

ATTACHMENT 10 - ODOUR ASSESSMENT

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Anakie Broiler Farm

Odour Assessment – Proposed Farm 3 Expansion

Pavilion Farm Pty Ltd

9 October 2025

→ The Power of Commitment



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1. Introduction

Pavilion Farms, operates six broiler farms in Anakie, Victoria. GHD understands that Pavilion Farms is proposing to develop a special class farm at the site. The proposal is to expand Farm 3 to over 800,000 birds. It is understood that the planning permit for Farm 2 expansion has been approved and is under construction at the time this report is prepared. To support the proposed expansion, Pavilion Farms has requested an Odour Environmental Risk Assessment (OERA) to be undertaken to assess the resultant odour impacts on the surrounding areas.

On 8 February 2024, a meeting between EPA Victoria representative¹, GHD and Pavilion Farms was held to discuss the scope of work for the OERA to be undertaken at the site. The scope of work proposed by GHD was accepted by EPA.

1.1 Purpose of this report

The purpose of this report is to undertake an OERA in accordance with EPA Publication 1883 – *Guidance for assessing odour* and AgriFutures – *Planning and environment guideline for establishing meat chicken farms: Guide 1 – Assessment guide* for a proposed expansion of the existing broiler farms at 435 Carrs Road, Anakie (the site), to understand odour risks associated with proposed operations. Specifically, this report assesses the proposed expansion of Farm 3 and the current farms (including expansion of Farm 2 currently under construction).

The findings, conclusions and recommendations of this assessment should be read in conjunction with the limitations presented in Section 1.3.

1.2 Scope of works

The scope of works is as follows:

- Inception meeting with EPA to discuss assessment approach
- Request and review of information
- Level 3 Odour Environmental Risk Assessment in line with EPA Victoria Publication 1883: *Guidance for Assessing Odour* and AgriFuture 2021. *Planning and environment guideline for establishing meat chicken farms: Guide 1 – Assessment guide*
- Review the odour controls for current and proposed operations
- Historical complaint data analysis within the area around the site
- Undertake air dispersion modelling using CALPUFF model
- Report detailing the findings of the above tasks including level of risk (or zone of risk) surrounding the site in the context of sensitive receptor impacts

1.3 Limitations

This report has been prepared by GHD for Pavilion Farm Pty Ltd and may only be used and relied on by Pavilion Farm Pty Ltd for the purpose agreed between GHD and Pavilion Farm Pty Ltd as set out in section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than Pavilion Farm Pty Ltd arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

¹ EPA Victoria Odour Expert – Chris Bydder

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer section(s) 1.4 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

Accessibility of documents

If this report is required to be accessible in any other format, this can be provided by GHD upon request and at an additional cost if necessary.

1.4 Assumptions

The following assumptions were utilised in the preparation of this report:

- Odour is the primary emission of concern from the broiler farm
- Odour generated from the broiler farms are linearly proportional to the throughput of the facilities
- GHD relied on EPA Publication 1883 and AgriFutures 2021 to undertake air dispersion modelling.
- Odour surveillance data for Sale-Toongabbie Farm is considered representative for broiler farms with similar shed size and ventilation set up. Based on this, GHD has relied on odour surveillance data from Sale-Toongabbie Farm to undertake odour risk assessment for broiler farms in Anakie
- All information provided is correct and representative of the proposed operations at the site
- Data obtained from Bureau of Meteorological (BoM) stations is correct
- All information related to the proposed Fertiliser Facility provided in the “Technical Review and Air Quality and Odour Impact Assessment” (prepared by The Odour Unit for Pavilion Farms in 2022) is free from significant errors and omissions

2. Legislation and guidelines

2.1 Environment Protection Act 2018 (amendment to Environment Protection Act 2017)

EPA Victoria released a new legal framework on 1 July 2021, with the intention for this framework to drive environmental improvements in industrial operations. The cornerstone of the Environment Protection Act 2017 (the EP Act) is the general environmental duty (GED), which requires Victorians to understand and minimise their risks of harm to human health and the environment, from pollution and waste.

Complying with the GED is about taking reasonable proactive steps and employing good environmental work practices. Compliance with the GED can be through following responsibilities under Occupational Health and Safety (OHS) laws, meeting industry standards, adopting industry better management practices, and following other relevant legislation related to the environment. In effect, the GED makes it clear that it is the individual businesses' responsibility to reduce risk to the environment and to protect it.

