer 1996). The forage maize will be harvested with a forage harvester in late April and the winter pasture harvested in October.

Table 3. Monthly crop factors for the irrigated wood lot and cropped areas.

Month	Wood lot	Crop	Comments
January	0.78	0.7	
February	0.84	0.85	
March	0.94	0.85	
April	1.17	0.6	Forage maize harvested
May	1.21	0.4	Winter pasture established
June	1.15	0.6	
July	1.13	0.7	
August	1.33	0.8	
September	1.33	0.8	
October	1.26	0.6	Winter pasture harvested
November	0.99	0.4	Forage maize sown
December	0.83	0.5	

The 4 years with YHL closest to the median (1457 mm) were 1966 (1428 mm), 1996 (1455 mm) 1998 (1465 mm) and 1962 (1479 mm).

When the monthly evapotranspiration is subtracted from the monthly wastewater for these years, there is no month when the volume of wastewater exceeds the evapotranspiration (Attachment 2 & 3 in Appendix H). Consequently, there is no need for a large storage.

The volume of wastewater in summer (January to April) is just under 3 ML per day with the remainder of the year being just under 0.5 ML per day (Attachment 2). Therefore a storage facility of 4 ML holds more than a days supply in peak season and more than 9 days supply in the off season (May to December).

Rain days during the peak processing season will necessitate termination of crop harvesting and delivery to the plant. Due to the method of harvest and the crops involved, harvested product will not be stored and therefore once harvesting stops processing will also cease. Wastewater outflow will then decrease to the off season volume until harvesting again resumes once the paddocks have dried out.

Conclusion

This analysis demonstrates that the planned 15 ha wood lot and 45 ha of summer and winter forage crops will be sufficient to manage the wastewater in years similar or drier than the 60 percentile year. Under these conditions, there is no need for a storage larger than that designed.

6.8.5 Wastewater Quantity and Quality

Quantity

The wastewater will come from several processing operations with the majority (318 ML) produced in a 105 day period (January to mid April) and the remaining 106 ML produced during the rest of the year. The anticipated quantities are shown in Table 1.

Table 1. Anticipated quantity of wastewater produced.

Product	Volume (ML/yr)	Period of production
Corn	53	January to mid April
Tomato	212	January to mid April
Pickles washings	3.2	Equally during year
Other products	156	Equally during year
Total	**424.2**	

Composition of the Wastewater

Sweet Corn

The Heinz Wattie plant in New Zealand is similar to that being installed at Parle Foods, Hanwood. The press effluent waste produced is stored in a tank in New Zealand. The composition of this wastewater is used as an estimate of the concentration of nutrients in the wastewater at the Parle Foods factory. However, at Parle Foods, the equivalent to the press effluent will be diluted 10 fold.

The average nutrient composition of the tank effluent sampled on 8 occasions from 26 January 1999 to 23 March 1999 is shown in Table 2.

Table 2. Average composition of the New Zealand tank effluent and estimated corn wastewater composition at Parle Foods factory, Hanwood.

Nutrient	New Zealand Tank	Parle Foods (diluted)
Nitrogen (mg/L)	1742	174
Phosphorus (mg/L)	362	36
Potassium (mg/L)	1307	131
Calcium (mg/L)	101	10
Magnesium (mg/L)	156	16

The BOD of the tank effluent was measured on a number of occasions and using a range of production processes. The measurements are shown in Table 3.

Table 3. Corn wastewater BOD (mg/L) results derived from various production processes and crop varieties in 1999 in New Zealand.

Parameter	New Zealand Tank	Parle Foods (diluted)
Hot cob	1530	
Conventional	3397	
Shallow cut	1605	
Sweetened	2948	
Unsweetened	4533	
Average	2803	280

Tomatoes

Wastewater samples were collected on 9th May 2000 from the tomato processing line at the Parle Foods factory in Griffith and analysed by ANCO Australasia Pty Ltd. Sample "A" came from the shaker table, Sample "C" from the spray/roller table and Sample "D" from the cooling tower.

The analytical results and the calculated wastewater composition is shown in Table 4. The wastewater composition assumes that 70 ML/yr originates from the processing line and 130 ML/yr from the cooling tower.

Table 4. Characteristics of the water samples from the tomato processing line and estimated composition of the wastewater at Parle Foods factory, Griffith.

Analysis	Sample A	Sample C	Sample D	Tomato W/water
Volume (ML/yr)	35	35	130	200
BOD (mg/L)	188	774	216	309
TDS (mg/L)	180	450	130	195
EC (dS/m)	0.286	0.735	0.208	0.314
pH	5.7	4.9	5.8	5.6
Total N (mg/L)	1.4	5.2	1.5	2.1
P (mg/L)	2.7	5.9	2.4	3.1
K (mg/L)	66	155	42	66

Pickles
The quantity of wastewater originating from the pickle line is quite small at less than 1% of the total. The wastewater from the pickle line has a salinity of 1000 mg/L (1.6 dS/m).

Other Products
Other products that will be processed include capsicum, celery, carrot, rice and onion. No information is available on the composition of the wastewater produced by these products and it is assumed that it will be similar to the average composition for sweet corn and tomato wastewater (Table 5).

Table 5. Estimated composition of wastewater from the pickles and other products processed at Parle Foods, Hanwood processing plant.

Analysis	Corn	Tomato	Estimated
Volume (ML/yr)	53	212	265
BOD (mg/L)	280	309	303
EC (dS/m)		.31	0.33
PH		5.6	
TN (mg/L)	174	2.1	36
P (mg/L)	36	3.1	9.7
K (mg/L)	131	66	79

Assuming that the composition of the wastewater produced by the other products is similar to the major wastewater producers - tomatoes and sweet corn, then the nutrient level would be classified as low (Table 4.7 EPA NSW 1995). However, the BOD (303 mg/L) is at the low end of the intermediate strength range 40 - 1500 mg/L.

Quantity of BOD Nutrients in Wastewater
The quantity of BOD and nutrients in the wastewater is shown in Table 6. The annual wastewater production contains 129 tonnes of BOD, 15.4 tonnes of nitrogen and 4.11 tonnes of phosphorus.

