Baiada Poultry Pty Limited

STATEMENT OF ENVIRONMENTAL EFFECTS

Section 96(2) Modification Application

APPENDIX H –

Odour Impact Assessment Study
(*The Odour Unit, 2006)*

Oakburn Processing Complex
Oxley Highway, Tamworth NSW

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THE ODOUR UNIT

Baiada Poultry Pty Limited

Odour Impact Assessment Study

Poultry Processing Plant

Tamworth NSW

Final Report

August 2006

THE ODOUR UNIT PTY LTD

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Project Number: 1245

Report Revision		
Revision Number	**Date**	**Description**
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Final	30.08.2006	Final Report for Review by Baiada Poultry Pty Ltd and Bath, Stewart Associates Pty Ltd incorporating comments from Bath Stewart Associates Pty Ltd.
Report Preparation		
Report Prepared By: A. Balch & T. Schulz		Approved By: T. Schulz
Report Title: Baiada Poultry Pty Limited – Tamworth Poultry Processing Plant - Odour Impact Assessment Study		

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1 INTRODUCTION

Baiada Poultry Pty Limited (Baiada) is planning to increase the production capacity of their poultry processing facility (PPF) at Tamworth, NSW from 750,000 to 1,000,000 birds per week. In order to facilitate this expansion, their current plant at Out St, Tamworth is to be re-located to the 'Oakburn' site (Lot 1 in DP 878642) on the Oxley Highway, adjacent to Tamworth Airport. The Baiada Protein Recovery Plant (PRP) is currently situated at the Oakburn site. The new poultry processing facility will be developed on the site between the current PRP and the highway.

In December 2005, Bath, Stewart Associates Pty Limited (BSA) commissioned The Odour Unit Pty Limited (TOU) on behalf of Baiada to conduct an odour impact assessment study into the projected odour impact of the new poultry processing facility operations for inclusion in a Statement of Environmental Effects. On 1 February 2006 Terry Schulz (TOU Principal and Director) and Andrew Balch (Manager, Odour Impact Assessment) carried out a site investigation of Baiada's current Out St PPF, and the Oakburn site and PRP. During the investigation of the PRP, the operations of the odour control unit (biofilter) were inspected. The design of the new PPF incorporates the biofilter into the treatment of several point source odour streams from the PPF.

TOU's approach to the study was to apply emission rates determined by a previous sampling and testing survey at a similar facility to production rates planned for the Oakburn facility, and to input these into a plume dispersion model with site-specific meteorology and terrain data. The model was then used to project the odour footprint in the local area for a variety of ground level concentrations to reflect current and possible future population densities. TOU used the Ausplume V6.0 Gaussian plume dispersion model in accordance with the NSW Department of Environment and Conservation's (NSW DEC) guidelines as the performance criterion. This guideline

specifies an odour criterion based on population density of between two and seven odour units at the nearest sensitive receptor for 99.0% of the time with a one second nose response time.

This report describes the methods used in the modelling study in relation to the NSW DEC odour criteria, and discusses the method employed for the determination of odour emission rates used in the model. The report then documents the findings of the dispersion modelling, and discusses the operational matters relating to odours from the planned PPF.

2 ODOUR SOURCES AND ODOUR EMISSION RATES

2.1 OAKBURN POULTRY PROCESSING FACILITY

For this odour impact assessment study, TOU developed an inventory of odour sources for the PPF based on both their experience in odour sampling and testing at several similar plants and their investigation of Baiada's current Tamworth operations. No odour sampling was conducted during the February 2006 site visit. **Table 2.1** presents the odour sources identified and the way it was accounted for during the dispersion modelling study.

Table 2.1: Odour sources and how they are treated in the study.

Process	Source Type	Included in the Dispersion Model?	Comment
On-trailer live bird storage	Volume/roof vent	Yes	Building under positive pressure from inlet fans and vented from open doorway and roofline ridge vent
Live bird reception area	Volume/roof vent	Yes	Building under positive pressure from inlet fans and vented from open doorway and roofline ridge vent
Bird scalding and picking line	Point	No	Emissions to be treated in the biofilter
Vacuum pumps for blood and offal transport to the PRP	Point	No	Emissions to be treated in the biofilter
Kill floor room air	Point	No	Emissions to be treated in the biofilter
Processing areas room air	Point	No	Emissions considered to be negligible during site investigation
Wash down wastewater	Area	No	Wastewater to be treated in covered anaerobic lagoon and/or a DAF unit.

TOU's previous experience has determined that the primary sources of odour from poultry processing plants are the live bird handling areas, the scalding stack/vent and the treatment of wastewater. Live bird handling involves the reception of trucks full of birds, the storage of the birds in cages while still on the trucks, the unloading of birds from the trucks and the introduction of birds into the production process. Baiada

management reported that there are approximately 8,000 birds on each truck. Baiada proposes to operate two discrete enclosed areas for the purposes of live bird handling. The first building, the On Trailer Bird Storage Building (OTBS) is designed to store a maximum of eight trucks prior to unloading and operate between 2300 hours and 1500 hours the following day. The second building, the Live Bird Reception Building (LBR) will receive up to three trucks at one time for bird unloading and operate between 0300 hours and 1500 hours. This building adjoins the start of the production process where birds enter the system. As both buildings will operate for only part of the day as trucks arrive and wait for a period before birds are processed, TOU developed a model to account for the daily truck movements and bird numbers and applied an emission rate to each bird as their on-site movements were tracked through the system. The determination of this emission rate will be discussed in **Section 2.2**.

TOU have commonly found at many similar plants that the bird scalding process emissions are released from a roof stack. However, at Baiada's Oakburn plant, provisions have been made in the facility's design for these emissions to be treated in the PRP's biofilter. This emission, therefore, has been omitted from the dispersion modelling study.

A further source of odour at many poultry processing plants is the treatment of wastewater, which generates odour in two main ways. Firstly, the cleaning of the process areas within the PPF produces wastewater mixed with blood and other organics including fats, which generate odours in the building during 'washdown', and secondly, during their treatment in the wastewater treatment plant. Baiada proposes to extract odours generated by the wastewater in the process building during the washdown process and treat them through the biofilter. These odours generally have a very low odour concentration, although the volume of air may be significant depending on building ventilation rates. This treatment however, will eliminate them as a source of odour. In the case of the wastewater treatment plant, odours generated here are likely to be high in concentration, but as they would constitute an

area source emission, their dispersion is a function of atmospheric boundary layer conditions. At present, Baiada propose to treat the wastewater in an enclosed DAF unit and/or anaerobic ponds. TOU recommends that these anaerobic ponds be covered and the odorous air above the pond surface be extracted and treated before release to the atmosphere.

Baiada also propose to dry clean the live bird handling areas to remove approximately 95% of the litter and other odorous material, before a light hose down completes the cleaning process. The emission rate determination model was designed to account for odours generated by both the actual birds and the litter present.

2.2 LIVE BIRD ODOUR EMISSION RATES

Several studies have been conducted to develop representative odour emission rates (OER) for poultry. Specifically, these studies have tended to concentrate on emissions from broiler sheds, however in the absence of site-specific emission rates for the handling of live birds at Baiada, it is prudent to discuss these OERs here.

The Western Australian Department of Environmental Protection (DEP) commissioned the University of NSW in 1997/8 to conduct a study on WA poultry farm odour emissions to develop a standard OER to be used for odour impact assessment studies in WA. Jiang and Sands (1998) found that a Specific Odour Emission Rate (SOER) of 195 ou s^{-1} per 1,000 birds was appropriate for WA farms. This emission rate was the result of extensive sampling and olfactometry testing at several poultry farms in WA. While the DEP withdrew their Guidance Note 47 that documented this SOER in late 2005 (for a variety of unrelated reasons), this value is useful as a guideline for emissions.

A more recent study on odour emissions from poultry farms was commissioned by the Australian Poultry CRC and carried out by GHD in 2003. GHD measured a range of SOERs from 190 to 240 ou s^{-1} per 1,000 birds, from several tunnel-ventilated and naturally ventilated poultry sheds.

In July 2005, TOU conducted an odour sampling, olfactometry testing and dispersion modelling study for another poultry client in WA at a processing facility very similar to the Baiada Oakburn plant. While production rates were less than those proposed at Oakburn, an SOER of 350 ou s^{-1} per 1,000 birds was determined. In that study the birds were caged and on trucks in an identical fashion to that proposed by Baiada, after transportation from the farm to the plant. Substantial litter was evident in the cages.

In this study, the odour units per bird were calculated by dividing the OER by the number of birds present at the time of each sampling event, and averaging the value over four events. The OER for the Live Bird Reception Area was derived from the product of the measured odour concentration (ou), the cross sectional area of the Reception Building opening (truck access point) and the wind velocity flowing through the building, which is a combination of the natural ventilation provided by the wind through the open area and the fans which induce additional flow. The range measured was between 220 and 550 ou s^{-1} per 1,000 birds with a mean of 350 ou s^{-1} per 1,000 birds.

Table 2.2 presents a summary of the SOERs discussed above and considered for this study.

Table 2.2: Comparison of SOERs from Poultry Studies	
Source	**Mean Specific Odour Emission Rate (i.e., odour units per bird)**
Jiang and Sands (1998)	0.195
GHD (2003)	0.215
TOU (2005)	0.350

In order to determine the worse case scenario, and to represent emissions from caged birds stored in a confined area in similar conditions to those predicted to occur at the Baiada PPF, TOU have used an SOER of 350 ou s^{-1} per 1,000 birds in this modelling study. **Table 2.3** outlines the calculation of hourly emission rates for the On Trailer Bird Storage Building based on the number of birds on hand each hour. **Table 2.4** outlines the calculation of hourly emission rates for the Live Bird Reception Building based on the number of birds on hand each hour.

Table 2.3: On Trailer Bird Storage Building Variable Hourly Emission Rates									
Hour of Day	No. of trucks offloading per hour	Birds Processed per hour	Cumulative Birds on Hand at end of hour	ou/bird	OER	No. of Stacks	OER / Stack each hour	Peak to Mean	OER with PM
1:00 AM	0	0	0	0.35	0	6	0	2.3	0
2:00 AM	0	0	0	0.35	0	6	0	2.3	0
3:00 AM	1	0	8,000	0.35	2,800	6	467	2.3	1,073
4:00 AM	2	0	24,000	0.35	8,400	6	1,400	2.3	3,220
5:00 AM	2	0	40,000	0.35	14,000	6	2,333	2.3	5,367
6:00 AM	2	18,000	38,000	0.35	13,300	6	2,217	2.3	5,098
7:00 AM	2	18,000	36,000	0.35	12,600	6	2,100	2.3	4,830
8:00 AM	2	18,000	34,000	0.35	11,900	6	1,983	2.3	4,562
9:00 AM	2	18,000	32,000	0.35	11,200	6	1,867	2.3	4,293
10:00 AM	3	18,000	38,000	0.35	13,300	6	2,217	2.3	5,098
11:00 AM	3	18,000	44,000	0.35	15,400	6	2,567	2.3	5,903
12:00 PM	3	18,000	50,000	0.35	17,500	6	2,917	2.3	6,708
1:00 PM	3	18,000	56,000	0.35	19,600	6	3,267	2.3	7,513
2:00 PM	2	18,000	54,000	0.35	18,900	6	3,150	2.3	7,245
3:00 PM	0	18,000	36,000	0.35	12,600	6	2,100	2.3	4,830
4:00 PM	0	18,000	18,000	0.35	6,300	6	1,050	2.3	2,415
5:00 PM	0	18,000	0	0.35	0	6	0	2.3	0
6:00 PM	0	0	0	0.35	0	6	0	2.3	0
7:00 PM	0	0	0	0.35	0	6	0	2.3	0
8:00 PM	0	0	0	0.35	0	6	0	2.3	0
9:00 PM	0	0	0	0.35	0	6	0	2.3	0
10:00 PM	0	0	0	0.35	0	6	0	2.3	0
11:00 PM	0	0	0	0.35	0	6	0	2.3	0
12:00 AM	0	0	0	0.35	0	6	0	2.3	0

Table 2.4: Live Bird Reception Building Variable Hourly Emission Rates

Hour of Day	No. of trucks arriving per hour	No. of trucks leaving per hour	Cumulative Trucks on Hand at end of hour	Cumulative Birds on Hand at end of hour	ou/ bird	OER	No. of Stacks	OER / Stack each hour	Peak to Mean	OER with PM
1:00 AM	1	0	3	24,000	0.35	8,400	6	1,400	2.3	3,220
2:00 AM	1	0	4	32,000	0.35	11,200	6	1,867	2.3	4,293
3:00 AM	2	1	5	40,000	0.35	14,000	6	2,333	2.3	5,367
4:00 AM	2	2	5	40,000	0.35	14,000	6	2,333	2.3	5,367
5:00 AM	3	2	6	48,000	0.35	16,800	6	2,800	2.3	6,440
6:00 AM	2	2	6	48,000	0.35	16,800	6	2,800	2.3	6,440
7:00 AM	3	2	7	56,000	0.35	19,600	6	3,267	2.3	7,513
8:00 AM	3	2	8	64,000	0.35	22,400	6	3,733	2.3	8,587
9:00 AM	2	2	8	64,000	0.35	22,400	6	3,733	2.3	8,587
10:00 AM	2	3	7	56,000	0.35	19,600	6	3,267	2.3	7,513
11:00 AM	2	3	6	48,000	0.35	16,800	6	2,800	2.3	6,440
12:00 PM	2	3	5	40,000	0.35	14,000	6	2,333	2.3	5,367
1:00 PM	0	3	2	16,000	0.35	5,600	6	933	2.3	2,147
2:00 PM	0	2	0	0	0.35	0	6	0	2.3	0
3:00 PM	0	0	0	0	0.35	0	6	0	2.3	0
4:00 PM	0	0	0	0	0.35	0	6	0	2.3	0
5:00 PM	0	0	0	0	0.35	0	6	0	2.3	0
6:00 PM	0	0	0	0	0.35	0	6	0	2.3	0
7:00 PM	0	0	0	0	0.35	0	6	0	2.3	0
8:00 PM	0	0	0	0	0.35	0	6	0	2.3	0
9:00 PM	0	0	0	0	0.35	0	6	0	2.3	0
10:00 PM	0	0	0	0	0.35	0	6	0	2.3	0
11:00 PM	1	0	1	8,000	0.35	2,800	6	467	2.3	1,073
12:00 AM	1	0	2	16,000	0.35	5,600	6	933	2.3	2,147

3 NSW ODOUR CRITERIA AND DISPERSION MODEL GUIDELINES

Regulatory authority guidelines for odorous impacts of gaseous process emissions are not designed to satisfy a 'zero odour impact criteria', but rather to minimise the nuisance effect to acceptable levels of these emissions to a large range of odour sensitive receptors within the local community.

In accordance with the requirements of the Department of Planning, the odour impact assessment for this project has been carried out in accordance with the methods outlined by the NSW DEC documents:

"*Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*" (2005), and

"*Draft Policy: Assessment and Management of Odour from Stationary Sources in NSW*" (2001).