2.2 Environment Reference Standard

The EP Act's environment protection framework includes the Environment Reference Standard (ERS). This identifies environmental values, air indicators and objectives that set the benchmark for the quality of the air environment needed to protect environmental values. The environmental values identified include:

- Life, health and wellbeing of humans
- Life, health and well-being of other forms of life, including the protection of ecosystems and biodiversity
- Local amenity and aesthetic enjoyment
- Visibility
- The useful life and aesthetic appearance of buildings, structures, property and materials
- Climate systems that are consistent with human development, the life, health and well-being of humans, and the protection of ecosystems and biodiversity

The ERS is a reference standard, not a 'compliance standard' for businesses i.e. it relates to ambient air and not any individual facility. The ERS replaces SEPP (AQM) and generally adopts the objectives in the National Environment Protection Measure (Ambient Air Quality) (NEPM AAQ) with some modifications.

The following air quality indicators, and respective objectives, relevant to this assessment are outlined below:

- **Odour**
An air environment that is free from offensive odours from commercial, industrial, trade and domestic activities

As such, the 5 Odour Unit (OU) level is generally taken as the level that if the odour is offensive, it may lead to nuisance and resultant complaint. Hence, GHD has utilised the 5 OU level to assess the 99.9th percentile 3-minute average odour impact from the site.

2.3 Victorian Code for Broiler Farms – 2009

The Victorian Code for Broiler Farms 2009 (The Code) is the code of practice for the planning, design, assessment, approval, construction, operation, and management of broiler farms in Victoria. It was developed to provide clear environmental standards for those wishing to establish new, or expand existing, broiler farms, and assurance for the surrounding landholders who may be impacted by broiler farming activities.

The 2018 amendments include:

- New definition for broiler farm to include free-range chicken meat farms
- A minimum farm size for which the Code applies (only applies to farms with more than 10,000 birds)

The Code details the method of calculating separation distances to assess whether a proposed broiler farm has sufficient separation to the nearest residences. However, where the farm capacity exceeds 400,000 birds, the farm is termed a Special Class and instead of using a separation distance criterion, an Odour Environmental Risk Assessment (OERA) must be conducted in accordance with the requirements outlined in Section 6 of the Code. The requirements are listed below:

Stage 1 – Odour dispersion modelling is required to assess the cumulative odour emissions from all the broiler farms within the site. The dispersion model will be used to calculate whether the predicted peak (99.9th percentile) odour levels exceed the 5 OU criterion at the site boundary². If the criterion is met at and beyond the broiler farm boundary, then the responsible authority should accept that the risk of odour amenity impact is low and no further assessment is required.

Stage 2 – When the odour modelling results do not meet the criterion, an analysis of the odour modelling results will be undertaken to determine the frequency (how often) of the odour impact, duration (the length of time) and extent (the number of odour units) on surrounding sensitive uses (that is for dwellings). This information can then be used to determine whether the risk of adverse odour impacts beyond the broiler farm boundary is acceptable.

Stage 3 – If, following Stage 2 analysis, the risk of adverse odour impacts beyond the broiler farm boundary is considered to be unacceptable, then the design of the broiler farm will need to be modified. This may include, for example, reducing the number of chickens and/or relocating the broiler sheds.

2.3.1 Project application

The OERA for this assessment will be conducted as follows:

Stage 1 – Odour dispersion modelling will be undertaken using CALPUFF, with odour emissions estimated using Ormerod and Holmes emissions method³. The predicted cumulative odour emissions from all broiler farms for all scenarios will be assessed against the 99.9th percentile 3-minute average 5 OU odour criterion.

Stage 2 – At the time this assessment was undertaken, there are no established risk assessment for assessing odour impact using predicted results from odour dispersion model. GHD has therefore adopted the assessment for risk of odour exposure presented in Section 6.3 of EPA Publication 1883 – *Risk of Offensive Odour using Area Surveillance Method* to assess the likelihood of the identified receptors in experiencing offensive odour from the broiler farm.

2.4 New national guideline – Meat chicken farms

In November 2021, the first national planning and environmental guideline developed for Australia's chicken meat industry was released⁴. Two guides have been prepared by AgriFutures Australia and include (i) Planning and environment guideline for establishing meat chicken (broiler) farms (Guide 1 – Assessment guide) and (ii) its companion document (Guide 2 – Applicant guide).

The principal aim of these guidelines is to safeguard that the chicken meat industry's ongoing economic growth upholds the principles of environmentally sustainable and socially responsible development. This is to be achieved by confirming that future meat chicken farms are located, designed, and managed sustainably and provide confidence for ongoing industry investment.