Table 6. Quantity of BOD, nitrogen and phosphorus in the wastewater streams and total content.

Component	Sweet corn		Tomatoes		Pickles		Other		Total	
	Conc mg/L	Amount kg/y	Conc mg/L	Amount kg/y	Conc mg/L	Amount kg/y	Conc mg/L	Amount kg/yr	Conc mg/L	Amount Kg/y
Volume (ML)	53		212		3.2		156		424	
BOD	280	14840	309	65508	303	970	303	47268	303	128.6
Nitrogen	174	9222	2.1	445	36	115	36	5616	36	15.4
Phosphorus	36	1908	3.1	657	9.7	31	9.7	1513	9.7	4.11

It is generally accepted that 10,000kg/ha/yr of BOD can be applied in surface irrigation without adverse effects (Meat Research Corporation 1995). The BOD applied here is estimated to be 129 t/yr (Table 6). Therefore, providing the effluent is applied to more than 13 ha, there should be no detrimental effect to the environment. Furthermore, Bowmer and Laut (1992) concluded that a BOD:N:P ratio of the order of 20:5:1 is ideal for successful stabilisation by micro-organisms. The ratio here is 31:3.7:1, close to the ideal.

Management of Nutrients

A number of alternatives have been evaluated to determine the most appropriate crops to manage the volume of wastewater and nutrients it contains. The strategy that will be adopted is to establish a wood lot for saw logs that will have a life of at least 16 years. On a separate area, forage maize will be grown during the summer and winter pasture during the winter. The above ground biomass of both crops will be removed with a forage harvester at the appropriate time.

Wood lot

A 15 ha wood lot will be established on the site and wastewater applied with drip irrigation.

Extensive research at Wagga has led to the development of guidelines for the management of sustainable effluent-irrigated plantations (Meyers et al 1999). Table 7 shows the estimated rate that nitrogen accumulation in the above ground parts of gum trees. The average nitrogen uptake for the first 8 years is 70 kg/ha/yr and will be used in the calculations.

The average phosphorus uptake varies from 8 to 12 kg/ha/yr and an average of 10 will be used in the calculations.

Table 7. Above ground accumulation rate of nitrogen in relation to stand age.

Interval (yr)	0 - 2	2 - 4	4 - 8	8 - 12	12 – 16	Average
Nitrogen (kg N /ha/yr)	79	84	57	35	17	48

The annual quantity of nutrients taken up by the 15 ha of wood lot in the 8 years after establishment is shown in Table 8.

Table 8. Quantity of nutrients taken up by the 15 ha wood lot.

Element	Concentration (kg/ha)	Quantity (kg/yr)
Nitrogen	70	1050
Phosphorus	10	150

Forage Maize

The crop that will be grown during the period of maximum wastewater production will be forage maize. The projected yield is 14 t dry matter/ha/y (Meat Research Council 1995).

In the FILTER project at Griffith (Blackwell et al 1999), 25 t dry matter /ha was produced with maize grown on border check with subsurface drainage but with irrigation water containing 4 times the quantity of salt. Therefore, the yield of forage maize of 14t dry matter/ha is considered realistic. The composition of the forage maize is based on Meat Research Corporation (1995) recommendations for plant nutrient removal in the harvested part of forage crops. The concentration and quantity of nitrogen and phosphorus taken up by this crop is shown in Table 9.

Table 9. Concentration of nutrients in the forage maize (Meat Research Corporation 1995) and winter pasture (Glendinning 1981) and nutrient uptake by the crops.

Element	Forage Maize		Winter Pasture		Total (kg/ha/y)
	Conc (mg/kg/)	Quantity (kg/ha/y)	Conc (mg/kg/)	Quantity (kg/ha/y)	
Nitrogen	110	154	260	130	284
Phosphorus	25	35	32	16	51

Winter Pasture

After the maize is harvested for silage in late April, a winter pasture containing annual ryegrass and sub clover will be sod seeded into the maize stubble. The pasture will be harvested with a forage harvester in late spring. The yield is estimated to be 5 t dry matter/ha, the composition of the pasture Glendinning (1981) and quantity of nutrients removed is shown in Table 9.

The nutrient balance and crop area required to achieve no net gain in nitrogen and phosphorus when applied to 10 ha of wood lot and 45 ha of crop is shown in Table 10.

Table 10. Quantity of nutrients removed by the summer and winter crops and area required for sustainable application.

Element	In Wastewater (t/yr)	Uptake Wood lot (t/yr)	Remainder (t/yr)	Crop Removal (kg/ha)	Crop Area Required (ha)
Nitrogen	15.4	1.0	14.4	284	51
Phosphorus	4.1	0.1	4.0	51	78

The estimated area required is 51 ha of crop to manage the nitrogen and 78 ha of crop to manage the phosphorus. The area required for nitrogen assumes no losses through volatilisation and denitrification will occur. A Canadian study (Bole et al 1985) showed that 45% of the labelled nitrogen applied in the wastewater was lost through denitrification and volatilisation. They attributed the high loss to the high levels of oxidisable carbon in the wastewater that enhanced denitrification.

An area of 45ha should be more than adequate to manage the nitrogen. The losses to achieve a nitrogen balance for this area is 13%.

The irrigation site now has available phosphate levels lower than desirable. The average value for the Olsen available phosphate test in the topsoil was 13 mg/kg (range 3 to 23). To achieve a sufficiency level for the crops planned, at least 20 mg/kg is required in the topsoil. Consequently, the opportunity exists to increase the available phosphate in the soil without a detrimental impact on the environment.

The phosphorus nutrient balance ignores the phosphorus fixation capacity of the soil.

Meyer et al (1999) developed a method to calculate the P retention capacity (TPR) of the soil and the P retention time. They found that their method yielded more accurate predictions of vertical soil P movement at the Wagga research site than other methods.

This method has been applied to the Parle Foods site. Here, the wastewater (424 ML/y) will be applied to 15 ha of wood lot and 45 ha of forage crops. The application rate will be 7.1 ML/ha/y.

TPR = P retained per kg* BD* ST/100

WhereBD = bulk density in kg/m³, and

ST = soil layer thickness (m).