The DEC Approved Methods document specifies that the odour modelling for Level 3 impact assessments upon which this assessment is made be based on the use of:

- 99.0th percentile dispersion model predictions;
- 1-hour averaging times with built–in peak-to-mean ratios to adjust the averaging time to a 1-second nose-response-time;
- The peak-to-mean ratio in the near-field for a wake-affected stack/roof vent source for Pasquill-Gifford atmospheric stability classes A-F is 2.3.

- The peak-to-mean ratio in the near-field for an area source for Pasquill-Gifford atmospheric stability classes A-D is 2.5 and E-F is 2.3.
- The appropriate odour unit performance criterion, based on the population of the affected community in the vicinity of the development.

The impact assessment criteria for complex mixtures of odours are designed to include receptors with a range of sensitivities. Therefore a statistical approach is used to determine the acceptable ground level concentration of odour at the nearest sensitive receptor. This criterion is determined by the following equation outlined in the DEC's *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW 2005* (p. 37):

$$\textbf{Impact assessment criterion (ou)} = (\log_{10}(\textbf{population}) - 4.5) / -0.6$$

Based on this equation, **Table 6.1** outlines the odour performance criteria for six different affected population density categories, and is reproduced from the DEC's Approved Methods document. It states that higher odour concentrations are permitted in lower population density applications.

Table 3.1: Odour Performance Criteria under Various Population Densities

Population of affected community	Odour performance criterion (ou)
Urban Area (≥ ~2000)	2.0
~500	3.0
~125	4.0
~30	5.0
~10	6.0
Single residence (≤ ~2)	7.0

Source: Department of Environment and Conservation (NSW), 2001, Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales.

Based on **Table 6.1** and an approximation of the population density, on property zoned both residential and commercial/industrial, surrounding the Baiada Poultry Processing facility at Oakburn, the suggested odour performance criterion (OPC) adopted for this study is 5 odour units. TOU believe that 5 ou is a very conservative OPC given the low population density in the local area and the rural nature of the environment.

4 ODOUR DISPERSION MODELLING METHOD

4.1 THE ODOUR DISPERSION MODEL

The odour dispersion modelling study for Baiada at Tamworth was carried out using AUSPLUME Version 6.0, a Gaussian, steady-state, plume dispersion model developed by the Victorian Environmental Protection Authority (EPA Victoria). Ausplume is the approved dispersion model recommended by the NSW DEC in their document - *Approved Methods and Guidance For the Modelling and Assessment of Air Pollutants in New South Wales (2005).*

The Ausplume V6.0 atmospheric dispersion model is used to project downwind ground level concentrations of air contaminants by taking into consideration various factors including:

- Odour emissions data - odour emission rate and source dimensions;
- Site specific meteorology;
- Geophysical impact (topography); and
- Building wake effects.

For this study, the air contaminant was odour and ground level concentrations in odour units (ou) have been projected.

4.2 METEOROLOGICAL DATASET

The meteorological dataset used in this study was developed using The Air Pollution Model (TAPM), and based on the 2002 synoptic meteorology dataset. TAPM is a prognostic meteorological model that incorporates several parameters such as synoptic scale meteorology, local topography and land use (including soil and vegetation) datasets into a site-specific meteorological profile, representative of hourly observations over a one-year period. The dataset can then be formatted for use in the Ausplume dispersion model for the projection of downwind odour concentrations.

TAPM can also be run with observational data assimilated with the database records. In this mode, the synoptic scale records and prognostic meteorological parameterisations are guided by an observational dataset collected at a surface automatic weather station (AWS). In this study, TAPM data has been assimilated with observational data collected at the Tamworth Airport Bureau of Meteorology (BoM) AWS located adjacent to the Baiada site.

The Baiada site location input into TAPM is longitude of 151° 49.5' E and latitude 31° 3.5' S.

The TAPM dataset for 2002 used in the Ausplume model was found to be the most representative after data assimilation. The data is presented as wind roses for wind direction and wind speed in **Appendix A**, and compared with the Tamworth Airport observations for 1992-2006. The observations data file obtained from the BoM consisted of three hourly temperature, wind direction and wind speed information only.

The wind rose analyses for the annual dataset shows reasonable representation, with a slight underestimation of winds >4 m s^{-1} from the southeast, and a slight

overestimation of winds from the northwest, mainly >2 m s^{-1}. The seasonal wind rose plots show that these differences mainly occur during winter and spring. This is unlikely to present a problem in modelling the 99.0th percentile impacts, as winds greater than 4 m s^{-1} are generally well dispersed and non-problematical. Adverse odour impacts are also likely to be more prevalent during warmer months, as elevated temperatures tend to result in higher odour emissions. It is also important to note that, while calm to light wind conditions are the most problematical in terms of poor dispersion and odour nuisance, the standard Gaussian dispersion formulation intrinsic to the Ausplume model fails to adequately cope with wind velocities below 0.5 m s^{-1}. As a result, all winds < 0.5 m s^{-1} are treated as 0.5 m s^{-1} by the model.

In addition to wind direction and speed, atmospheric stability is an important factor in odour transport and dispersion. Stability refers to the vertical movement of the atmosphere and subsequently the dispersion of pollutants vertically within the atmospheric boundary layer. Atmospheric stability is classified under the Pasquill-Gifford scheme where seven stability classes have been defined as: A – very unstable; B – unstable; C – slightly unstable; D – neutral; E – slightly stable; F – stable; and G – very stable. F and G tend to be grouped together as F in dispersion models. When the atmosphere is stable, vertical movement is suppressed and dispersion is poor. This is the case for classes E and F, which are apparent during temperature inversions. Neutral conditions also result in poor vertical dispersion for ambient temperature or cool plumes. The frequency distribution of each stability class for the TAPM dataset used in the modelling study is presented in **Table 4.1**, and shown graphically in **Figure 4.1**.

Table 4.1: Tamworth stability class frequency in met file		
Pasquill-Gifford Scheme Stability Class	**Frequency (hours)**	**Percent (%)**
A	724	8.3
B	1143	13.0
C	1044	11.9
D	2122	24.2
E	1458	16.6
F	2269	25.9
Total	**8760**	**100.0**

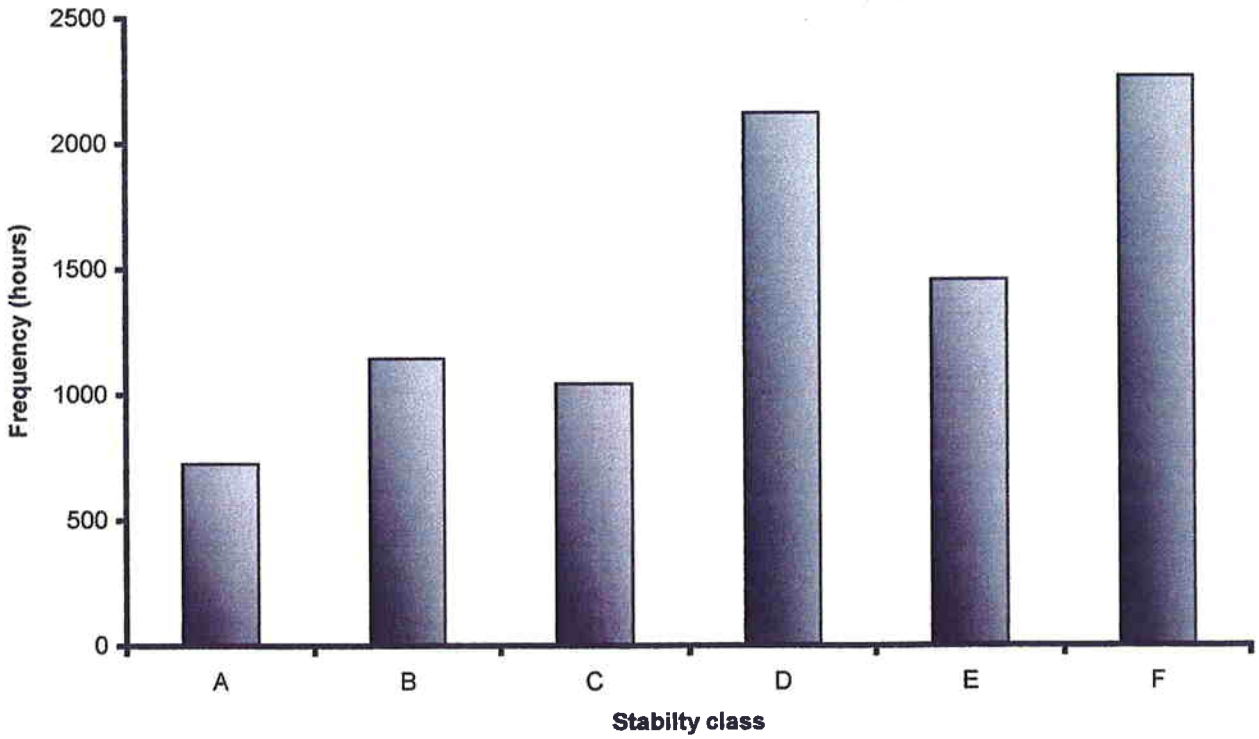


Figure 4.1: Stability Class Frequency Distribution for the TAPM dataset.

Table 4.1 shows that the atmosphere in the region of the facility is stable for 42.5% of the year, and neutral for a further 24.2%.

4.3 TOPOGRAPHICAL DATA AND LAND USE

Topographical information was incorporated into the dispersion model from the 1:25,000 scale topographic map *Tamworth 9035-I-N (Second Edition)*, produced by the Central Mapping Authority of NSW. In the case of the area of interest in this study, the topography was generally a flat rural landscape 390 m above sea level and therefore the surface roughness category (Z_o) used in the dispersion model was 0.1 m. The Tamworth area is situated on the western slopes of the Great Dividing Range.

The Baiada site is positioned along the Oxley Highway between Tamworth and Gunnedah, in a rural setting with very few residential neighbours within a 1-2 km radius. Adjacent to the site is Tamworth Airport, with the terminal building situated approximately 2 km to the south-southeast. A significant percentage of the land surrounding the site is open pasture. There are also two abattoirs, one with an adjoining rendering plant, situated approximately 1.4 km to the east. To the northwest a minimum of around 600 m away is a motor racing speedway, which is unlikely to be impacted as its main operational hours are likely to be outside of Baiada's shift times.

4.4 GRIDDED RECEPTOR FILE

The Receptor file used in the model was a Cartesian grid with receptors spaced at 100 m by 100 m intervals. The grid extended to more than 2,000 m in all directions around the facility.

4.5 SITE LAYOUT AND BUILDING DIMENSIONS

The layout of the Baiada Oakburn site has been graphically illustrated using site specific Australian Map Grid (AMG) coordinates based on Australian Geodetic Datum

(AGD) 1966 in **Figure 4.2** to show the positioning of the buildings input to the Ausplume model Building Profile Input Program (BPIP), which calculates the affects of building wake turbulence with respect to odour dispersion. This data is also presented in **Table 4.2**. The position of the buildings is an approximation as no exact site plan with specific coordinates was supplied to TOU during the study. A plan of the future site layout is presented in **Appendix B**.

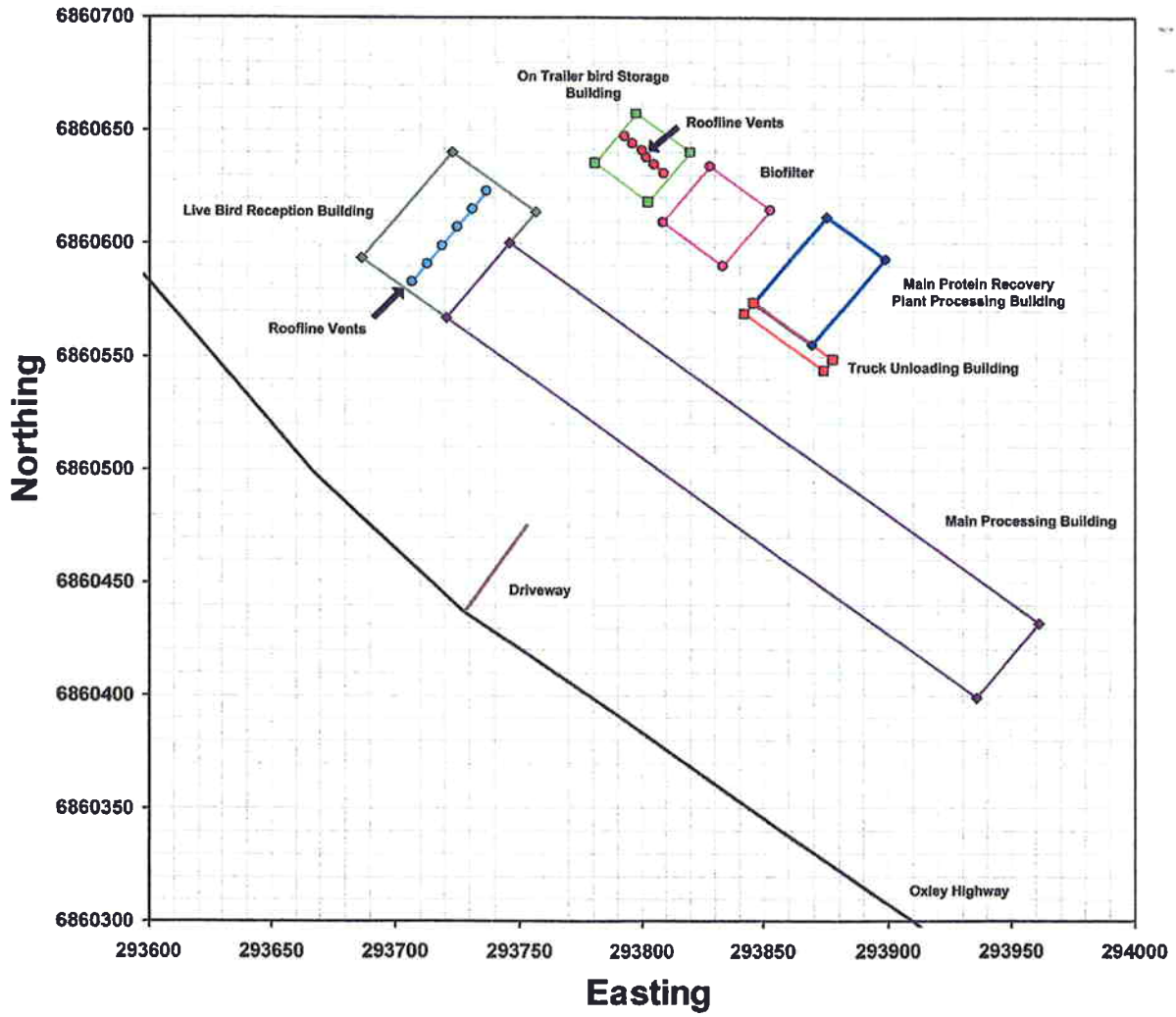


Figure 4.2: Graphical representation of the PPF and PRP showing positions of the roof vent and biofilter sources used in the dispersion model. Coordinates are Australian Map Grid based on AGD 1966. All structures were input to the Building Profile Input Program (BPIP) within the Ausplume model.