They have been developed through an extensive review of state environmental requirements and application guidance for meat chicken farms and other intensive animal industries. These guidelines were developed in collaboration and consultation with researchers and industry experts, as well as local government and state departments of planning, environment, primary industries, and agriculture.

² In accordance with SEPP (AQM) which is now superseded by the ERS.

³ Ormerod and Holmes 2005. A study referenced in AgriFuture 2021 Guide – 1. However, the title and publisher of this study is not presented in Guide 1.

⁴ <https://agrifutures.com.au/product/planning-and-environment-guideline-for-establishing-meat-chicken-farms-guide-1-assessment-guide/>

2.4.1 Project application

For odour dispersion modelling, CALPUFF is selected as it is the model recommended in AgriFutures Guide 1 to be used to undertake poultry assessment. This assessment also utilised the K-factor method, also known as the Ormerod and Holmes emissions method (Ormerod and Holmes 2005)⁵. The K-factor emissions method is based on the relationship between the number of birds present, the stocking density of the birds, the ventilation rate and overall farm management.

The K-factor method estimates hourly varying odour emission rates (OER) from a poultry farm shed using the following equation:

$$OER = 0.025 \times K \times A \times D \times V^{0.5}$$

Where:

OER	Hourly odour emission rate (OU.m ³ /s)
K	Scaling factor between 1 and 5, where a value of 1 represents a very well designed and managed shed operating with minimal odour emissions, and a value of 4 – 5 would represent a shed with serious odour management issues. For this assessment, a K factor of 1.9 has been selected. AgriFutures Guide 1 recommends that when modelling a 'greenfield' site that will be operated to best management practice, a K-factor of no less than 1.9 should be used as it represented the most recent test data from new farms. GHD notes that recent K measurements has shown K factor values down to 1.2 and 1.3 however use of 1.9 will be more conservative and give a higher impact than what will occur for a new farm.
A	Total shed floor area (m ²)
D	Average bird density (kg/m ²)
V	Ventilation rate (m ³ /s)

2.5 EPA Publication 1883 Guidance for assessing odour

EPA Publication 1883 provides guidance on how to assess the risk posed by odour emission sources and to understand the receiving environment where effects might occur. The guideline is to be utilised once an assessment of the separation distance has been undertaken to assess for any potential constraints. This is to evaluate the risk of harm in accordance with ERS objective for odour.

EPA Publication 1883 focuses on the assessment of odour under the provisions of the EP Act, including the GED, which requires all Victorians to take precautionary and reasonable actions to avoid hazards causing harm. The guideline is primarily intended for government, the planning sector, practitioners, and specialists, who need to understand offensive odours that are associated with a development proposal, investigation or study where an odour assessment is required. The publication provides a framework for three levels of risk assessment, according to the odour impact potential of an industry or site. The three levels of assessment include:

- Level 1 – Gateway assessment of emissions duration, wind direction and cumulative odour sources
- Level 2 – Source-Pathway-Receptor assessment
- Level 3 – Detailed risk assessment that could include:
 - Comparisons with similar operations or case studies
 - Risk assessment using field odour surveillance data
 - Complaint assessment
 - Community odour surveys/questionnaires and odour diaries
 - The use of dispersion modelling

⁵ Ormerod and Holmes 2005. A study referenced in AgriFuture 2021 Guide – 1. However, the title and publisher of this study is not presented in Guide 1.

2.5.1 Project application

This assessment includes selected Level 3 tools to assess the overall odour risk from the broiler farm. The tasks associated with Level 3 assessments undertaken for this site are presented below:

- Complaint assessment
- Odour dispersion modelling
- Odour surveillance from a comparable operation