The P retained value is 200 mg/kg (Meyer *et al* 1999). The average value of BD for transitional red-brown earth's is 1400 kg/m³ for the surface 20cm (Hornbuckle and Christen 1999). The soil layer thickness where the P accumulates is set at 0.2m. Therefore,

TPR = 200*1400*0.2/100

= 560 kg/ha

The P retention time (PRT) is calculated as follows:

PRT = PR/ Pa where

Pa = annual P loading

Here, the Pa will be the difference between the P applied in the wastewater (70.7 kg/ha/y - derived from Table 6) and the P removed by the crop (40 kg/ha/y - derived from Table 8).

PRT = 560/(71 - 51.0) = 18 y

Thus, the prediction is that after 18 y of wastewater application and crop removal, the surface 20cm soil will reach saturation and P will begin to move out of this zone. This time is longer than the time to when the trees will be harvested.

Salinity

The salinity of the wastewater is 0.33dS/m (Table 5) and is considered to be at the low end of the medium salinity range ((0 - 0.27 dS/m - EPA 1995). However, other authorities would consider it to be of low salinity (0 - 0.7 dS/m - Robbins et al 1991).

The wastewater is high in potassium (Table 5) and other nutrients and much of these will be removed by crops and therefore will not accumulate in the soil.

The annual salt loading excluding potassium is estimated to be 940kg/ha, similar to the salt loading for a rice crop.

When the potassium removal is taken into consideration, the wastewater can be considered to be of low salinity and suitable for border check irrigation.

Conclusions

The quantity and quality of the wastewater from the Parle Foods plant at Hanwood has been determined and the nitrogen and phosphorus levels are of low strength (Table 6). However, the BOD is at the low end of intermediate strength, the nutrient balance will encourage optimum microbiological activity and the land application rate will be considerably less than the maximum.

15 ha of wood lot and 45 ha of forage maize followed by a grass/clover winter pasture will be established to manage the nutrients. The biomass from both crops will be removed with a forage harvester. All of the nitrogen will be removed if a denitrification and volatilisation loss of 13% is assumed. There will be a slow increase in phosphorus over time. Initially this will increase the available phosphorus in the soil to levels that will allow optimum crop growth. Thereafter, the phosphorus will be adsorbed in the soil and it is estimated that no phosphorus will leave the root zone for at least 18 years. In addition, the organic matter will increase in the soil and immobilise more phosphorus.

The salinity of the wastewater will average 0.33 dS/m and is at the low end of the medium salinity range. The salinity is about twice that of irrigation supply water. However, this not considered as be an issue because of the high potassium content of the wastewater. The potassium will be removed when the crops are harvested.

6.9 Social and Economic Factors

6.9.1 Social

The proposed development will offer opportunities for both male and female employees and will employ people with a diversity of skills. The company has an in-house training policy and hence career opportunities will be available.

6.9.2 Economic

It is estimated that up to 120 personnel will be employed at the site when in full production.

Based on a commonly accepted ratio of 2.5:1 for this type of industry the development could be expected to create indirectly an additional 300 employment positions in the region.

It is estimated that the wage input to the area from the food processing plant will initially be about $4million in year 2000 with potential to increase to over $9million by year 2003.

There will be opportunities for existing companies in the area to tender for contract work, particularly in the areas of transport, maintenance and supplies.

7. ENVIRONMENTAL MONITORING

7.1 Air Quality

Testing of the boiler stack gas emissions will be initially carried out as soon as all of the boilers come online and are running at full capacity to ensure that the emission estimates used in this study are valid.

After the above initial testing has verified the outputs of the boilers meet EPA guidelines the boiler emissions will be monitored at regular intervals to ensure the boilers are being maintained and operated at maximum efficiency. The monitoring interval will depend on the individual boiler utilisations, however as a guide we purpose every twelve months based on operations at full capacity until a trend of performance is established after which the monitoring interval may be extended.

7.2 Groundwater

Initial base line water quality data has already been established by Coffeys during the site assessment for this study (Appendix I). It is proposed that the four monitoring wells established at the site by Coffeys be maintained and at least one more suite of testing be carried out on groundwater samples from the wells prior to wastewater irrigation being commenced to reinforce the baseline data information.

Monitoring of the groundwater level will be carried out monthly affer the commencement of the irrigation for at least twelve months and then reviewed based on the results and trends.

7.3 Soils

Baseline chemical characteristics of the soils over the site have been established by Coffeys as part of this study (refer Appendix I).

Monitoring of the soils over the site in the future will depend largely on the cropping types, rotations and wastewater composition and application rate.

It is proposed that surficial soil monitoring be carried out in irrigated areas initially at twelve monthly intervals for at least two (2) years extended to then twenty four month intervals to be reviewed based on monitoring results and trends.

7.4 Wastewater

In conjunction with the groundwater and soil monitoring program the chemistry of the wastewater will be monitored for each type of product processing until clear trends are established.

7.5 Cropping

Records of forage growth and yield in conjunction with wastewater application rates and quality will be maintained as a tool to calculate and manage the process of cropping and wastewater application in a manner to ensure soil/groundwater degradation does not occur.

7.6 Noise

At the end of twelve months or earlier when the plant has reached full design production, noise monitoring will be carried out to verify the validity of the modelling carried out as part of this study and to record noise impacts at the two (2) areas identified by the modelling where noise exceedances may occur. Based on the outcome of this monitoring, future monitoring intervals will be determined after taking into consideration any changes to the mode of operation.

8. POST CLOSURE

Remediation of the site to its present status will depend a lot on the length of time over which the operation is sustained, the results of the environmental monitoring that will be carried out during the operation of the facility and any alterations to the nature of the operation that may be approved along the way.

Based on the current plan of operation, post closure procedures would involve the following:

- A audit of environmental monitoring results;
- a phase 1 contamination assessment followed by a more detailed assessment if deemed necessary;
- clean up operations; and
- revegetation of disturbed areas.