Note: The building dimensions are accurate as supplied by Baiada, however their exact spatial positioning is approximated.

Table 4.2: Building Co-ordinates (AGD66)				
Building	**Building Area Dimensions**	**Building Height**	**Building Corner Coordinates**	
Building	**Length x Width (m)**	**(m)**	**X Coordinate**	**Y Coordinate**
Main Processing Plant	273 x 41.8	5.5	293721	6860567
			293936	6860399
			293961	6860432
			293746	6860600
Live Bird Reception Area	58.9 x 42.9	7.0	293723	6860640
			293757	6860614
			293721	6860567
			293687	6860594
On Trailer Bird Storage	28.0 x 28.0	6.0	293820	6860640
			293803	6860618
			293781	6860635
			293798	6860657
Protein Recovery Plant Main Building	48.1 x 29.8	7	293846	6860574
			293869	6860555
			293899	6860593
			293875	6860612
Protein Recovery Plant Truck Offloading Building	40.6 x 6.0	12	293842	6860569
			293874	6860544
			293878	6860549
			293846	6860574
Protein Recovery Plant Biofilter	31.35 x 31.35	2	293828	6860634
			293853	6860615
			293833	6860590
			293809	6860609

4.6 DISPERSION MODEL SOURCE AND EMISSION RATE CONFIGURATIONS

Both point and area source emissions were modelled in this study. The point sources consisted a series of roof vents on the On Trailer Bird Storage and Live Bird Reception Buildings, while the area source was the biofilter. The biofilter has been modelled separately to the untreated process sources as the emissions are not cumulative and have a vast different character. In addition, the biofilter treats multiple sources including those from the PRP.

Baiada plan to ventilate the On Trailer Bird Storage (OTBS) and Live Bird Reception (LBR) Buildings using multiple fans to draw air into the building, with the convective emissions released through a roof ridgeline vent running the length of the building, or from several roof vents. During normal operations with trucks frequently entering and exiting the building, Baiada plan to operate with the truck portals remaining open at all times during the shift. TOU suggest that fast action doors be implemented in order to prevent fugitive emissions and encourage emissions to exit from the roof vents. These roof vents may also require fans to provide adequate dispersion, however this has not been considered in the current modelling study. The Ausplume model has been set up to account for emissions from these buildings to be released via the roof vents under convection given that the building will be sealed and emissions from doorways minimised. The positions of the roof vents are presented in **Table 4.3**. The area source co-ordinates are presented in **Table 4.4**.

The point source model configuration data is presented in **Table 4.5**, while the area source data is in **Table 4.6**. As the roof vent emission sources are wake-affected point sources, the emissions have been adjusted for a peak-to-mean factor of 2.3 (near-field), in accordance with the NSW guidelines to account for a one-second average nose response time. These roof vent sources have been modelled as a variable hourly emission in accordance with production rates as outlined in Section 2.2. A peak to mean factor of 2.5 for stability classes A-D, and 2.3 stability classes E-

F has been applied to the area source (biofilter). As the biofilter constitutes a constant emission source, it has been configured according to the wind speed/stability class emission rates in Ausplume.

Table 4.3: Roof Vent Co-ordinates (AGD66 Co-ordinates)

Odour Source	X Co-ordinate	Y Co-ordinate
OTBS1	293809	6860631
OTBS2	293805	6860635
OTBS3	293802	6860638
OTBS4	293800	6860641
OTBS5	293796	6860644
OTBS6	293793	6860647
LBR1	293707	6860583
LBR2	293713	6860591
LBR3	293719	6860599
LBR4	293725	6860607
LBR5	293731	6860615
LBR6	293737	6860623

Table 4.4: Area Source Co-ordinates (AGD66 Coordinates)

Odour Source	Southwest corner X Co-ordinate	Southwest corner Y Co-ordinate
Biofilter	293809	6860609

Table 4.5: Roof Vent Source Configurations

Odour Source	Number of Roof Vents	Total Volumetric Flow Rate ($m^3 h^{-1}$)	Total Volumetric Flow Rate ($m^3 s^{-1}$)	Vent Diameter (m)	Vent Cross Sectional Area (m^2)	Vent Source Gas Velocity ($m s^{-1}$)
On Trailer Bird Storage	6	141,120	39.2	1.72	2.33	2.8
Live Bird Reception	6	353,754	98.3	2.5	4.83	3.39

Note: Emission rates are variable for hourly bird storage rates in each building and outlined in Section 2.2.

Table 4.6: Biofilter Source Configurations							
Odour Source	Vol. Flow Rate ($m^3 s^{-1}$)	Surface Area (m^2)	Source Gas Vel. ($m s^{-1}$)	Odour Conc^n (ou)	OER ($ou.m^3 s^{-1}$)	SOER ($ou.m^3 m^{-2} s^{-1}$)	SOER (Incl. peak to means)
Biofilter	24.9	983	0.025	200	4,980	5.07	A-D: 12.7 E-F: 11.7

Note: The biofilter operating with optimal performance should have an odour concentration of approximately 200 ou with an earthy, compost character.

4.7 ODOUR DISPERSION MODELLING SCENARIOS

Two modelling scenarios have been run for this study. These are:

1. Emissions during normal operations from the On Trailer Bird Storage and Live Bird Reception Buildings only; and

2. Biofilter only.

5 ODOUR DISPERSION MODELLING RESULTS

The results of the two modelling scenarios are presented as follows:

1. **Figure 5.1**: Emissions during normal operations from the On Trailer Bird Storage and Live Bird Reception Buildings only; and
2. **Figure 5.2**: Biofilter emissions only.

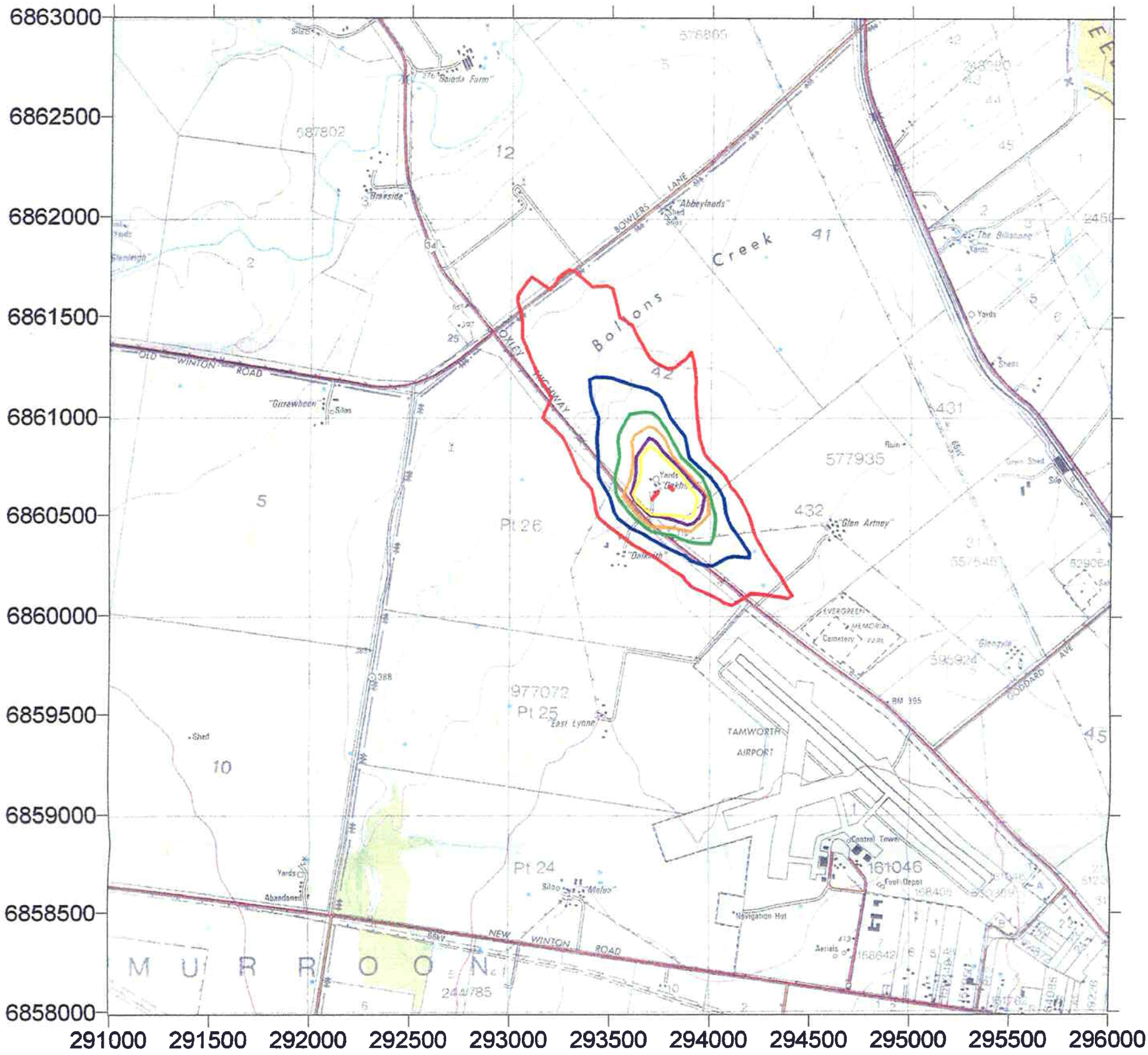


Figure 5.1: Ground level concentration contours for odour emissions from the On Trailer Bird Storage and Live Bird Reception Buildings.

Legend:

2 ou = red contour
3 ou = blue contour
4 ou = green contour
5 ou = orange contour
6 ou = purple contour
7 ou = yellow contour

Coordinates are Australian Map Grid based on AGD 1966

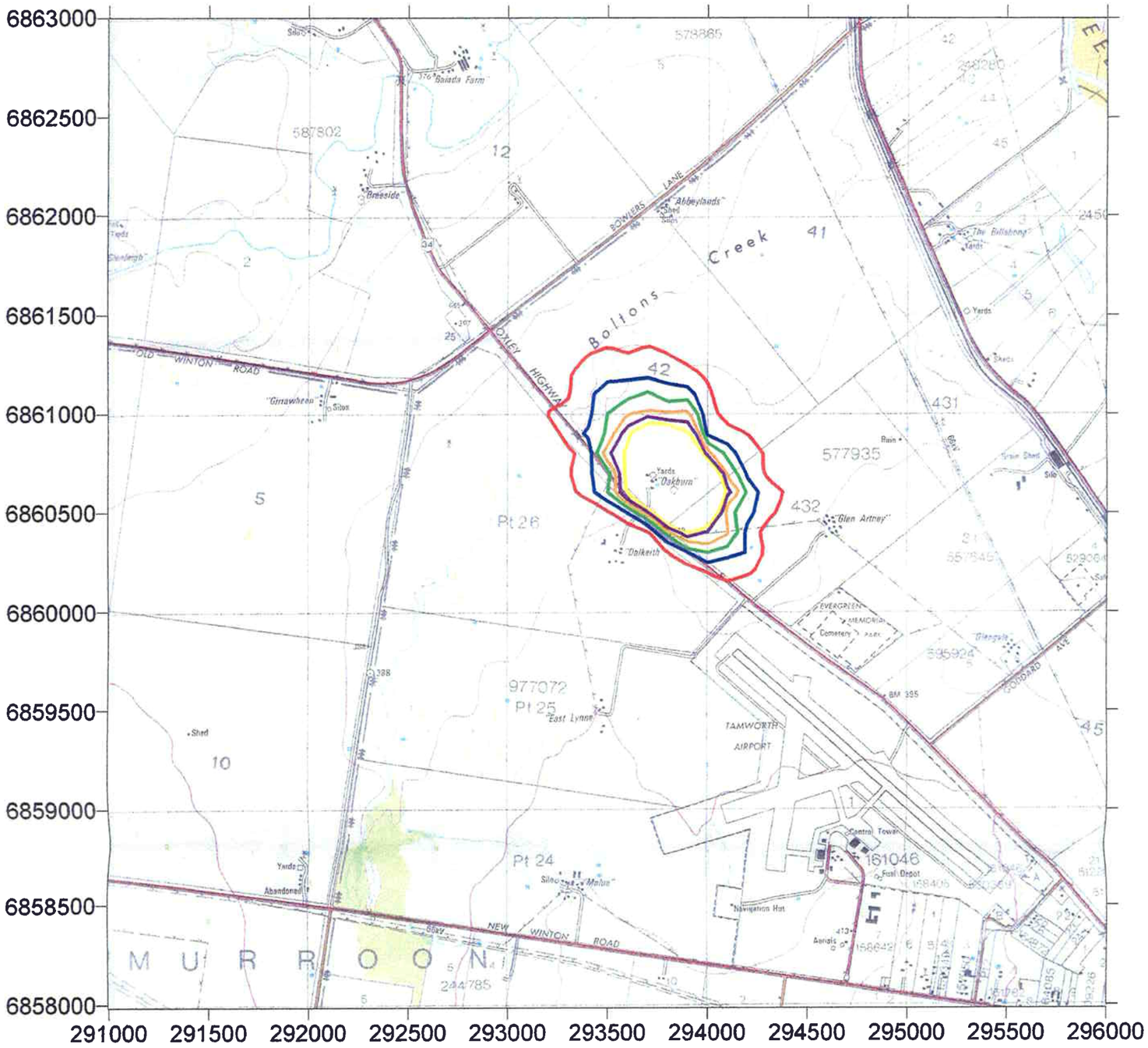


Figure 5.2: Ground level concentration contours for odour emissions from the Biofilter.

Legend:

2 ou = red contour	5 ou = orange contour
3 ou = blue contour	6 ou = purple contour
4 ou = green contour	7 ou = yellow contour

Coordinates are Australian Map Grid based on AGD 1966

An example of the Ausplume V6.0 output file is presented in **Appendix C**.

6 DISCUSSION AND CONCLUSIONS

The results of the odour dispersion modelling study indicate that the odour impact from the future Baiada PPF is likely to be minimal. TOU also considers that a site-specific OPC of 5 odour units for the 99.0th percentile frequency with a 1-second nose response time is conservative but easily achieved, given the low population density around the site.

The SOERs used in this study have also been adopted to reinforce the conservative approach. SOERs from three industry studies were compared, with the highest value employed to reflect the worse case scenario. This SOER was measured from birds stored on trucks prior to processing by TOU during a study of a similar poultry processing facility. The SOER used was 39% higher than those determined by two other poultry industry sponsored studies, which measured poultry odour emissions from broiler sheds.

It is also pertinent that the character of the odours against the background of the rural setting be taken into consideration when evaluating the results of this study. The configuration of the PPF will result in process area ventilation air, the scalding and picking process emissions and exhaust air from blood and offal transport vacuum pumps being treated in the PRP's biofilter, leaving only live bird storage emissions to vent to atmosphere.

The biofilter emissions have been modelled separately in this study, as they possess a different character to that of the untreated emissions, and are therefore not cumulative. These emissions are not considered to be an issue due to the earthy, compost character produced by biofilters when operating at their optimum. These odours will also tend to blend in with the background odours in the rural environment.