3. Site overview

3.1 Site location

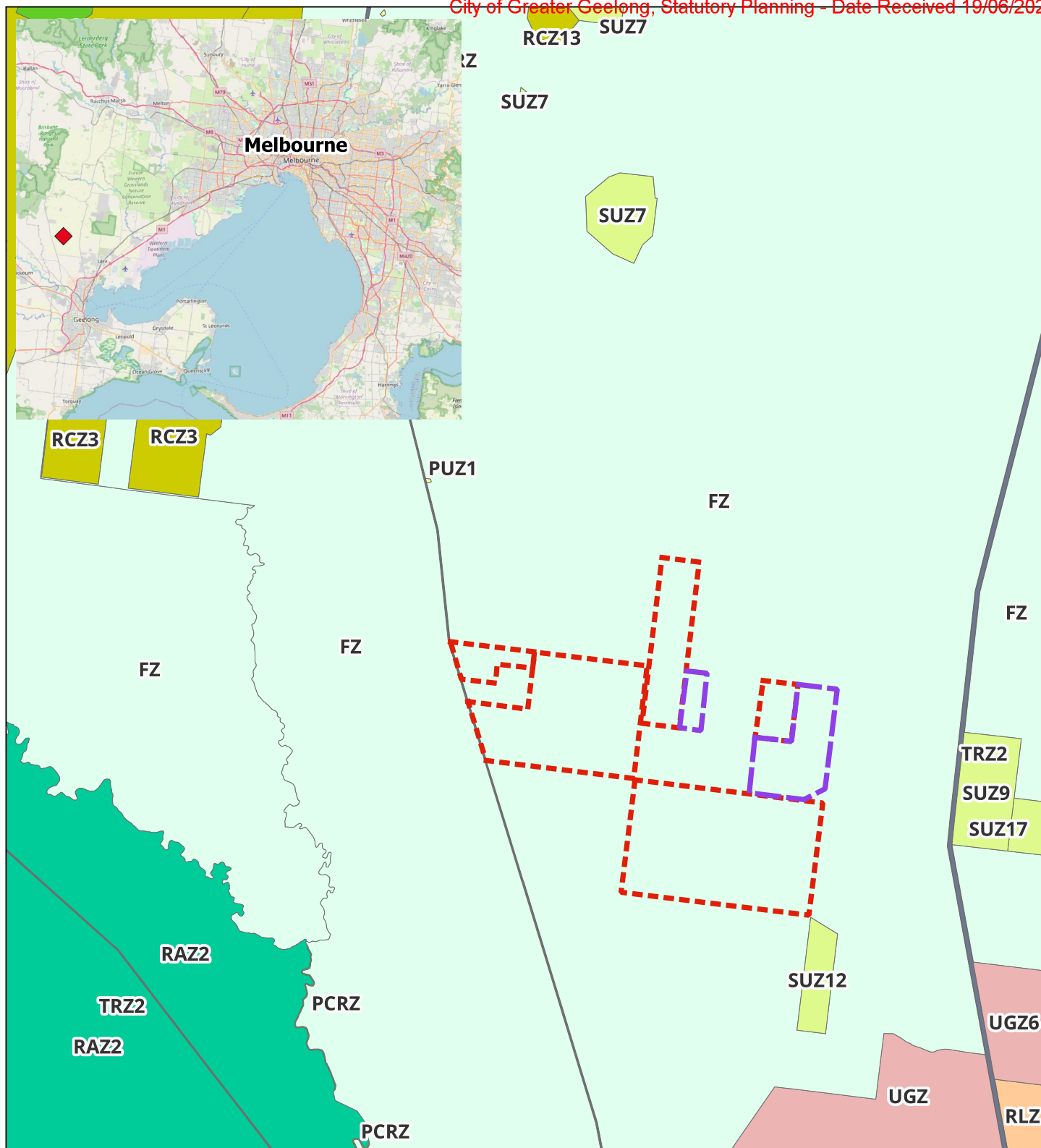
The existing and proposed farms are located at Anakie East (the site). The site and its immediate surrounding are currently zoned as Farming Zone under the Greater Geelong City Council.

The township closest to the site is Lara, which is approximately 4 km to the southeast, followed by Anakie township located approximately 5 km northwest of the site. The existing air quality in the area is considered to be typical of a rural area with mainly agricultural activities, notably a feedlot south of Farm 5, and other non-agricultural activities such as quarry to the east of Farm 1 and a composting facility to the west of Farm 3. An aerial image of the site relative to the townships and land zonings are shown in Figure 1.

The locations of the existing and proposed broiler farms are summarised in Table 1 and presented graphically in Figure 2.

Table 1 *Locations of existing and proposed broiler farms*

Existing farm	Proposed additional farm	Address	Parcel
Farm 1 (F1)	No	435 Carrs Road, Anakie 3213	Lot 1, PS703711
Farm 2 (F2)	Yes - planning application approved and currently under construction. In this report, F2 expansion is considered as existing farm.	435 Carrs Road, Anakie 3213	Lot 1, PS703711
Farm 3 (F3)	Yes	415 Carrs Road, Anakie 3213	Lot 1, PS829403
Farm 4 (F4)	No	1,280 Ballan Road, Anakie 3213	CA93 TP905606
Farm 5 (F5)	No	1,450 Ballan Road, Anakie 3213	CA134 – TP315423
Farm 6 (F6)	No	1,540 Ballan Road, Anakie 3213	Lot 1, PS802218