9. CONCLUSION

9.1 Summary of Safeguard Measures

The proposed development incorporates a number of safeguards designed to mitigate any adverse effects of the development on the environment. These are described throughout the report and are summarised below:

Ecologically Sustainable Development

The project has committed to:

- protecting natural environments;
- water conservation;
- energy conservation;
- illustrating global standards of environmental responsibility; and
- waste avoidance and minimisation.

Water Quality Safeguards

Wastewater irrigated areas will be bunded and managed to prevent any stormwater from leaving the site. Stormwater from the plant and roads will be collected and diverted with drains to the stormwater retention dam from where it will also be pumped to the bunded irrigation area.

Stormwater from the other areas of the site will drain via the current Murrumbidgee drainage system.

Air Quality Safeguards

Potential impacts on air quality relate to emissions from the gas fired boilers, odour from the wastewater stream and dust from traffic.

Safeguards in respect to these potential impacts that will be applied at the site are:

- monitoring and maintenance of the boilers;
- odour complaints will be monitored, and if necessary plant notifications carried out;
- dust will be suppressed by watering or sealing offending areas; and
- tree plantations will act as a carbon sink.

Noise

The noise study indicates minor noise level exceedances may initially occur at the residences to the north of the site until the planned tree planting has been established. The levels of exceedance are rated as minor, 3 to 5dBA, and only likely to occur under temperature inversion conditions. Significant temperature inversion conditions are most likely to occur during winter nights and are assessed to occur approximately twenty five (25) times per year in the Griffith area based on available meteorological data. Given that the peak production period when the plant is operating twenty four (24) hours per day will be from January to April, when temperature inversions are rare the above exceedances are unlikely to occur.

The predicted levels of road train noise that may exceed the EPA Industrial Noise Criteria at the Farm 1054 residence are based on traffic intensities of two (2) road trains (or B doubles) in any fifteen minute period or four in any one hour. Opportunities to reduce potential noise exceedances could be achieved by scheduling the vehicles to more amenable periods or reducing the opportunity of successive movements per hour.

Traffic

The traffic assessment shows that the development will have no significant impacts on the existing road system based on the intersection of Crawford Road and Kidman Way being upgraded to accommodate slowing and turning vehicles and the upgrade of Crawford Road to road train standard.

Archaeological

No archaeological significant sites or artefacts were identified during the site assessment. Construction Management Plans will contain reference to procedures to follow in the unlikely event that an aboriginal relic is uncovered during site works.

Flora and Fauna

- No threatened specifies to be affected; and
- additional planting of primarily native species will provide additional habitat in the area.

Wastewater Management

Soil and groundwater studies carried out as part of this assessment show that the quantity and quality of the wastewater that will be produced at the plant can be disposed of by irrigation on a sustainable basis and yield a benefit in terms of crop and forestry production.

The study also shows that the total volume of water to be applied to the site is significantly less then when the land was used for irrigation and hence water conservation has been achieved and the regional impact on the groundwater level reduced.

Aesthetics

The planting of native trees around the perimeter of the site and the irrigated tree lot will generally enhance the landscape of the area.

Monitoring

The environmental monitor program will provide a "safewarning" system if any unforseen impacts were to emerge.

9.2 Concluding Statement

9.2.1 Need for the Proposal

Parle Foods Pty Ltd wish to establish a modern, high technology, fruit and vegetable processing, packaging and distribution facility at the Willbriggie site. The company has a significant market presence and can no longer meet market demands from their current facility in Griffith. The company has also identified significant opportunity to expand the business to supply to a growing overseas market. The new plant at Willbriggie will allow the company to meet current product demands and expand in the future.

9.2.2 Impact Assessment

Careful consideration has been given to the likely environmental consequences of the development relevant to the development approval process. Regard has been given to the requirements of the Environmental Planning and Assessment Regulation, Section 79C of the Environmental Planning and Assessment Act and the requirements of the Director-General. It is concluded that, having regard to the safeguards incorporated into the development and otherwise proposed, the development will have no significant adverse or impact on the environment of the locality.

9.2.3 Consequences of No Action or Deferral

The consequences of not carrying out the proposed development would be that the project objectives, benefits and elements of sustainability outlined in Section 3 would not be achieved. The proposed development has the following benefits:

- It will eliminate wastewater, odour and traffic impacts at the existing plant in the City of Griffith;
- It will enable the business to expand its NSW presence;
- It will increase Australian export value;
- It will reduce water consumption at the site and improve the appearance and habitat value of the site; and
- It provides a clean modern industry that complies with principles of ecological sustainability and has no significant adverse environmental impacts resulting from the processes involved.

9.2.4 Justification of the Proposal

In justifying the proposal consideration has been given to the suitability of the site as described above and in Section 2, the environmental impacts considered in Section 6 and the elements of sustainability summarised in Section 3.4. It is considered that the proposal is justified in that:

- the site is appropriate and suitable for the proposed development;
- the objectives of the proposal are satisfied;
- the proposed development is consistent with the principles of ecologically sustainable development as set out in Section 3.4 in that:
  - the proposal incorporates current proven technologies with certainty of proven effectiveness. There are no threats of serious or irreversible environmental damage and consequently the development is consistent with the precautionary principle;
  - the proposal serves the needs of the present generation in a manner that does not deprive future generations of a healthy, diverse and productive environment;
  - the proposal is consistent with biodiversity and ecological integrity. It encourages efficiency in fruit and vegetable processing, packaging and distribution, establishes habitat on land previously cleared for irrigation of rice and employs processes that have no significant effect on the environment; and
  - provides employment and growth opportunities in a regional area of NSW.

9.2.5 Conclusion

Having regard to the matters for consideration under Section 79C of the Environmental Planning and Assessment Act, and the Director General's requirements, it is considered that the proposed development is appropriate and should be approved.