In addition, the modelling results indicate that the 5 ou contour is likely to extend no further than approximately 500 m from the site to the northwest.

7 REFERENCES

Jiang, K. and Sands, J., 1998. *Odour emissions from poultry farms in Western Australia*, CWWT, Western Australian Department of Environmental Protection.

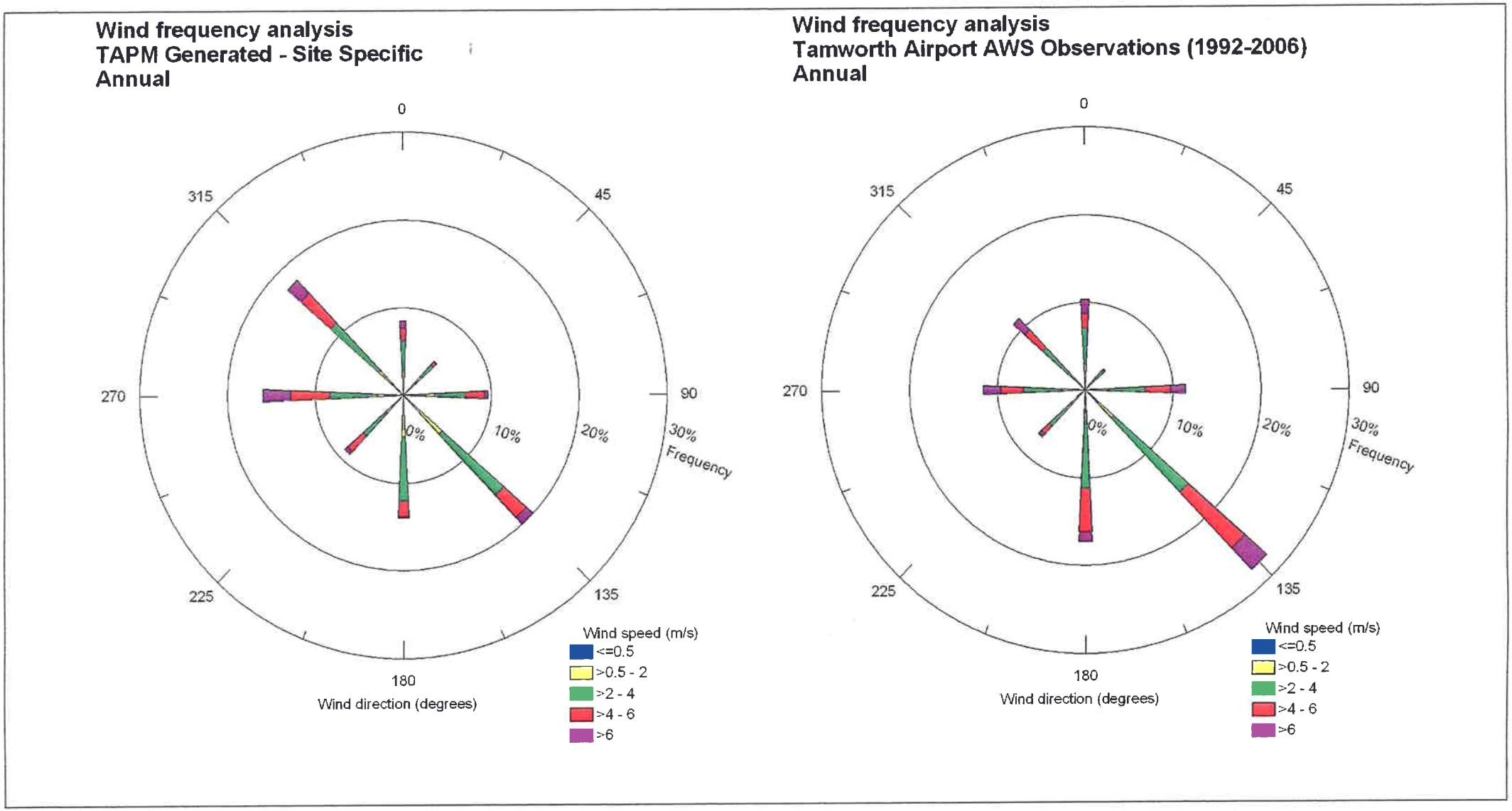
GHD, 2003. *Review of Modelling, Emission Measurement and Treatment of Odour and Dust Emissions from Broiler Farms*, Australian Poultry CRC.

NSW DEC, 2005. *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales,* New South Wales Department of Environment and Conservation, Sydney, Australia.

NSW DEC, 2001. *Draft Policy: Assessment and Management of Odour from Stationary Sources in NSW,* New South Wales Department of Environment and Conservation, Sydney, Australia.

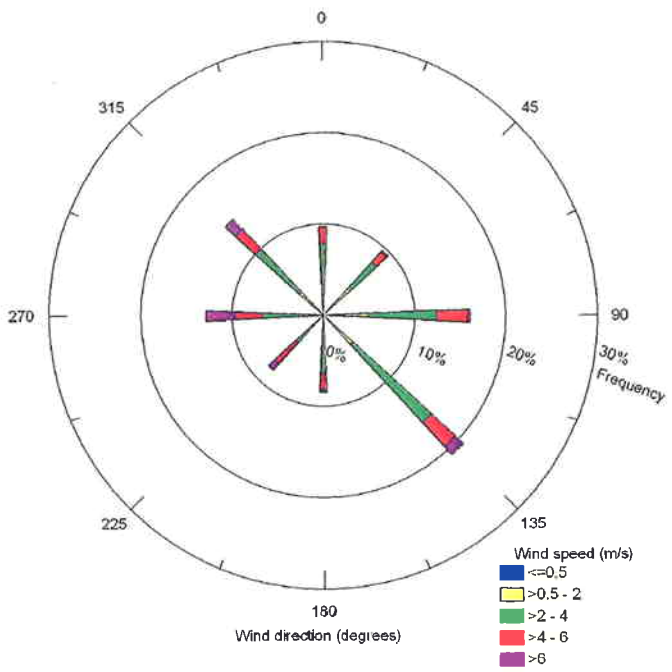
Appendix A

Meteorological Data Wind Rose Plots

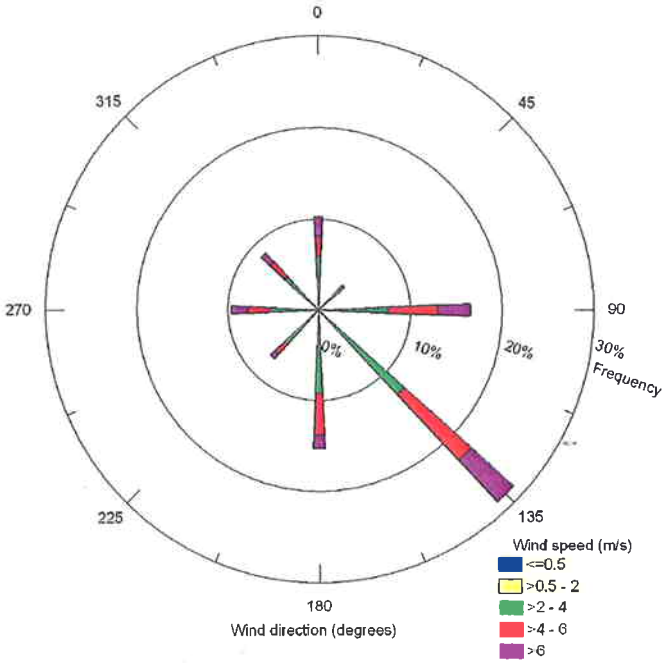


Wind speed and direction frequency comparison of modelled and observed data. Annual datasets.

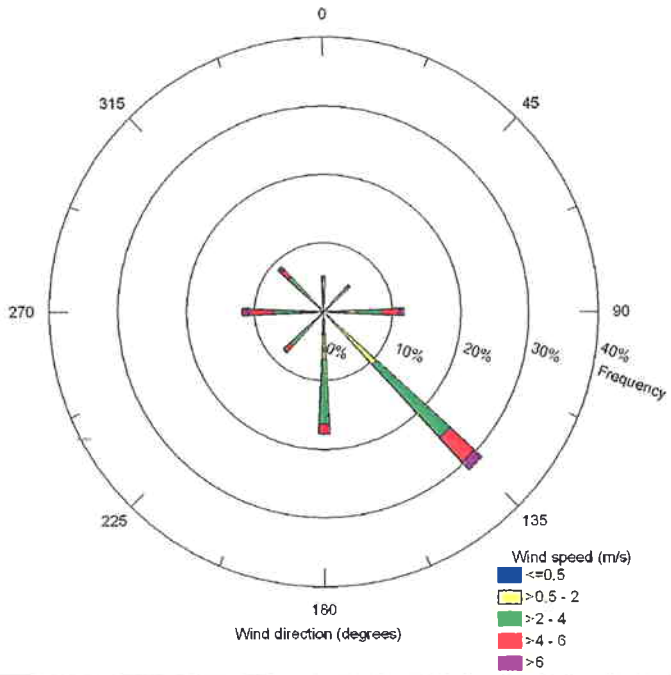
Wind frequency analysis
TAPM Generated - Site Specific
Summer



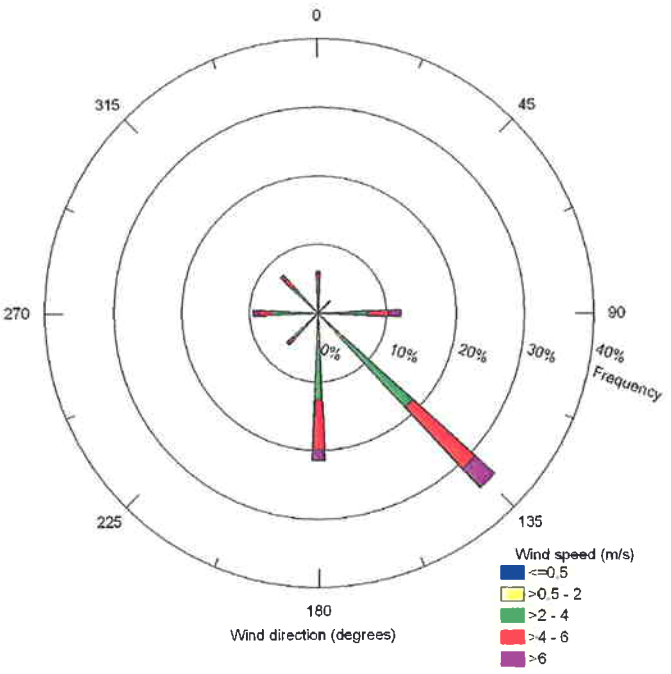
Wind frequency analysis
Tamworth Airport AWS Observations (1992-2006)
Summer



Wind frequency analysis
TAPM Generated - Site Specific
Autumn

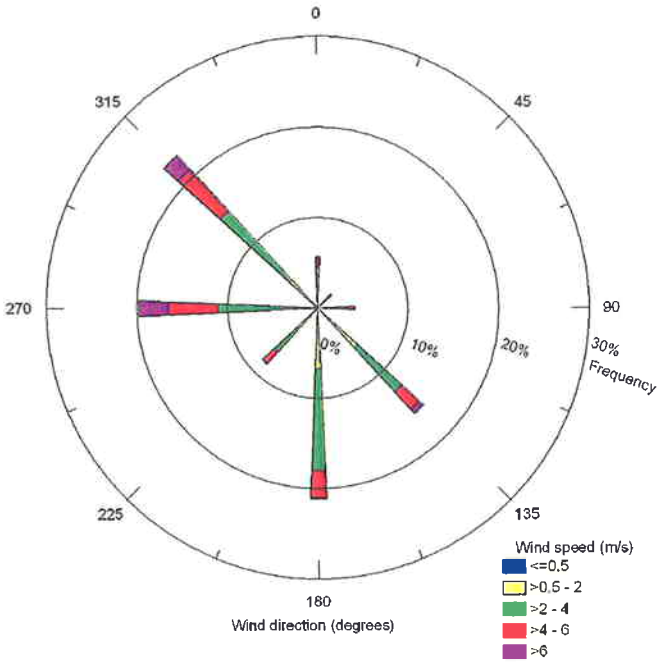


Wind frequency analysis
Tamworth Airport AWS Observations (1992-2006)
Autumn

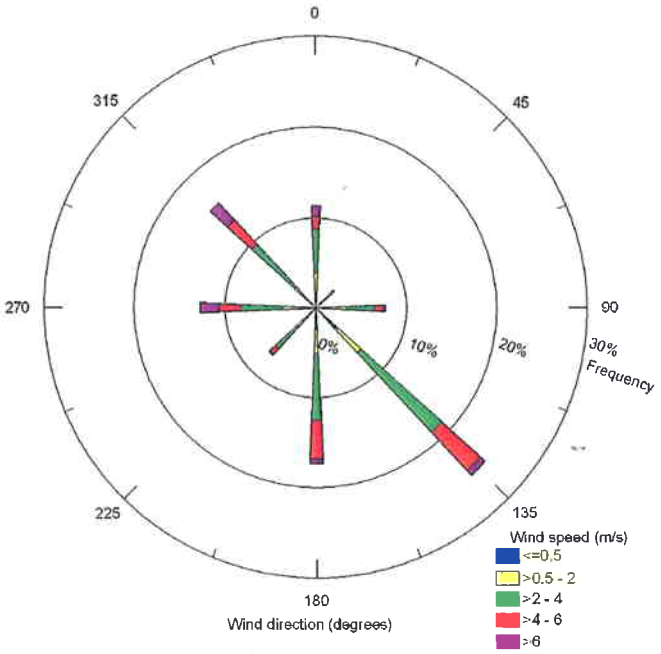


Wind speed and direction frequency comparison of modelled and observed data. Summer and Autumn datasets.