Legend

- | | | |
|--|--|-----------------------------------|
| Pavilion Farms owned properties | PUZ1 - Public Use Zone-Service and Utility | TRZ2 - Principal Road Network |
| Land to be acquired by Pavilion Farms | RAZ - Rural Activity Zone | TRZ3 - Significant Municipal Road |
| Site location | RCZ - Rural Conservation Zone | TZ - Township Zone |
| PCRZ - Public Conservation and Resource Zone | RGZ - Residential Growth Zone | UGZ - Urban Growth Zone |
| PPRZ - Public Park and Recreation Zone | RLZ - Rural Living Zone | |
| | SUZ - Special Use Zone | |

Paper Size ISO A4
0 1,000 2,000 m
Map Projection: Universal Transverse Mercator
Horizontal Datum: WGS84 - UTM
Grid: UTM 55 S



Pavilion Farms
Anakie Broiler Farm Odour Assessment

Site location

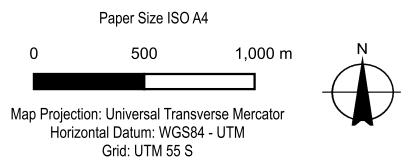
Project No. 12629546
Revision No. -
Date. 07/03/2024

FIGURE 1.0



Legend

- | | |
|---------------------------------------|---------------------|
| Pavilion Farms owned properties | Existing farm sheds |
| Land to be acquired by Pavilion Farms | Proposed farm sheds |



Pavilion Farms
Anakie Broiler Farm Odour Assessment

Existing farm locations

Project No. 12629546
Revision No. -
Date. 09/10/2025

FIGURE 2.0

3.2 Site operation

3.2.1 Bird numbers

Table 2 summarises the number of existing and proposed sheds within each farm, number of birds in each shed and the farm identifications which GHD uses for the farms in this assessment.

Table 2 Farm Information

Farm ID	Existing			Proposed		
	Shed number	Bird per shed	Total bird number	Shed number	Bird per shed	Total bird number
F1	4	44,500	178,000	-		
F2	8	44,500	356,000	-		
F2 expansion (planning permit approved and under construction)	6	75,473	452,838	-		
F3	6	66,667	400,000	6	75,473	452,838
F4	6	66,667	400,000	-		
F5	8	48,625	389,000	-		
F6	8	48,625	389,000	-		

3.2.2 Shed size

Table 3 summarises the existing and proposed shed dimensions and areas at each farm.

Table 3 Shed sizes

Farm ID	Existing		Proposed	
	Dimensions	Area (m ²)	Dimensions	Area (m ²)
F1	150 m X 17.1 m	2,565	-	-
F2	150 m X 17.1 m	2,565	-	-
F2 expansion (planning permit approved and under construction)	174 m X 25 m	4,350	-	-
F3	156 m X 25 m	3,900	174 m X 25 m	4,350
F4	156 m X 25 m	3,900	-	-
F5	164 m X 17.1 m	2,804	-	-
F6	164 m X 17.1 m	2,804	-	-

3.2.3 Grow-out cycle

The typical grow-out cycle, or the production cycle, for the current and proposed farms are nine weeks (61 days) in total, comprising:

- 47 days of bird occupation
- 7 days of litter removal and shed cleanout
- 7 days of new bedding and preparation work for the next batch of birds

The typical bird live weight over the growth cycle is summarised in Table 4.

Table 4 Typical bird live weight over the growth cycle

Day in growth cycle	Typical bird live weight (grams)
0	42
7	190
14	519
21	985
28	1,573
35	2,235
42	2,918
47	3,393

3.2.4 Sequencing

It is understood that birds are placed in each farm sequentially over a sixty-day period. The placement of birds in the existing and proposed farm, relative to the growth cycle of Farm 1, are summarised in Table 5.

Table 5 Sequence of bird placement at the existing and proposed farms

Farm ID	Placement of birds (Day relative to Farm 1 growth cycle)	
	Existing farm	Proposed farm
Farm 1	Day 1	-
Farm 2	Day 8	-
Farm 3	Day 18	Day 18
Farm 4	Day 28	-
Farm 5	Day 38	-
Farm 6	Day 48	-

3.2.5 Bird thinning

The RSPCA Approved Farming Scheme Standard for Meat Chicken⁶ (RSPCA 2020), the recommended stocking density for tunnel ventilated or extractive systems is to be less than 34 kg/m². The existing farms have placement density ranging between 17.1 birds/m² and 17.4 birds/m². The proposed farms are expected to have a placement density of approximately 17.4 birds/m².