For and on behalf of

COFFEY GEOSCIENCES PTY LTD

A P EDWARDS

MANAGER

Denotes relative location of the site

Coffey Geosciences Pty Ltd ACN 056 335 516		Geotechnical I Resources I Environmental I Technical I Project Management	
Drawn	MH	PARLE FOODS PTY LTD PROPOSED FOOD PROCESSING PLANT FARM 1059, WILLBRIGGIE, NSW	Drawing no: FIGURE 1
Approved	AE		
Date	26/06/2000		Job no: AWL6615/1
Scale	N.T.S		

Coffey

Coffey Geosciences Pty Ltd ACN 056 335 516

Geotechnical | Resources | Environmental | Technical | Project Management

Drawn	MH	PARLE FOODS PTY LTD ENVIRONMENTAL IMPACT STATEMENT PROPOSED FOOD PROCESSING PLANT FARM 1059, WILLBRIGGIE, NSW	Drawing no: FIGURE 2
Approved	AE		
Date	27/06/2000		
Scale	N.T.S		Job no: AWL6409/1

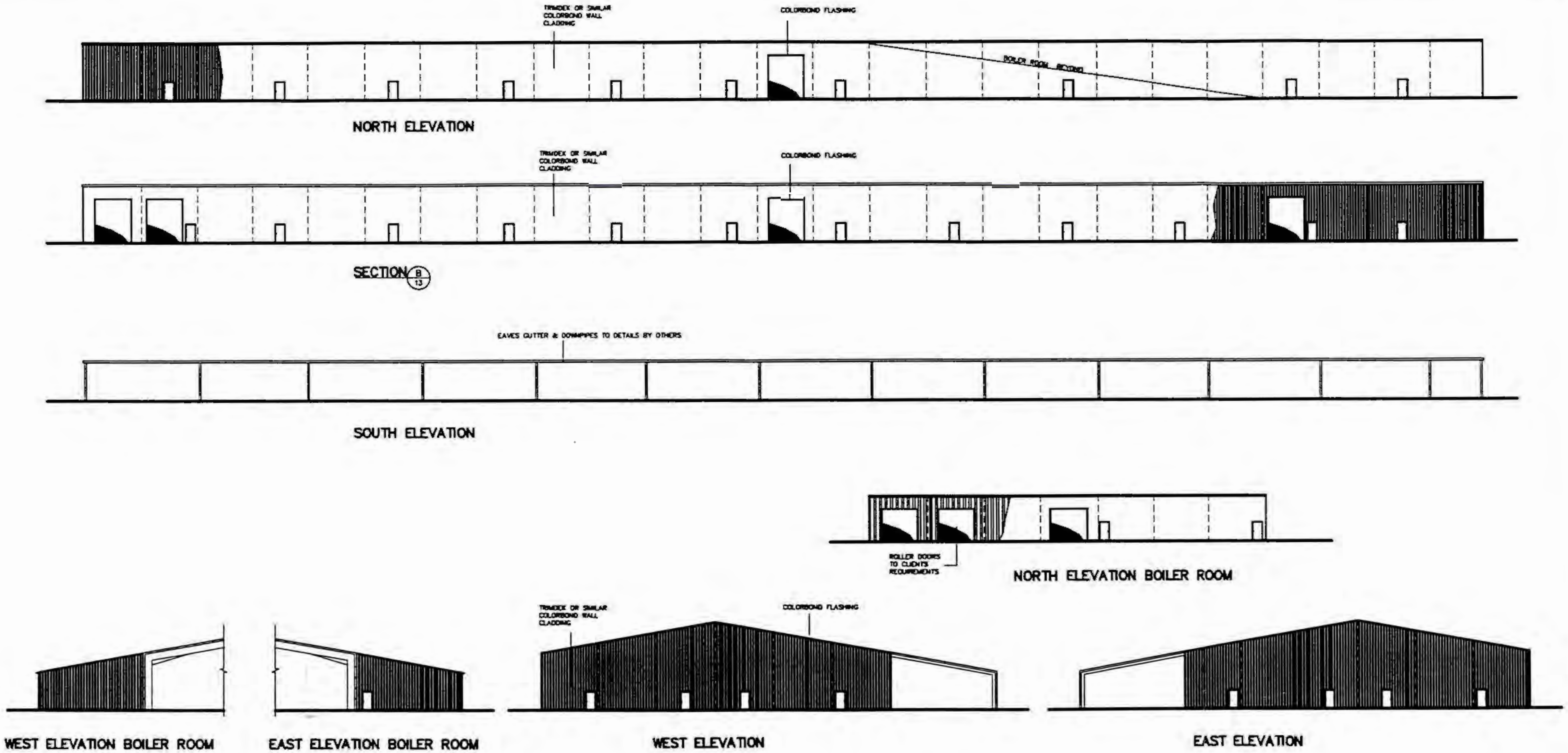
PARLE FOODS

Site Plan

Scale NTS

Coffey Geosciences Pty Ltd ACN 056 335 516 | Geotechnical | **Resources** | Environmental | **Technical** | Project Management

Drawn	MH	PARLE FOODS PTY LTD ENVIRONMENTAL IMPACT STATEMENT PROPOSED FOOD PROCESSING PLANT FARM 1059, WILLBRIGGIE, NSW	**Drawing no:** FIGURE 3
Approved	AE		
Date	27/06/2000		
Scale	N.T.S		Job no: AWL6409/1



NOTE: MAN DOOR LOCATIONS ARE DIAGRAMATIC ONLY DOOR LOCATIONS/DISTANCE OF TRAVEL TO BE DETERMINED ONCE MACHINERY LAYOUTS HAVE BEEN FINALISED.