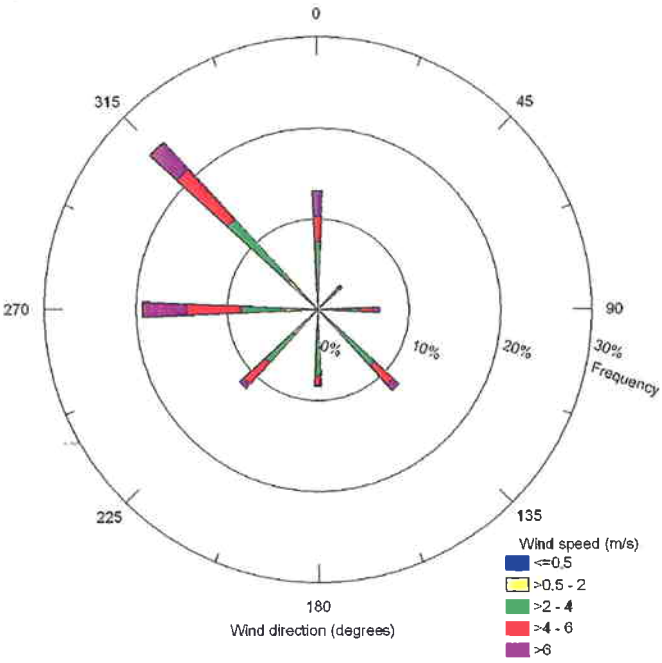
Wind frequency analysis
TAPM Generated - Site Specific
Winter



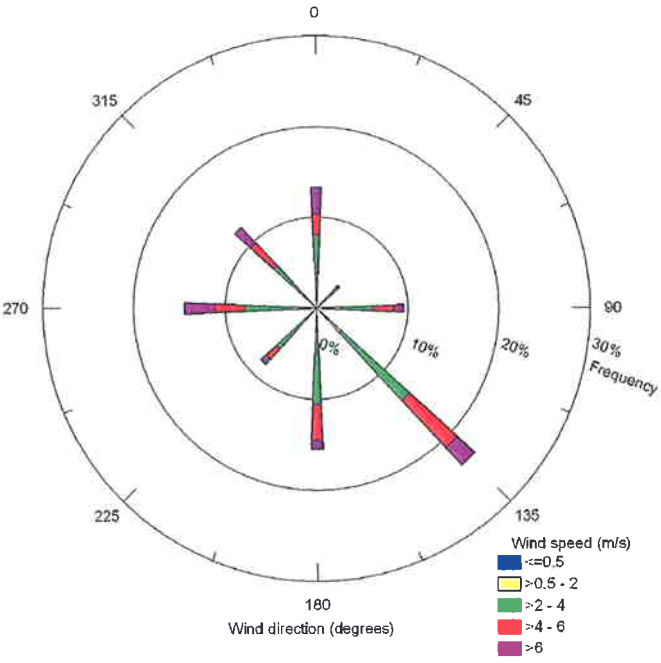
Wind frequency analysis
Tamworth Airport AWS Observations (1992-2005)
Winter



Wind frequency analysis
TAPM Generated - Site Specific
Spring



Wind frequency analysis
Tamworth Airport AWS Observations (1992-2005)
Spring



Wind speed and direction frequency comparison of modelled and observed data. Winter and Spring datasets.

Appendix C

Ausplume Configuration Output File Example

1

Baiada Poultry Processing Plant EIS Modelling Study

Concentration or deposition Concentration
Emission rate units OUV/second
Concentration units Odour_Units
Units conversion factor 1.00E+00
Constant background concentration 0.00E+00
Terrain effects Egan method
Smooth stability class changes? No
Other stability class adjustments ("urban modes") None
Ignore building wake effects? No
Decay coefficient (unless overridden by met. file) 0.000
Anemometer height 10 m
Roughness height at the wind vane site 0.300 m
Use the convective PDF algorithm? No
Averaging time for sigma-theta values 60 min.

DISPERSION CURVES
Horizontal dispersion curves for sources <100m high Sigma-theta
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: PRIME method.
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 gradients
given by the hourly met. file, a value from the following table
(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

Boundaries between categories (in m/s) are: 1.54, 3.09, 5.14, 8.23, 10.80

WIND PROFILE EXPONENTS: "Irwin Rural" values (unless overridden by met. file)

AVERAGING TIMES
1 hour

Baiada Poultry Processing Plant EIS Modelling Study

SOURCE GROUPS

Group No.	Members
1	OTBS1 OTBS2 OTBS3 OTBS4 OTBS5 OTBS6 LBRB1 LBRB2 LBRB3 LBRB4 LBRB5 LBRB6
2	BIO
3	OTBS1 OTBS2 OTBS3 OTBS4 OTBS5 OTBS6 LBRB1 LBRB2 LBRB3 LBRB4 LBRB5 LBRB6 BIO

1

Baiada Poultry Processing Plant EIS Modelling Study

SOURCE CHARACTERISTICS

STACK SOURCE: OTBS1

X(m)	Y(m)	Ground Elev.	Stack Height	Diameter	Temperature	Speed
293809	6860631	390m	6m	1.72m	25C	2.8m/s

Effective building dimensions (in metres)

Flow direction	10°	20°	30°	40°	50°	60°	70°	80°	90°	100°	110°	120°
Effective building width	38	35	32	29	34	37	38	40	39	38	35	32
Effective building height	6	6	6	6	6	6	6	6	6	6	6	6
Along-flow building length	38	35	32	29	33	36	38	39	39	38	35	31
Along-flow distance from stack	-14	-15	-15	-15	-19	-22	-25	-27	-28	-28	-28	-26
Across-flow distance from stack	9	10	11	11	10	10	9	8	7	5	3	1

Flow direction	130°	140°	150°	160°	170°	180°	190°	200°	210°	220°	230°	240°
Effective building width	29	33	36	38	39	39	38	35	31	29	33	37
Effective building height	6	6	6	6	6	6	6	6	6	6	6	6
Along-flow building length	29	33	37	39	40	39	38	35	32	29	33	37
Along-flow distance from stack	-25	-27	-28	-28	-28	-26	-24	-21	-17	-14	-15	-14
Across-flow distance from stack	-1	-2	-4	-6	-7	-9	-9	-10	-11	-11	-11	-10

Flow direction	250°	260°	270°	280°	290°	300°	310°	320°	330°	340°	350°	360°
Effective building width	39	40	39	38	35	31	29	33	36	38	39	39
Effective building height	6	6	6	6	6	6	6	6	6	6	6	6
Along-flow building length	38	39	39	38	35	31	29	33	36	39	39	39
Along-flow distance from stack	-14	-12	-11	-9	-7	-5	-4	-6	-8	-10	-12	-13
Across-flow distance from stack	-9	-8	-7	-5	-3	-2	1	3	4	6	7	9

Emission rates by hour of day in OUV/second:

1 2.15E+03	2 3.22E+03	3 4.29E+03	4 5.37E+03
5 5.37E+03	6 6.44E+03	7 6.44E+03	8 7.51E+03
9 8.59E+03	10 8.59E+03	11 7.51E+03	12 6.44E+03
13 5.37E+03	14 2.15E+03	15 0.00E+00	16 0.00E+00
17 0.00E+00	18 0.00E+00	19 0.00E+00	20 0.00E+00
21 0.00E+00	22 0.00E+00	23 0.00E+00	24 1.07E+03

No gravitational settling or scavenging.

STACK SOURCE: OTBS2

X(m)	Y(m)	Ground Elev.	Stack Height	Diameter	Temperature	Speed
293805	6860635	390m	6m	1.72m	25C	2.8m/s

Effective building dimensions (in metres)

Flow direction	10°	20°	30°	40°	50°	60°	70°	80°	90°	100°	110°	120°
Effective building width	38	35	32	29	34	37	38	40	39	38	35	32
Effective building height	6	6	6	6	6	6	6	6	6	6	6	6
Along-flow building length	38	35	32	29	33	36	38	39	39	38	35	31
Along-flow distance from stack	-17	-17	-16	-16	-19	-21	-23	-24	-24	-24	-23	-21
Across-flow distance from stack	5	5	5	5	5	5	4	3	3	2	1	0

Flow direction	130°	140°	150°	160°	170°	180°	190°	200°	210°	220°	230°	240°
Effective building width	29	33	36	38	39	39	38	35	31	29	33	37
Effective building height	6	6	6	6	6	6	6	6	6	6	6	6
Along-flow building length	29	33	37	39	40	39	38	35	32	29	33	37
Along-flow distance from stack	-20	-22	-23	-23	-23	-22	-21	-18	-16	-13	-15	-16
Across-flow distance from stack	-1	-2	-3	-3	-4	-5	-5	-5	-5	-5	-5	-4

Flow direction	250°	260°	270°	280°	290°	300°	310°	320°	330°	340°	350°	360°
Effective building width	39	40	39	38	35	31	29	33	36	38	39	39
Effective building height	6	6	6	6	6	6	6	6	6	6	6	6
Along-flow building length	38	39	39	38	35	31	29	33	36	39	39	39
Along-flow distance from stack	-16	-16	-15	-14	-12	-11	-10	-12	-14	-15	-17	-17
Across-flow distance from stack	-4	-3	-3	-2	-1	0	1	2	3	3	4	5

Emission rates by hour of day in OUV/second:

1 2.15E+03	2 3.22E+03	3 4.29E+03	4 5.37E+03
5 5.37E+03	6 6.44E+03	7 6.44E+03	8 7.51E+03
9 8.59E+03	10 8.59E+03	11 7.51E+03	12 6.44E+03
13 5.37E+03	14 2.15E+03	15 0.00E+00	16 0.00E+00
17 0.00E+00	18 0.00E+00	19 0.00E+00	20 0.00E+00
21 0.00E+00	22 0.00E+00	23 0.00E+00	24 1.07E+03

No gravitational settling or scavenging.

STACK SOURCE: OTBS3

X(m)	Y(m)	Ground Elev.	Stack Height	Diameter	Temperature	Speed
293802	6860638	390m	6m	1.72m	25C	2.8m/s

_____ Effective building dimensions (in metres) _____

Flow direction	10°	20°	30°	40°	50°	60°	70°	80°	90°	100°	110°	120°
Effective building width	38	35	32	29	34	37	38	40	39	38	35	32
Effective building height	6	6	6	6	6	6	6	6	6	6	6	6
Along-flow building length	38	35	32	29	33	36	38	39	39	38	35	31
Along-flow distance from stack	-20	-19	-17	-16	-18	-20	-21	-21	-21	-20	-19	-17
Across-flow distance from stack	1	1	1	1	1	0	0	0	-1	-1	-1	-1

Flow direction	130°	140°	150°	160°	170°	180°	190°	200°	210°	220°	230°	240°
Effective building width	29	33	36	38	39	39	38	35	31	29	33	37
Effective building height	6	6	6	6	6	6	6	6	6	6	6	6
Along-flow building length	29	33	37	39	40	39	38	35	32	29	33	37
Along-flow distance from stack	-15	-17	-19	-20	-20	-19	-18	-17	-15	-13	-15	-17
Across-flow distance from stack	-2	-2	-2	-2	-2	-2	-1	-1	-1	-1	-1	0

Flow direction	250°	260°	270°	280°	290°	300°	310°	320°	330°	340°	350°	360°
Effective building width	39	40	39	38	35	31	29	33	36	38	39	39
Effective building height	6	6	6	6	6	6	6	6	6	6	6	6
Along-flow building length	38	39	39	38	35	31	29	33	36	39	39	39
Along-flow distance from stack	-18	-18	-18	-17	-16	-15	-14	-16	-18	-19	-20	-20
Across-flow distance from stack	0	0	1	1	1	1	2	2	1	2	2	2

Emission rates by hour of day in OUV/second:

1 2.15E+03	2 3.22E+03	3 4.29E+03	4 5.37E+03
5 5.37E+03	6 6.44E+03	7 6.44E+03	8 7.51E+03
9 8.59E+03	10 8.59E+03	11 7.51E+03	12 6.44E+03
13 5.37E+03	14 2.15E+03	15 0.00E+00	16 0.00E+00
17 0.00E+00	18 0.00E+00	19 0.00E+00	20 0.00E+00
21 0.00E+00	22 0.00E+00	23 0.00E+00	24 1.07E+03

No gravitational settling or scavenging.

STACK SOURCE: OTBS4

X(m)	Y(m)	Ground Elev.	Stack Height	Diameter	Temperature	Speed
293800	6860641	390m	6m	1.72m	25C	2.8m/s

_____ Effective building dimensions (in metres) _____

Flow direction	10°	20°	30°	40°	50°	60°	70°	80°	90°	100°	110°	120°
Effective building width	38	35	32	29	34	37	38	40	39	38	35	32
Effective building height	6	6	6	6	6	6	6	6	6	6	6	6
Along-flow building length	38	35	32	29	33	36	38	39	39	38	35	31
Along-flow distance from stack	-23	-21	-19	-17	-19	-20	-20	-20	-19	-18	-16	-14
Across-flow distance from stack	-1	-2	-2	-3	-3	-3	-4	-4	-4	-3	-4	-3

Flow direction	130°	140°	150°	160°	170°	180°	190°	200°	210°	220°	230°	240°
Effective building width	29	33	36	38	39	39	38	35	31	29	33	37

Effective building height 6 6 6 6 6 6 6 6 6 6 6 6
Along-flow building length 29 33 37 39 40 39 38 35 32 29 33 37
Along-flow distance from stack -12 -14 -15 -16 -17 -16 -16 -15 -13 -12 -15 -17
Across-flow distance from stack -3 -2 -1 -1 0 1 1 2 2 3 3 3

Flow direction 250° 260° 270° 280° 290° 300° 310° 320° 330° 340° 350° 360°
Effective building width 39 40 39 38 35 31 29 33 36 38 39 39
Effective building height 6 6 6 6 6 6 6 6 6 6 6 6
Along-flow building length 38 39 39 38 35 31 29 33 36 39 39 39
Along-flow distance from stack -19 -20 -20 -20 -19 -18 -17 -20 -21 -23 -23 -23
Across-flow distance from stack 3 4 4 4 3 3 3 2 1 1 0 -1

Emission rates by hour of day in OUV/second:

1 2.15E+03	2 3.22E+03	3 4.29E+03	4 5.37E+03
5 5.37E+03	6 6.44E+03	7 6.44E+03	8 7.51E+03
9 8.59E+03	10 8.59E+03	11 7.51E+03	12 6.44E+03
13 5.37E+03	14 2.15E+03	15 0.00E+00	16 0.00E+00
17 0.00E+00	18 0.00E+00	19 0.00E+00	20 0.00E+00
21 0.00E+00	22 0.00E+00	23 0.00E+00	24 1.07E+03

No gravitational settling or scavenging.

STACK SOURCE: OTBS5

X(m)	Y(m)	Ground Elev.	Stack Height	Diameter	Temperature	Speed
293796	6860644	390m	6m	1.72m	25C	2.8m/s

_____ Effective building dimensions (in metres) _____
Flow direction 10° 20° 30° 40° 50° 60° 70° 80° 90° 100° 110° 120°
Effective building width 38 35 32 29 34 37 38 40 39 38 35 32
Effective building height 6 6 6 6 6 6 6 6 6 6 6 6
Along-flow building length 38 35 32 29 33 36 38 39 39 38 35 31
Along-flow distance from stack -25 -22 -20 -17 -18 -18 -17 -16 -15 -13 -11 -9
Across-flow distance from stack -6 -7 -7 -8 -8 -8 -8 -7 -7 -6 -5 -3

Flow direction 130° 140° 150° 160° 170° 180° 190° 200° 210° 220° 230° 240°
Effective building width 29 33 36 38 39 39 38 35 31 29 33 37
Effective building height 6 6 6 6 6 6 6 6 6 6 6 6
Along-flow building length 29 33 37 39 40 39 38 35 32 29 33 37
Along-flow distance from stack -7 -9 -11 -12 -13 -13 -13 -13 -13 -12 -16 -19
Across-flow distance from stack -2 -1 1 2 3 5 6 7 7 8 8 8

Flow direction 250° 260° 270° 280° 290° 300° 310° 320° 330° 340° 350° 360°
Effective building width 39 40 39 38 35 31 29 33 36 38 39 39
Effective building height 6 6 6 6 6 6 6 6 6 6 6 6
Along-flow building length 38 39 39 38 35 31 29 33 36 39 39 39
Along-flow distance from stack -21 -23 -24 -24 -24 -23 -22 -25 -26 -27 -27 -26
Across-flow distance from stack 8 7 7 6 5 4 2 1 -1 -2 -3 -5

Emission rates by hour of day in OUV/second:

1 2.15E+03	2 3.22E+03	3 4.29E+03	4 5.37E+03
5 5.37E+03	6 6.44E+03	7 6.44E+03	8 7.51E+03
9 8.59E+03	10 8.59E+03	11 7.51E+03	12 6.44E+03

13 5.37E+03 14 2.15E+03 15 0.00E+00 16 0.00E+00
17 0.00E+00 18 0.00E+00 19 0.00E+00 20 0.00E+00
21 0.00E+00 22 0.00E+00 23 0.00E+00 24 1.07E+03

No gravitational settling or scavenging.