Bird thinning is carried out to maintain the stocking density below the RSPCA 2020 standard of 34 kg/m². It is understood that the current site generally removes 33% of the total birds at around Day 29 (start of week 5), another 18% of the remaining birds at around Day 42 (end of week 6) and all birds on Day 47 (end of growth cycle). Accounting for a mortality rate of around 4% for one growth cycle, this would give maximum bird mass density ranging between 28 kg/m² and 33 kg/m² during one growing cycle before birds are removed from the shed.

⁶ RSPCA Approved Farming Scheme Standard for Meat Chicken, v1.1, published in August 2020 by RSPCA Australia

3.2.6 Shed temperature

The shed temperature in a shed is controlled. Generally, the shed temperature is held at approximately 31°C at the start of the growing cycle as this is the optimum temperature for baby chick comfort, health, and survival. As bird mass increases, the internal shed temperatures required for optimum bird performance decreases. The shed temperature is gradually lowered by about 0.5 °C each day after the first two days, down to 20°C by week 6.

3.2.7 Ventilation

Ventilation is used to manage internal shed temperatures. Changes in ventilation that are required to achieve the target effective temperature are a function of ambient temperature. At Pavilion Broiler Farms, all sheds are installed with the following ventilation technologies:

- DACS Variable Speed MagFans (tunnel ventilation fan)
- Corona ventilation system (roof inlet fan) which brings fresh air into the shed through the roof and dispersing this air across the floor of the shed

Table 6 summarises the number of tunnel ventilation fan and roof inlet fans at each existing and proposed shed. The specifications of these fans are provided to GHD by Pavilion Farms and are included in Appendix A of this report.

Table 6 *Number of fans at each shed*

Farm ID	Existing		Proposed	
	Number of tunnel fans per shed	Number of roof inlet fans per shed	Number of tunnel fans per shed	Number of roof inlet fans per shed
F1	10	9	-	-
F2	10	9	-	-
F2 expansion (planning permit approved and under construction)	14	32	-	-
F3	12	28	14	32
F4	12	28	-	-
F5	8	10	-	-
F6	8	10	-	-

3.3 Sensitive receptors

The sensitivity of the receiving environment has two aspects: the overall land use in the receiving environment and the compliance history, social or historical context experienced by people in determining the odour receiving environment score.

As stated in Section 5.5 of EPA Publication 1883, land use is based on the existing uses and/or land use terms and nesting diagrams in the Victoria Planning Provisions (VPP) land use terms and nesting groups (Clause 73.03 & 73.04, as shown in Table 4 of EPA Publication 1883, also shown in this report as Figure 3). Assessment is to be based on the most sensitive land-use within the separation distance (also known as buffer distance) or 2 km, whichever is closest.

Based on the above, sensitive receptors were identified within 2 km of radius from the site as this is generally considered the distance at which sensitive receptors are likely to experience odour nuisance from an odour source. A total of 28 receptors have been identified within 2 km of the site boundary to be included in this assessment.

All sensitive receptors identified are located on lands zoned as Farming Zone except for R2 – R4 which are located on lands zoned as Special Use Zone – Schedule 9. Information of the identified receptors are presented in Table 7 and graphed in Figure 4.

It should be noted that the sensitive receptors are identified based on publicly available aerial imagery provided in Google Earth and Google Maps at the time this assessment is undertaken. The receptor addresses are verified using VicPlan⁷.

Sensitivity	VPP Land use term or nesting group (number in bold)	Existing Uses
Low	• 73.04-3 animal production • 73.04-2 agriculture • 73.04-10 Recreational boat facility • 73.04-15 Warehouse • 73.04-5 Industry • 73.04-7 Earth and energy resources • 73.04-13 Transport terminal • 73.04-14 Utility installation • 73.04-16 Renewable energy • Car Park • Saleyard • Tramway • Natural systems • Freeway service centre/service stations	• Industrial use or equivalent rural use (in the case of agricultural odours). No population nearby or uses are transient (e.g., state parks etc.). • Exposure to odours can easily be avoided.
Medium	• 73.04-8 Office • 73.04-6 Leisure and recreation • 73.04-9 Place of assembly • 73.04-11 Retail premises • 73.04-12 Retail Premises (shop) • 73.04-4 Education centre • Research centre • Winery • Cemetery or Crematorium • Emergency services facility • Brothel • Art and craft centre	• Business areas: exposure can typically be controlled by mitigation at the receptor (incorporated health ventilation and air conditioning systems etc.). • Receptors that are single dwelling or isolated rural dwellings receptor is business/commercial. • Enjoyment of the outdoors: recreational activities, playing sport, populations can move on or plan around exposure.
High	• 73.04-1 Accommodation • Rural living zones • Hotels/motels • Hospital • Prison • Mixed use zones with residential apartments at ground level. • Residential areas	• Built up area, towns, many dwellings with backyards and outdoor living areas. • Rural residential, schools, childcare or apartments. • Permanent populations where avoiding exposure is not possible.