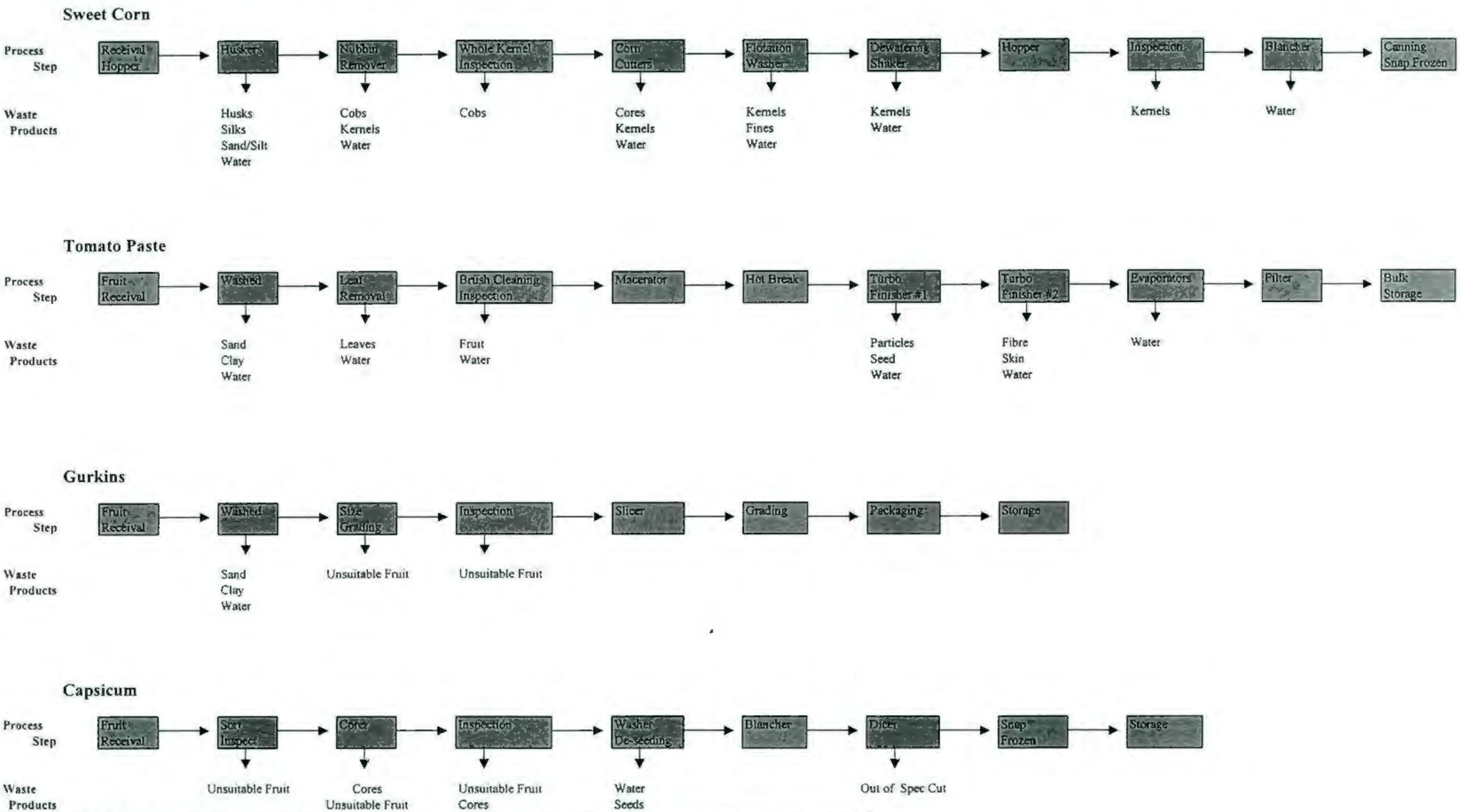
Coffey Geosciences Pty Ltd ACN 056 335 516		Geotechnical | Resources | Environmental | Technical | Project Management	
Drawn	MH	PARLE FOODS PTY LTD ENVIRONMENTAL IMPACT STATEMENT PROPOSED FOOD PROCESSING PLANT FARM 1059, WILLBRIGGIE, NSW	Drawing no: FIGURE 4
Approved	AE		
Date	27/06/2000		
Scale	N.T.S		Job no: AWL6409/1

PROPOSED PROCESSING SHED
PORTION 77.FARM 1059
HANWOOD N.S.W
for PARLE FOODS PTY LTD
ELEVATIONS & SECTIONS
Client: PARLE FOODS P/L

Scale: 1:250
Date: DEC 1999
Chk'd :
990961–A2

C:\ACAD\DRAW\990961b.dwg Wed Jun 07 16:25:43 2000

Process Flowchart - Parle Foods



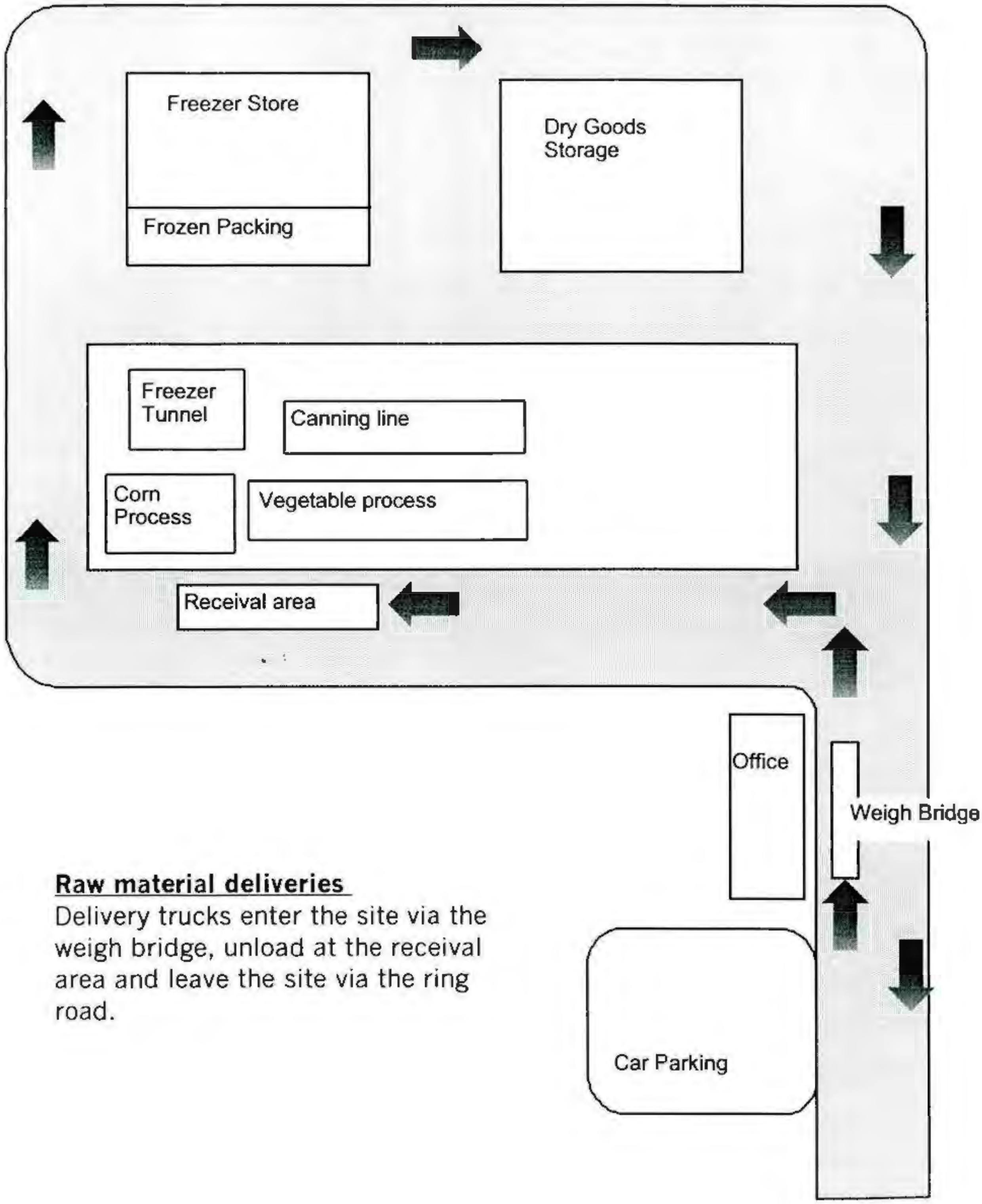
Coffey Geosciences Pty Ltd ACN 056 335 516