STACK SOURCE: OTBS6

X(m)	Y(m)	Ground Elev.	Stack Height	Diameter	Temperature	Speed
293793	6860647	390m	6m	1.72m	25C	2.8m/s

Effective building dimensions (in metres)

Flow direction	10°	20°	30°	40°	50°	60°	70°	80°	90°	100°	110°	120°
Effective building width	38	35	32	29	34	37	38	40	39	38	35	32
Effective building height	6	6	6	6	6	6	6	6	6	6	6	6
Along-flow building length	38	35	32	29	33	36	38	39	39	38	35	31
Along-flow distance from stack	-27	-24	-21	-17	-17	-16	-15	-14	-12	-10	-7	-5
Across-flow distance from stack	-9	-10	-11	-12	-12	-12	-12	-11	-10	-8	-7	-4

Flow direction	130°	140°	150°	160°	170°	180°	190°	200°	210°	220°	230°	240°
Effective building width	29	33	36	38	39	39	38	35	31	29	33	37
Effective building height	6	6	6	6	6	6	6	6	6	6	6	6
Along-flow building length	29	33	37	39	40	39	38	35	32	29	33	37
Along-flow distance from stack	-3	-5	-6	-8	-9	-10	-11	-11	-12	-12	-17	-20
Across-flow distance from stack	-3	0	2	4	6	8	9	10	11	12	12	12

Flow direction	250°	260°	270°	280°	290°	300°	310°	320°	330°	340°	350°	360°
Effective building width	39	40	39	38	35	31	29	33	36	38	39	39
Effective building height	6	6	6	6	6	6	6	6	6	6	6	6
Along-flow building length	38	39	39	38	35	31	29	33	36	39	39	39
Along-flow distance from stack	-23	-25	-27	-28	-28	-27	-26	-29	-30	-31	-31	-29
Across-flow distance from stack	11	11	10	8	6	5	3	1	-2	-4	-6	-8

Emission rates by hour of day in OUV/second:

1 2.15E+03 2 3.22E+03 3 4.29E+03 4 5.37E+03
5 5.37E+03 6 6.44E+03 7 6.44E+03 8 7.51E+03
9 8.59E+03 10 8.59E+03 11 7.51E+03 12 6.44E+03
13 5.37E+03 14 2.15E+03 15 0.00E+00 16 0.00E+00
17 0.00E+00 18 0.00E+00 19 0.00E+00 20 0.00E+00
21 0.00E+00 22 0.00E+00 23 0.00E+00 24 1.07E+03

No gravitational settling or scavenging.

STACK SOURCE: LBRB1

X(m)	Y(m)	Ground Elev.	Stack Height	Diameter	Temperature	Speed
293707	6860583	390m	7m	2.50m	25C	3.4m/s

Effective building dimensions (in metres)

Flow direction	10°	20°	30°	40°	50°	60°	70°	80°	90°	100°	110°	120°
Effective building width	65	59	51	45	55	62	68	72	73	73	70	64
Effective building height	7	7	7	7	7	7	7	7	7	7	7	7
Along-flow building length	73	70	65	60	67	71	73	73	70	66	59	51

Along-flow distance from stack -14 -11 -7 -5 -8 -12 -15 -18 -20 -22 -23 -23
Across-flow distance from stack -11 -7 -3 2 6 11 14 18 21 23 24 26

Flow direction	130°	140°	150°	160°	170°	180°	190°	200°	210°	220°	230°	240°
Effective building width	61	67	71	73	72	70	65	59	51	45	55	62
Effective building height	7	7	7	7	7	7	7	7	7	7	7	7
Along-flow building length	46	55	62	68	72	73	72	70	64	61	67	71
Along-flow distance from stack	-25	-33	-41	-48	-54	-57	-59	-59	-58	-56	-59	-59
Across-flow distance from stack	26	25	24	21	18	15	11	7	2	-2	-6	-10

Flow direction	250°	260°	270°	280°	290°	300°	310°	320°	330°	340°	350°	360°
Effective building width	68	72	73	72	69	65	60	67	71	73	72	70
Effective building height	7	7	7	7	7	7	7	7	7	7	7	7
Along-flow building length	73	72	70	65	59	51	46	55	63	68	72	73
Along-flow distance from stack	-58	-55	-50	-44	-36	-28	-21	-22	-21	-20	-18	-16
Across-flow distance from stack	-14	-18	-21	-23	-25	-25	-26	-25	-24	-21	-18	-15

Emission rates by hour of day in OUV/second:

1 0.00E+00	2 0.00E+00	3 0.00E+00	4 1.07E+03
5 3.22E+03	6 5.37E+03	7 5.10E+03	8 4.83E+03
9 4.56E+03	10 4.29E+03	11 5.10E+03	12 5.90E+03
13 6.71E+03	14 7.51E+03	15 7.25E+03	16 4.83E+03
17 2.42E+03	18 0.00E+00	19 0.00E+00	20 0.00E+00
21 0.00E+00	22 0.00E+00	23 0.00E+00	24 0.00E+00

No gravitational settling or scavenging.

STACK SOURCE: LBRB2

X(m)	Y(m)	Ground Elev.	Stack Height	Diameter	Temperature	Speed
293713	6860591	390m	7m	2.50m	25C	3.4m/s

_____ Effective building dimensions (in metres) _____

Flow direction	10°	20°	30°	40°	50°	60°	70°	80°	90°	100°	110°	120°
Effective building width	65	59	51	45	55	62	68	72	73	73	70	64
Effective building height	7	7	7	7	7	7	7	7	7	7	7	7
Along-flow building length	73	70	65	60	67	71	73	73	70	66	59	51
Along-flow distance from stack	-23	-20	-17	-15	-18	-21	-23	-25	-26	-26	-26	-24
Across-flow distance from stack	-7	-4	-1	1	4	7	9	11	13	14	15	16

Flow direction	130°	140°	150°	160°	170°	180°	190°	200°	210°	220°	230°	240°
Effective building width	61	67	71	73	72	70	65	59	51	45	55	62
Effective building height	7	7	7	7	7	7	7	7	7	7	7	7
Along-flow building length	46	55	62	68	72	73	72	70	64	61	67	71
Along-flow distance from stack	-24	-31	-37	-43	-47	-49	-50	-50	-48	-46	-49	-50
Across-flow distance from stack	16	15	14	13	11	9	7	4	1	-1	-4	-6

Flow direction	250°	260°	270°	280°	290°	300°	310°	320°	330°	340°	350°	360°
Effective building width	68	72	73	72	69	65	60	67	71	73	72	70
Effective building height	7	7	7	7	7	7	7	7	7	7	7	7
Along-flow building length	73	72	70	65	59	51	46	55	63	68	72	73
Along-flow distance from stack	-49	-47	-44	-39	-34	-27	-22	-24	-25	-26	-25	-24
Across-flow distance from stack	-9	-11	-13	-14	-15	-15	-16	-15	-14	-13	-11	-9

Emission rates by hour of day in OUV/second:

1 0.00E+00	2 0.00E+00	3 0.00E+00	4 1.07E+03
5 3.22E+03	6 5.37E+03	7 5.10E+03	8 4.83E+03
9 4.56E+03	10 4.29E+03	11 5.10E+03	12 5.90E+03
13 6.71E+03	14 7.51E+03	15 7.25E+03	16 4.83E+03
17 2.42E+03	18 0.00E+00	19 0.00E+00	20 0.00E+00
21 0.00E+00	22 0.00E+00	23 0.00E+00	24 0.00E+00

No gravitational settling or scavenging.

STACK SOURCE: LBRB3

X(m)	Y(m)	Ground Elev.	Stack Height	Diameter	Temperature	Speed
293719	6860599	390m	7m	2.50m	25C	3.4m/s

Effective building dimensions (in metres)

Flow direction	10°	20°	30°	40°	50°	60°	70°	80°	90°	100°	110°	120°
Effective building width	65	59	51	45	55	62	68	72	73	73	70	64
Effective building height	7	7	7	7	7	7	7	7	7	7	7	7
Along-flow building length	73	70	65	60	67	71	73	73	70	66	59	51
Along-flow distance from stack	-32	-30	-27	-25	-28	-30	-32	-32	-32	-31	-28	-25
Across-flow distance from stack	-2	-1	0	1	2	3	4	4	5	5	5	6

Flow direction	130°	140°	150°	160°	170°	180°	190°	200°	210°	220°	230°	240°
Effective building width	61	67	71	73	72	70	65	59	51	45	55	62
Effective building height	7	7	7	7	7	7	7	7	7	7	7	7
Along-flow building length	46	55	62	68	72	73	72	70	64	61	67	71
Along-flow distance from stack	-23	-29	-34	-37	-40	-41	-41	-40	-38	-36	-39	-40
Across-flow distance from stack	6	6	5	5	4	3	2	1	0	-1	-2	-3

Flow direction	250°	260°	270°	280°	290°	300°	310°	320°	330°	340°	350°	360°
Effective building width	68	72	73	72	69	65	60	67	71	73	72	70
Effective building height	7	7	7	7	7	7	7	7	7	7	7	7
Along-flow building length	73	72	70	65	59	51	46	55	63	68	72	73
Along-flow distance from stack	-41	-40	-38	-35	-31	-26	-22	-26	-29	-31	-32	-32
Across-flow distance from stack	-3	-4	-5	-5	-6	-5	-6	-5	-5	-5	-4	-3

Emission rates by hour of day in OUV/second:

1 0.00E+00	2 0.00E+00	3 0.00E+00	4 1.07E+03
5 3.22E+03	6 5.37E+03	7 5.10E+03	8 4.83E+03
9 4.56E+03	10 4.29E+03	11 5.10E+03	12 5.90E+03
13 6.71E+03	14 7.51E+03	15 7.25E+03	16 4.83E+03
17 2.42E+03	18 0.00E+00	19 0.00E+00	20 0.00E+00
21 0.00E+00	22 0.00E+00	23 0.00E+00	24 0.00E+00

No gravitational settling or scavenging.

STACK SOURCE: LBRB4

X(m)	Y(m)	Ground Elev.	Stack Height	Diameter	Temperature	Speed
293725	6860607	390m	7m	2.50m	25C	3.4m/s

_____ Effective building dimensions (in metres) _____

Flow direction	10°	20°	30°	40°	50°	60°	70°	80°	90°	100°	110°	120°
Effective building width	65	59	51	45	55	62	68	72	73	73	70	64
Effective building height	7	7	7	7	7	7	7	7	7	7	7	7
Along-flow building length	73	70	65	60	67	71	73	73	70	66	59	51
Along-flow distance from stack	-41	-39	-37	-34	-38	-40	-40	-40	-38	-35	-31	-27
Across-flow distance from stack	2	2	1	0	-1	-2	-2	-3	-4	-4	-4	-5

Flow direction	130°	140°	150°	160°	170°	180°	190°	200°	210°	220°	230°	240°
Effective building width	61	67	71	73	72	70	65	59	51	45	55	62
Effective building height	7	7	7	7	7	7	7	7	7	7	7	7
Along-flow building length	46	55	62	68	72	73	72	70	64	61	67	71
Along-flow distance from stack	-23	-27	-30	-32	-33	-33	-32	-31	-28	-26	-29	-31
Across-flow distance from stack	-4	-4	-4	-4	-3	-3	-2	-2	-1	0	1	2

Flow direction	250°	260°	270°	280°	290°	300°	310°	320°	330°	340°	350°	360°
Effective building width	68	72	73	72	69	65	60	67	71	73	72	70
Effective building height	7	7	7	7	7	7	7	7	7	7	7	7
Along-flow building length	73	72	70	65	59	51	46	55	63	68	72	73
Along-flow distance from stack	-33	-33	-32	-30	-28	-24	-23	-28	-33	-37	-39	-40
Across-flow distance from stack	3	3	4	4	5	4	4	4	4	4	4	3

Emission rates by hour of day in OUV/second:

1 0.00E+00	2 0.00E+00	3 0.00E+00	4 1.07E+03
5 3.22E+03	6 5.37E+03	7 5.10E+03	8 4.83E+03
9 4.56E+03	10 4.29E+03	11 5.10E+03	12 5.90E+03
13 6.71E+03	14 7.51E+03	15 7.25E+03	16 4.83E+03
17 2.42E+03	18 0.00E+00	19 0.00E+00	20 0.00E+00
21 0.00E+00	22 0.00E+00	23 0.00E+00	24 0.00E+00

No gravitational settling or scavenging.

STACK SOURCE: LBRB5

X(m)	Y(m)	Ground Elev.	Stack Height	Diameter	Temperature	Speed
293731	6860615	390m	7m	2.50m	25C	3.4m/s

_____ Effective building dimensions (in metres) _____

Flow direction	10°	20°	30°	40°	50°	60°	70°	80°	90°	100°	110°	120°
Effective building width	65	59	51	45	55	62	68	72	73	73	70	64
Effective building height	7	7	7	7	7	7	7	7	7	7	7	7
Along-flow building length	73	70	65	60	67	71	73	73	70	66	59	51
Along-flow distance from stack	-49	-49	-47	-44	-47	-49	-49	-47	-44	-40	-34	-28
Across-flow distance from stack	7	5	2	0	-3	-6	-8	-10	-12	-13	-14	-15

Flow direction	130°	140°	150°	160°	170°	180°	190°	200°	210°	220°	230°	240°
Effective building width	61	67	71	73	72	70	65	59	51	45	55	62
Effective building height	7	7	7	7	7	7	7	7	7	7	7	7
Along-flow building length	46	55	62	68	72	73	72	70	64	61	67	71
Along-flow distance from stack	-22	-24	-26	-26	-26	-25	-23	-21	-18	-16	-20	-22
Across-flow distance from stack	-14	-14	-13	-12	-11	-9	-7	-5	-2	1	3	6

Flow direction	250°	260°	270°	280°	290°	300°	310°	320°	330°	340°	350°	360°
Effective building width	68	72	73	72	69	65	60	67	71	73	72	70

Effective building height 7 7 7 7 7 7 7 7 7 7 7 7
Along-flow building length 73 72 70 65 59 51 46 55 63 68 72 73
Along-flow distance from stack -24 -25 -26 -26 -25 -23 -23 -31 -37 -42 -46 -48
Across-flow distance from stack 8 10 12 13 14 14 14 14 13 12 11 9

Emission rates by hour of day in OUV/second:

1 0.00E+00	2 0.00E+00	3 0.00E+00	4 1.07E+03
5 3.22E+03	6 5.37E+03	7 5.10E+03	8 4.83E+03
9 4.56E+03	10 4.29E+03	11 5.10E+03	12 5.90E+03
13 6.71E+03	14 7.51E+03	15 7.25E+03	16 4.83E+03
17 2.42E+03	18 0.00E+00	19 0.00E+00	20 0.00E+00
21 0.00E+00	22 0.00E+00	23 0.00E+00	24 0.00E+00

No gravitational settling or scavenging.