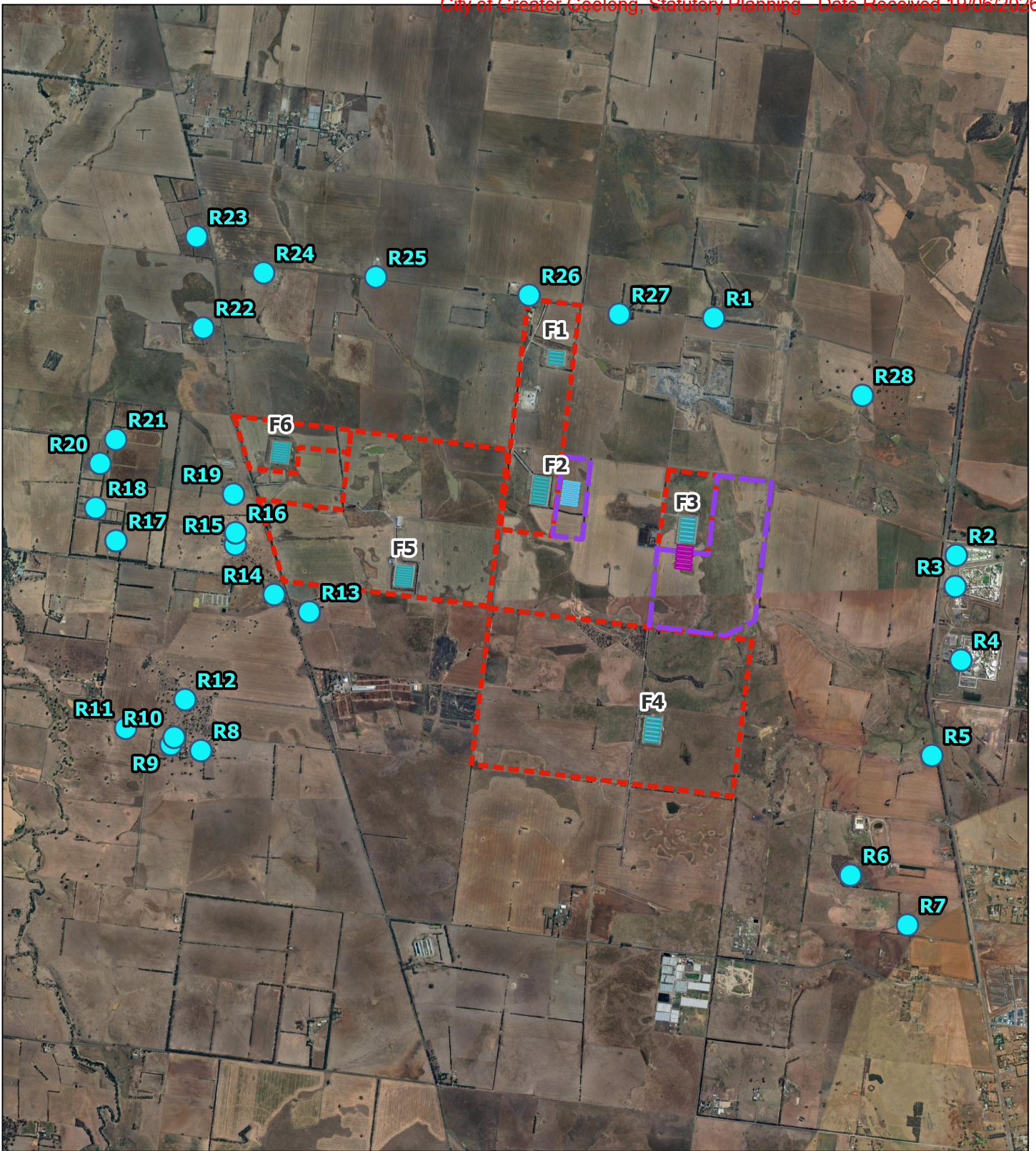
Figure 3 Receiving environment sensitivity. Extracted from Table 4 of EPA Publication 1883