Geotechnical | Resources | Environmental | Technical | Project Management

Drawn	MH	PARLE FOODS PTY LTD.	Drawing no:
Approved	AE	ENVIRONMENTAL IMPACT STATEMENT	FIGURE 5
Date	15/08/2000	PROPOSED FOOD PROCESSING PLANT	
Scale	N.T.S	FARM 1059, WILLBRIGGIE, NSW PROCESS FLOWCHART	Job no: AWL 6615/1-BD

Wastewater Sources

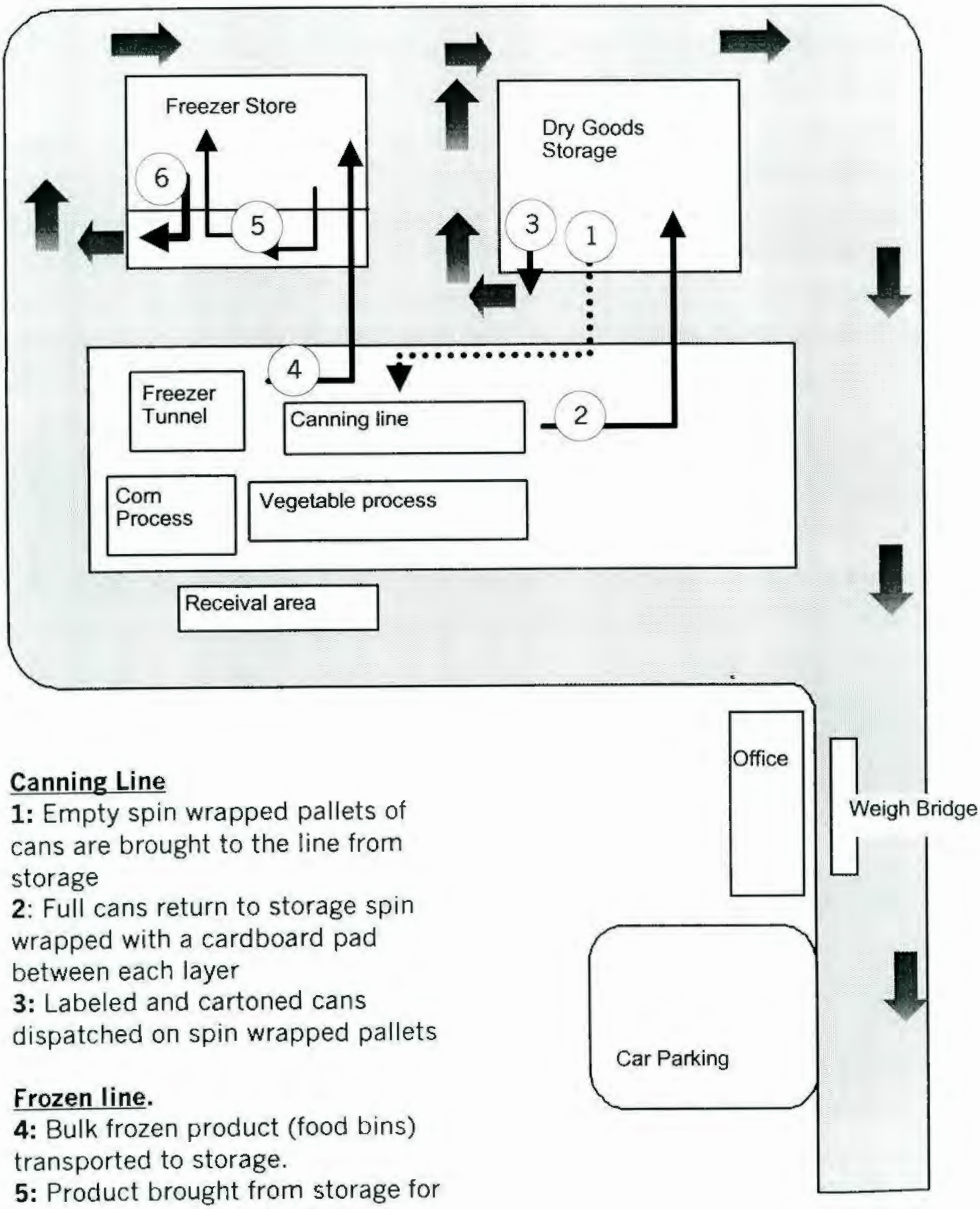
Traffic Flow - Truck Deliveries (Raw Material)



Truck Flow direction

Coffey Geosciences Pty Ltd ACN 056 335 516		Geotechnical | Resources | Environmental | Technical | Project Management	
Drawn	MH	PARLE FOODS PTY LTD. ENVIRONMENTAL IMPACT STATEMENT PROPOSED FOOD PROCESSING PLANT FARM 1059, WILLBRIGGIE, NSW TRAFFIC FLOW - TRUCK DELIVERIES	Drawing no: FIGURE 6
Approved	AE		
Date	15/08/2000		
Scale	N.T.S.		Job no: AWL6615/1-BD

Forklift Traffic Flow.
Process to Storage. Storage to dispatch



Canning Line

1: Empty spin wrapped pallets of cans are brought to the line from storage

2: Full cans return to storage spin wrapped with a cardboard pad between each layer

3: Labeled and cartoned cans dispatched on spin wrapped pallets

Frozen line.