STACK SOURCE: LBRB6

X(m)	Y(m)	Ground Elev.	Stack Height	Diameter	Temperature	Speed
293737	6860623	390m	7m	2.50m	25C	3.4m/s

_____ Effective building dimensions (in metres) _____

Flow direction 10° 20° 30° 40° 50° 60° 70° 80° 90° 100° 110° 120°
Effective building width 65 59 51 45 55 62 68 72 73 73 70 64
Effective building height 7 7 7 7 7 7 7 7 7 7 7 7
Along-flow building length 73 70 65 60 67 71 73 73 70 66 59 51
Along-flow distance from stack -58 -58 -57 -54 -57 -58 -57 -54 -50 -44 -37 -29
Across-flow distance from stack 11 8 4 -1 -5 -10 -13 -17 -20 -22 -24 -25

Flow direction 130° 140° 150° 160° 170° 180° 190° 200° 210° 220° 230° 240°
Effective building width 61 67 71 73 72 70 65 59 51 45 55 62
Effective building height 7 7 7 7 7 7 7 7 7 7 7 7
Along-flow building length 46 55 62 68 72 73 72 70 64 61 67 71
Along-flow distance from stack -22 -22 -22 -21 -19 -17 -14 -12 -8 -6 -10 -13
Across-flow distance from stack -24 -24 -22 -21 -18 -15 -11 -8 -4 1 5 10

Flow direction 250° 260° 270° 280° 290° 300° 310° 320° 330° 340° 350° 360°
Effective building width 68 72 73 72 69 65 60 67 71 73 72 70
Effective building height 7 7 7 7 7 7 7 7 7 7 7 7
Along-flow building length 73 72 70 65 59 51 46 55 63 68 72 73
Along-flow distance from stack -16 -18 -20 -21 -22 -22 -24 -33 -41 -47 -53 -56
Across-flow distance from stack 14 17 20 22 24 24 24 24 22 21 18 15

Emission rates by hour of day in OUV/second:

1 0.00E+00	2 0.00E+00	3 0.00E+00	4 1.07E+03
5 3.22E+03	6 5.37E+03	7 5.10E+03	8 4.83E+03
9 4.56E+03	10 4.29E+03	11 5.10E+03	12 5.90E+03
13 6.71E+03	14 7.51E+03	15 7.25E+03	16 4.83E+03
17 2.42E+03	18 0.00E+00	19 0.00E+00	20 0.00E+00
21 0.00E+00	22 0.00E+00	23 0.00E+00	24 0.00E+00

No gravitational settling or scavenging.

INTEGRATED AREA SOURCE: BIO

X0(m)	Y0(m)	Ground El	Length X	Length Y	Or. Angle	Ver. spread	Height
293809	6860609	390m	31m	31m	38deg	2m	2m

Emission rates by stability and wind speed, in OUV/second per square metre:

Wind speeds (m/s):	< 1.5	1.5_ 3.1	3.1_ 5.1	5.1_ 8.2	8.2_10.8	>10.8
Stability A:	1.27E+01	1.27E+01	1.27E+01	1.27E+01	1.27E+01	1.27E+01
Stability B:	1.27E+01	1.27E+01	1.27E+01	1.27E+01	1.27E+01	1.27E+01
Stability C:	1.27E+01	1.27E+01	1.27E+01	1.27E+01	1.27E+01	1.27E+01
Stability D:	1.27E+01	1.27E+01	1.27E+01	1.27E+01	1.27E+01	1.27E+01
Stability E:	1.17E+01	1.17E+01	1.17E+01	1.17E+01	1.17E+01	1.17E+01
Stability F:	1.17E+01	1.17E+01	1.17E+01	1.17E+01	1.17E+01	1.17E+01

No gravitational settling or scavenging.

1

Baiada Poultry Processing Plant EIS Modelling Study

RECEPTOR LOCATIONS

The Cartesian receptor grid has the following x-values (or eastings):
291000.m 291100.m 291200.m 291300.m 291400.m 291500.m 291600.m
291700.m 291800.m 291900.m 292000.m 292100.m 292200.m 292300.m
292400.m 292500.m 292600.m 292700.m 292800.m 292900.m 293000.m
293100.m 293200.m 293300.m 293400.m 293500.m 293600.m 293700.m
293800.m 293900.m 294000.m 294100.m 294200.m 294300.m 294400.m
294500.m 294600.m 294700.m 294800.m 294900.m 295000.m 295100.m
295200.m 295300.m 295400.m 295500.m 295600.m 295700.m 295800.m
295900.m 296000.m

and these y-values (or northings):
6858000.m 6858100.m 6858200.m 6858300.m 6858400.m 6858500.m 6858600.m
6858700.m 6858800.m 6858900.m 6859000.m 6859100.m 6859200.m 6859300.m
6859400.m 6859500.m 6859600.m 6859700.m 6859800.m 6859900.m 6860000.m
6860100.m 6860200.m 6860300.m 6860400.m 6860500.m 6860600.m 6860700.m
6860800.m 6860900.m 6861000.m 6861100.m 6861200.m 6861300.m 6861400.m
6861500.m 6861600.m 6861700.m 6861800.m 6861900.m 6862000.m 6862100.m
6862200.m 6862300.m 6862400.m 6862500.m 6862600.m 6862700.m 6862800.m
6862900.m 6863000.m

METEOROLOGICAL DATA : AUSPLUME METFILE

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1 Peak values for the 100 worst cases (in Odour_Units)
Averaging time = 1 hour; Source group No. 1

Rank	Value	Time Recorded hour,date	Coordinates (* denotes polar)
1	7.80E+01	09,18/02/02	(293800, 6860600, 0.0)
2	7.01E+01	10,23/01/02	(293800, 6860600, 0.0)
3	6.92E+01	10,21/11/02	(293800, 6860600, 0.0)
4	6.89E+01	10,07/03/02	(293800, 6860600, 0.0)
5	6.73E+01	10,14/12/02	(293800, 6860600, 0.0)
6	6.65E+01	09,04/01/02	(293800, 6860600, 0.0)
7	6.35E+01	10,19/11/02	(293800, 6860600, 0.0)
8	6.25E+01	09,15/12/02	(293800, 6860600, 0.0)
9	6.23E+01	11,20/12/02	(293800, 6860600, 0.0)
10	6.22E+01	10,28/02/02	(293800, 6860600, 0.0)
11	6.22E+01	09,03/12/02	(293800, 6860600, 0.0)
12	6.21E+01	09,26/10/02	(293800, 6860600, 0.0)
13	6.18E+01	10,11/04/02	(293800, 6860600, 0.0)
14	6.12E+01	10,21/12/02	(293800, 6860600, 0.0)
15	6.10E+01	10,02/12/02	(293800, 6860600, 0.0)
16	6.09E+01	10,18/02/02	(293800, 6860600, 0.0)
17	6.09E+01	09,21/11/02	(293800, 6860600, 0.0)
18	6.01E+01	11,02/02/02	(293800, 6860600, 0.0)
19	5.98E+01	09,19/03/02	(293800, 6860600, 0.0)
20	5.90E+01	09,06/01/02	(293800, 6860600, 0.0)
21	5.83E+01	11,21/12/02	(293800, 6860600, 0.0)
22	5.72E+01	11,23/01/02	(293800, 6860600, 0.0)
23	5.68E+01	09,19/11/02	(293800, 6860600, 0.0)
24	5.61E+01	09,20/02/02	(293800, 6860600, 0.0)
25	5.60E+01	09,21/01/02	(293800, 6860600, 0.0)
26	5.58E+01	09,23/11/02	(293800, 6860600, 0.0)
27	5.56E+01	09,21/12/02	(293800, 6860600, 0.0)
28	5.54E+01	10,05/01/02	(293800, 6860600, 0.0)
29	5.43E+01	11,07/03/02	(293800, 6860600, 0.0)
30	5.31E+01	09,17/02/02	(293800, 6860600, 0.0)
31	5.28E+01	10,25/03/02	(293800, 6860600, 0.0)
32	5.22E+01	10,17/02/02	(293800, 6860600, 0.0)
33	5.17E+01	10,18/11/02	(293800, 6860600, 0.0)
34	5.11E+01	10,26/02/02	(293800, 6860600, 0.0)
35	5.10E+01	11,18/02/02	(293800, 6860600, 0.0)
36	5.08E+01	10,02/02/02	(293800, 6860600, 0.0)
37	5.07E+01	10,20/12/02	(293800, 6860600, 0.0)
38	5.05E+01	11,21/11/02	(293800, 6860600, 0.0)
39	5.04E+01	09,18/11/02	(293800, 6860600, 0.0)
40	5.03E+01	10,22/11/02	(293800, 6860600, 0.0)
41	4.98E+01	09,31/10/02	(293800, 6860600, 0.0)
42	4.98E+01	09,01/03/02	(293800, 6860600, 0.0)
43	4.97E+01	10,20/01/02	(293800, 6860600, 0.0)
44	4.91E+01	11,13/04/02	(293800, 6860600, 0.0)
45	4.90E+01	11,10/04/02	(293800, 6860600, 0.0)
46	4.89E+01	12,11/03/02	(293800, 6860600, 0.0)
47	4.89E+01	09,22/11/02	(293800, 6860600, 0.0)
48	4.89E+01	10,25/04/02	(293800, 6860600, 0.0)
49	4.88E+01	08,03/12/02	(293800, 6860600, 0.0)
50	4.85E+01	11,28/02/02	(293800, 6860600, 0.0)
51	4.85E+01	09,24/11/02	(293800, 6860600, 0.0)
52	4.83E+01	11,09/04/02	(293800, 6860600, 0.0)

53	4.76E+01	11,25/04/02	(293800, 6860600, 0.0)
54	4.76E+01	11,23/12/02	(293800, 6860600, 0.0)
55	4.75E+01	11,11/04/02	(293800, 6860600, 0.0)
56	4.73E+01	08,20/01/02	(293800, 6860600, 0.0)
57	4.71E+01	08,17/02/02	(293800, 6860600, 0.0)
58	4.71E+01	10,23/09/02	(293800, 6860600, 0.0)
59	4.66E+01	09,31/12/02	(293800, 6860600, 0.0)
60	4.66E+01	08,18/02/02	(293800, 6860600, 0.0)
61	4.66E+01	12,30/12/02	(293800, 6860600, 0.0)
62	4.66E+01	10,10/04/02	(293800, 6860600, 0.0)
63	4.61E+01	11,26/02/02	(293800, 6860600, 0.0)
64	4.59E+01	11,17/02/02	(293800, 6860600, 0.0)
65	4.55E+01	09,29/11/02	(293800, 6860600, 0.0)
66	4.55E+01	10,14/11/02	(293800, 6860600, 0.0)
67	4.55E+01	09,08/11/02	(293800, 6860600, 0.0)
68	4.54E+01	12,09/04/02	(293800, 6860600, 0.0)
69	4.54E+01	10,20/02/02	(293800, 6860600, 0.0)
70	4.53E+01	10,27/09/02	(293800, 6860600, 0.0)
71	4.52E+01	10,07/02/02	(293800, 6860600, 0.0)
72	4.51E+01	10,31/12/02	(293800, 6860600, 0.0)
73	4.49E+01	10,20/11/02	(293800, 6860600, 0.0)
74	4.49E+01	08,24/11/02	(293800, 6860600, 0.0)
75	4.48E+01	09,23/01/02	(293800, 6860600, 0.0)
76	4.45E+01	09,20/11/02	(293800, 6860600, 0.0)
77	4.43E+01	09,03/10/02	(293800, 6860600, 0.0)
78	4.42E+01	11,28/03/02	(293800, 6860600, 0.0)
79	4.42E+01	09,10/02/02	(293800, 6860600, 0.0)
80	4.41E+01	08,29/11/02	(293800, 6860600, 0.0)
81	4.37E+01	09,04/10/02	(293800, 6860600, 0.0)
82	4.37E+01	09,16/02/02	(293800, 6860600, 0.0)
83	4.37E+01	08,16/01/02	(293800, 6860600, 0.0)
84	4.36E+01	11,09/05/02	(293800, 6860600, 0.0)
85	4.36E+01	09,08/12/02	(293800, 6860600, 0.0)
86	4.35E+01	08,20/11/02	(293800, 6860600, 0.0)
87	4.34E+01	09,25/10/02	(293800, 6860600, 0.0)
88	4.34E+01	13,07/11/02	(293800, 6860600, 0.0)
89	4.29E+01	10,13/09/02	(293800, 6860600, 0.0)
90	4.28E+01	10,24/11/02	(293800, 6860600, 0.0)
91	4.27E+01	10,27/03/02	(293800, 6860600, 0.0)
92	4.26E+01	10,16/05/02	(293800, 6860600, 0.0)
93	4.25E+01	12,02/11/02	(293800, 6860600, 0.0)
94	4.25E+01	08,20/02/02	(293800, 6860600, 0.0)
95	4.24E+01	12,02/03/02	(293800, 6860600, 0.0)
96	4.23E+01	10,07/06/02	(293800, 6860600, 0.0)
97	4.21E+01	08,14/11/02	(293800, 6860600, 0.0)
98	4.20E+01	10,15/09/02	(293800, 6860600, 0.0)
99	4.15E+01	09,14/11/02	(293800, 6860600, 0.0)
100	4.15E+01	10,28/03/02	(293800, 6860600, 0.0)

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1 Peak values for the 100 worst cases (in Odour_Units)
Averaging time = 1 hour; Source group No. 2

Rank Value Time Recorded Coordinates

hour,date (* denotes polar)

1	1.74E+02	23,18/11/02	(293800, 6860600,	0.0)
2	1.73E+02	02,07/03/02	(293800, 6860600,	0.0)
3	1.73E+02	20,22/11/02	(293800, 6860600,	0.0)
4	1.72E+02	01,16/03/02	(293800, 6860600,	0.0)
5	1.70E+02	05,28/05/02	(293800, 6860600,	0.0)
6	1.70E+02	04,29/11/02	(293800, 6860600,	0.0)
7	1.67E+02	04,15/09/02	(293800, 6860600,	0.0)
8	1.67E+02	05,12/04/02	(293800, 6860600,	0.0)
9	1.65E+02	02,03/12/02	(293800, 6860600,	0.0)
10	1.63E+02	06,15/12/02	(293800, 6860600,	0.0)
11	1.59E+02	23,05/11/02	(293800, 6860600,	0.0)
12	1.57E+02	05,14/11/02	(293800, 6860600,	0.0)
13	1.53E+02	23,13/04/02	(293800, 6860600,	0.0)
14	1.53E+02	02,25/04/02	(293800, 6860600,	0.0)
15	1.48E+02	21,23/12/02	(293800, 6860600,	0.0)
16	1.47E+02	01,29/03/02	(293800, 6860600,	0.0)
17	1.46E+02	04,19/11/02	(293800, 6860600,	0.0)
18	1.44E+02	18,07/04/02	(293800, 6860600,	0.0)
19	1.42E+02	01,21/12/02	(293800, 6860600,	0.0)
20	1.33E+02	23,05/06/02	(293800, 6860600,	0.0)
21	1.30E+02	22,07/11/02	(293800, 6860600,	0.0)
22	1.30E+02	05,19/11/02	(293800, 6860600,	0.0)
23	1.27E+02	06,30/12/02	(293800, 6860600,	0.0)
24	1.21E+02	21,09/08/02	(293900, 6860600,	0.0)
25	1.18E+02	02,29/11/02	(293800, 6860600,	0.0)
26	1.16E+02	01,13/04/02	(293800, 6860600,	0.0)
27	1.16E+02	24,23/12/02	(293800, 6860600,	0.0)
28	1.16E+02	03,17/02/02	(293800, 6860600,	0.0)
29	1.14E+02	20,20/12/02	(293800, 6860600,	0.0)
30	1.14E+02	02,21/11/02	(293800, 6860600,	0.0)
31	1.12E+02	18,24/04/02	(293800, 6860600,	0.0)
32	1.11E+02	19,14/09/02	(293900, 6860600,	0.0)
33	1.11E+02	07,30/12/02	(293800, 6860600,	0.0)
34	1.10E+02	21,30/06/02	(293800, 6860600,	0.0)
35	1.09E+02	08,28/02/02	(293800, 6860600,	0.0)
36	1.09E+02	23,11/04/02	(293800, 6860600,	0.0)
37	1.08E+02	22,21/08/02	(293800, 6860600,	0.0)
38	1.07E+02	21,29/10/02	(293900, 6860700,	0.0)
39	1.06E+02	03,29/09/02	(293900, 6860600,	0.0)
40	1.05E+02	01,12/07/02	(293900, 6860600,	0.0)
41	1.05E+02	04,25/10/02	(293900, 6860600,	0.0)
42	1.03E+02	02,18/11/02	(293800, 6860600,	0.0)
43	1.03E+02	21,21/08/02	(293800, 6860600,	0.0)
44	1.02E+02	24,09/11/02	(293800, 6860700,	0.0)
45	1.01E+02	02,03/04/02	(293800, 6860600,	0.0)
46	1.01E+02	08,28/05/02	(293800, 6860600,	0.0)
47	1.00E+02	24,10/08/02	(293800, 6860700,	0.0)
48	9.92E+01	05,26/10/02	(293900, 6860600,	0.0)
49	9.89E+01	09,09/07/02	(293800, 6860600,	0.0)
50	9.87E+01	04,09/05/02	(293800, 6860600,	0.0)
51	9.86E+01	06,31/12/02	(293800, 6860600,	0.0)
52	9.81E+01	02,09/04/02	(293800, 6860600,	0.0)
53	9.81E+01	05,09/04/02	(293800, 6860600,	0.0)
54	9.64E+01	06,21/10/02	(293900, 6860600,	0.0)

55	9.63E+01	06,11/08/02	(293800, 6860600,	0.0)
56	9.52E+01	24,04/10/02	(293800, 6860600,	0.0)
57	9.47E+01	20,24/03/02	(293800, 6860600,	0.0)
58	9.37E+01	18,24/02/02	(293800, 6860600,	0.0)
59	9.30E+01	06,21/04/02	(293800, 6860700,	0.0)
60	9.27E+01	24,22/06/02	(293800, 6860600,	0.0)
61	9.15E+01	04,29/08/02	(293800, 6860600,	0.0)
62	8.94E+01	22,05/06/02	(293800, 6860700,	0.0)
63	8.90E+01	24,25/06/02	(293900, 6860600,	0.0)
64	8.88E+01	04,18/02/02	(293800, 6860600,	0.0)
65	8.84E+01	05,06/05/02	(293900, 6860600,	0.0)
66	8.68E+01	22,13/04/02	(293800, 6860700,	0.0)
67	8.66E+01	03,12/01/02	(293800, 6860600,	0.0)
68	8.60E+01	03,03/10/02	(293900, 6860700,	0.0)
69	8.60E+01	03,24/07/02	(293800, 6860700,	0.0)
70	8.58E+01	22,28/05/02	(293900, 6860600,	0.0)
71	8.58E+01	22,13/09/02	(293900, 6860600,	0.0)
72	8.55E+01	01,15/02/02	(293800, 6860600,	0.0)
73	8.54E+01	22,20/12/02	(293800, 6860600,	0.0)
74	8.48E+01	19,28/05/02	(293900, 6860600,	0.0)
75	8.46E+01	04,06/11/02	(293900, 6860700,	0.0)
76	8.42E+01	23,17/08/02	(293800, 6860600,	0.0)
77	8.35E+01	24,30/11/02	(293800, 6860600,	0.0)
78	8.26E+01	13,24/12/02	(293800, 6860600,	0.0)
79	8.24E+01	07,14/09/02	(293900, 6860600,	0.0)
80	8.16E+01	02,29/10/02	(293800, 6860600,	0.0)
81	8.08E+01	06,12/07/02	(293800, 6860700,	0.0)
82	7.97E+01	06,23/07/02	(293800, 6860700,	0.0)
83	7.90E+01	19,24/04/02	(293900, 6860700,	0.0)
84	7.88E+01	22,17/02/02	(293800, 6860600,	0.0)
85	7.87E+01	21,06/10/02	(293900, 6860600,	0.0)
86	7.77E+01	07,14/02/02	(293800, 6860600,	0.0)
87	7.76E+01	20,14/09/02	(293900, 6860600,	0.0)
88	7.72E+01	22,10/04/02	(293800, 6860700,	0.0)
89	7.69E+01	04,03/03/02	(293800, 6860600,	0.0)
90	7.67E+01	08,20/08/02	(293900, 6860600,	0.0)
91	7.65E+01	03,26/02/02	(293800, 6860600,	0.0)
92	7.61E+01	07,19/01/02	(293800, 6860600,	0.0)
93	7.57E+01	01,08/11/02	(293800, 6860600,	0.0)
94	7.57E+01	04,10/04/02	(293800, 6860600,	0.0)
95	7.55E+01	23,28/08/02	(293800, 6860500,	0.0)
96	7.50E+01	06,06/08/02	(293900, 6860600,	0.0)
97	7.50E+01	06,24/11/02	(293800, 6860700,	0.0)
98	7.47E+01	19,02/03/02	(293800, 6860600,	0.0)
99	7.39E+01	06,08/12/02	(293800, 6860600,	0.0)
100	7.39E+01	03,08/07/02	(293800, 6860700,	0.0)

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1 Peak values for the 100 worst cases (in Odour_Units)
Averaging time = 1 hour; Source group No. 3

Rank	Value	Time Recorded hour,date	Coordinates (* denotes polar)

1	1.74E+02	23,18/11/02	(293800, 6860600, 0.0)
2	1.73E+02	02,07/03/02	(293800, 6860600, 0.0)
3	1.73E+02	20,22/11/02	(293800, 6860600, 0.0)
4	1.72E+02	01,16/03/02	(293800, 6860600, 0.0)
5	1.70E+02	05,28/05/02	(293800, 6860600, 0.0)
6	1.70E+02	04,29/11/02	(293800, 6860600, 0.0)
7	1.67E+02	04,15/09/02	(293800, 6860600, 0.0)
8	1.67E+02	05,12/04/02	(293800, 6860600, 0.0)
9	1.65E+02	02,03/12/02	(293800, 6860600, 0.0)
10	1.63E+02	06,15/12/02	(293800, 6860600, 0.0)
11	1.59E+02	23,05/11/02	(293800, 6860600, 0.0)
12	1.57E+02	05,14/11/02	(293800, 6860600, 0.0)
13	1.53E+02	23,13/04/02	(293800, 6860600, 0.0)
14	1.53E+02	02,25/04/02	(293800, 6860600, 0.0)
15	1.48E+02	21,23/12/02	(293800, 6860600, 0.0)
16	1.47E+02	01,29/03/02	(293800, 6860600, 0.0)
17	1.46E+02	04,19/11/02	(293800, 6860600, 0.0)
18	1.44E+02	18,07/04/02	(293800, 6860600, 0.0)
19	1.42E+02	01,21/12/02	(293800, 6860600, 0.0)
20	1.33E+02	23,05/06/02	(293800, 6860600, 0.0)
21	1.30E+02	22,07/11/02	(293800, 6860600, 0.0)
22	1.30E+02	05,19/11/02	(293800, 6860600, 0.0)
23	1.27E+02	06,30/12/02	(293800, 6860600, 0.0)
24	1.21E+02	21,09/08/02	(293900, 6860600, 0.0)
25	1.18E+02	02,29/11/02	(293800, 6860600, 0.0)
26	1.16E+02	01,13/04/02	(293800, 6860600, 0.0)
27	1.16E+02	24,23/12/02	(293800, 6860600, 0.0)
28	1.16E+02	03,17/02/02	(293800, 6860600, 0.0)
29	1.14E+02	20,20/12/02	(293800, 6860600, 0.0)
30	1.14E+02	02,21/11/02	(293800, 6860600, 0.0)
31	1.12E+02	18,24/04/02	(293800, 6860600, 0.0)
32	1.11E+02	19,14/09/02	(293900, 6860600, 0.0)
33	1.11E+02	07,30/12/02	(293800, 6860600, 0.0)
34	1.10E+02	21,30/06/02	(293800, 6860600, 0.0)
35	1.09E+02	08,28/02/02	(293800, 6860600, 0.0)
36	1.09E+02	23,11/04/02	(293800, 6860600, 0.0)
37	1.08E+02	22,21/08/02	(293800, 6860600, 0.0)
38	1.07E+02	04,25/10/02	(293900, 6860600, 0.0)
39	1.07E+02	21,29/10/02	(293900, 6860700, 0.0)
40	1.06E+02	03,29/09/02	(293900, 6860600, 0.0)
41	1.06E+02	01,12/07/02	(293900, 6860600, 0.0)
42	1.05E+02	05,26/10/02	(293900, 6860600, 0.0)
43	1.04E+02	24,09/11/02	(293800, 6860700, 0.0)
44	1.03E+02	02,18/11/02	(293800, 6860600, 0.0)
45	1.03E+02	21,21/08/02	(293800, 6860600, 0.0)
46	1.01E+02	02,03/04/02	(293800, 6860600, 0.0)
47	1.01E+02	08,28/05/02	(293800, 6860600, 0.0)
48	1.00E+02	24,10/08/02	(293800, 6860700, 0.0)
49	9.89E+01	09,09/07/02	(293800, 6860600, 0.0)
50	9.87E+01	04,09/05/02	(293800, 6860600, 0.0)
51	9.86E+01	06,31/12/02	(293800, 6860600, 0.0)
52	9.81E+01	02,09/04/02	(293800, 6860600, 0.0)
53	9.81E+01	05,09/04/02	(293800, 6860600, 0.0)
54	9.64E+01	06,21/10/02	(293900, 6860600, 0.0)
55	9.63E+01	06,11/08/02	(293800, 6860600, 0.0)
56	9.52E+01	24,04/10/02	(293800, 6860600, 0.0)

57	9.47E+01	20,24/03/02	(293800, 6860600, 0.0)
58	9.37E+01	18,24/02/02	(293800, 6860600, 0.0)
59	9.32E+01	06,21/04/02	(293800, 6860700, 0.0)
60	9.27E+01	24,22/06/02	(293800, 6860600, 0.0)
61	9.15E+01	04,29/08/02	(293800, 6860600, 0.0)
62	8.95E+01	24,25/06/02	(293900, 6860600, 0.0)
63	8.94E+01	22,05/06/02	(293800, 6860700, 0.0)
64	8.88E+01	04,18/02/02	(293800, 6860600, 0.0)
65	8.84E+01	05,06/05/02	(293900, 6860600, 0.0)
66	8.72E+01	03,24/07/02	(293800, 6860700, 0.0)
67	8.68E+01	22,13/04/02	(293800, 6860700, 0.0)
68	8.66E+01	03,12/01/02	(293800, 6860600, 0.0)
69	8.63E+01	03,03/10/02	(293900, 6860700, 0.0)
70	8.58E+01	22,28/05/02	(293900, 6860600, 0.0)
71	8.58E+01	22,13/09/02	(293900, 6860600, 0.0)
72	8.55E+01	01,15/02/02	(293800, 6860600, 0.0)
73	8.54E+01	22,20/12/02	(293800, 6860600, 0.0)
74	8.48E+01	04,06/11/02	(293900, 6860700, 0.0)
75	8.48E+01	19,28/05/02	(293900, 6860600, 0.0)
76	8.42E+01	23,17/08/02	(293800, 6860600, 0.0)
77	8.35E+01	24,30/11/02	(293800, 6860600, 0.0)
78	8.30E+01	06,23/07/02	(293800, 6860700, 0.0)
79	8.27E+01	13,24/12/02	(293800, 6860600, 0.0)
80	8.24E+01	07,14/09/02	(293900, 6860600, 0.0)
81	8.16E+01	02,29/10/02	(293800, 6860600, 0.0)
82	8.11E+01	06,12/07/02	(293800, 6860700, 0.0)
83	8.07E+01	09,18/02/02	(293800, 6860600, 0.0)
84	7.90E+01	19,24/04/02	(293900, 6860700, 0.0)
85	7.88E+01	22,17/02/02	(293800, 6860600, 0.0)
86	7.87E+01	21,06/10/02	(293900, 6860600, 0.0)
87	7.77E+01	07,14/02/02	(293800, 6860600, 0.0)
88	7.76E+01	20,14/09/02	(293900, 6860600, 0.0)
89	7.75E+01	02,27/09/02	(293900, 6860600, 0.0)
90	7.72E+01	22,10/04/02	(293800, 6860700, 0.0)
91	7.69E+01	04,03/03/02	(293800, 6860600, 0.0)
92	7.67E+01	08,20/08/02	(293900, 6860600, 0.0)
93	7.65E+01	03,26/02/02	(293800, 6860600, 0.0)
94	7.61E+01	07,19/01/02	(293800, 6860600, 0.0)
95	7.57E+01	01,08/11/02	(293800, 6860600, 0.0)
96	7.57E+01	04,10/04/02	(293800, 6860600, 0.0)
97	7.55E+01	23,28/08/02	(293800, 6860500, 0.0)
98	7.55E+01	10,14/12/02	(293800, 6860600, 0.0)
99	7.54E+01	06,24/11/02	(293800, 6860700, 0.0)
100	7.52E+01	03,08/07/02	(293800, 6860700, 0.0)