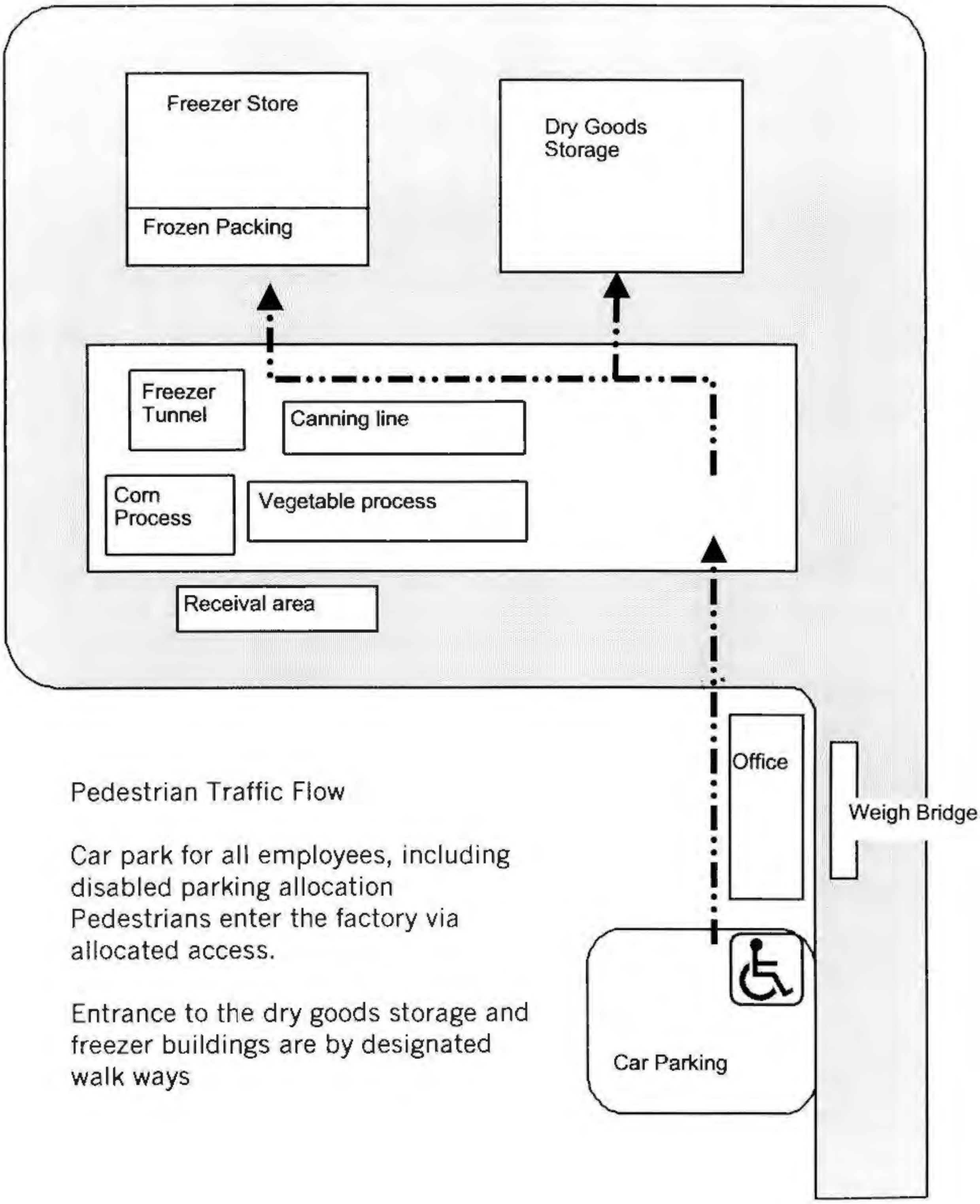
4: Bulk frozen product (food bins) transported to storage.

5: Product brought from storage for packing, and returned to storage.

6: Pallets frozen product from storage to dispatch in Refrigerated vans.

offey Geosciences Pty Ltd ACN 056 335 516		Geotechnical | Resources | Environmental | Technical | Project Management
rawn	MH	PARLE FOODS PTY LTD ENVIRONMENTAL IMPACT STATEMENT PROPOSED FOOD PROCESSING PLANT FARM 1059, WILLBRIGGIE, NSW FORKLIFT TRAFFIC FLOW	Drawing no: FIGURE 7 Job no: AWL6615/1-BD
pproved	AE		
ate	15/08/2000		
cale	N.T.S		

Pedestrian Traffic Flow



Pedestrian Traffic Flow

Car park for all employees, including disabled parking allocation
Pedestrians enter the factory via allocated access.

Entrance to the dry goods storage and freezer buildings are by designated walk ways

offey Geosciences Pty Ltd ACN 056 335 516		Geotechnical | Resources | Environmental | Technical | Project Management	
rawn	MH	PARLE FOODS PTY LTD ENVIRONMENTAL IMPACT STATEMENT PROPOSED FOOD PROCESSING PLANT FARM 1059, WILLBRIGGIE, NSW PEDESTRIAN TRAFFIC FLOW	Drawing no: FIGURE 8
proved	AE		
ate	15/08/2000		
cale	N.T.S		Job no: AWL6615/1-BD