⁷ <https://mapshare.vic.gov.au/vicplan/>- Last access March 2024

Table 7 Sensitive receptors identified within approximately 2 km radius from the site boundary

Receptor	Address	Type of receptor	UTM 55 x (m)	UTM 55 y (m)	Zoning	Receiving environment sensitivity
R1	230 Carrs Road Anakie 3213	Residential	264788.2	5796033.4	Farming	Low
R2	SESG Training, Peak School Rd, Lara VIC 3212	Training facility/Education centre	267242.4	5793630.9	Special Use Zone - Schedule 9	Medium
R3	1170 Bacchus Marsh Rd, Lara VIC 3212	Marngoneet Correctional Centre	267231.8	5793315.7	Special Use Zone - Schedule 9	High
R4	1140 Bacchus Marsh Rd, Anakie VIC 3212	HM Prison Barwon	267290.2	5792570.5	Special Use Zone - Schedule 9	High
R5	965 Bacchus Marsh Rd, Anakie VIC 3213	Residential	266995.9	5791606.3	Farming	Low
R6	805 Bacchus Marsh Rd, Anakie VIC 3213	Residential	266172.1	5790395.3	Farming	Low
R7	785 Bacchus Marsh Rd, Anakie VIC 3213	Residential	266748.7	5789891.6	Farming	Low
R8	1165-1205 Ballan Road, Anakie, 3213	Residential	259600.6	5791655.4	Farming	Low
R9	600 Sutherlands Creek Road, Anakie, 3213	Residential	259296.7	5791715.8	Farming	Low
R10	650 Sutherlands Creek Road Anakie, 3213	Residential	259329.9	5791790.1	Farming	Low
R11	635 Sutherlands Creek Road Anakie	Residential	258840.1	5791881.7	Farming	Low
R12	1215 Ballan Road Anakie, 3213	Residential	259440	5792171	Farming	Low
R13	1360 Ballan Road Anakie 3213	Residential	260696.1	5793057.8	Farming	Low
R14	35 Pringles Road Anakie 3213	Residential	260341.5	5793234.1	Farming	Low
R15	1385-1425 Ballan Road Anakie 3213	Residential	259948.2	5793740.5	Farming	Low
R16	1435-1475 Ballan Road Anakie 3213	Residential	259951.3	5793858.8	Farming	Low
R17	170 Pringles Road Anakie	Residential	258741.8	5793777.8	Farming	Low
R18	80 Clifton Road Anakie 3213	Residential	258535.2	5794111.2	Farming	Low
R19	1485-1575 Ballan Road Anakie 3213	Residential	259931	5794250.2	Farming	Low
R20	120 Clifton Road Anakie 3213	Residential	258580.5	5794560.6	Farming	Low
R21	160 Clifton Road Anakie 3213	Residential	258738.7	5794803.3	Farming	Low

Receptor	Address	Type of receptor	UTM 55 x (m)	UTM 55 y (m)	Zoning	Receiving environment sensitivity
R22	1645 Geelong-Ballan Rd, Anakie VIC 3213	Residential	259623.3	5795931.2	Farming	Low
R23	1745 Geelong-Ballan Road Anakie 3213	Residential	259556.9	5796854.7	Farming	Low
R24	705 Carrs Rd, Anakie VIC 3213	Residential and Jewel Park Border Collies	260234.6	5796488.8	Farming	Low
R25	610 Carrs Road Anakie 3213	Residential	261369.6	5796447.1	Farming	Low
R26	420 Carrs Road Anakie 3213	Residential	262920.8	5796262.7	Farming	Low
R27	345 Carrs Road Anakie 3213	Residential	263832.3	5796070.0	Farming	Low
R28	95 – 125 Carrs Road Anakie 3213	Residential	266292.7	5795249.0	Farming	Low



Legend

- Sensitive receptors
- Pavilion Farms owned properties
- Land to be acquired by Pavilion Farms
- ▭ Existing farm sheds
- ▭ Proposed farm sheds

Paper Size ISO A4
0 500 1,000 m
Map Projection: Universal Transverse Mercator
Horizontal Datum: WGS84 - UTM
Grid: UTM 55 S



Pavilion Farms
Anakie Broiler Farm Odour Assessment

Sensitive receptors

Project No. 12629546
Revision No. -
Date. 09/10/2025

FIGURE 4.0

3.4 Other odour sources

3.4.1 Feedlot and composting facility

As mentioned in Section 3.1 of this report, there is a feedlot south of Farm 5, and a composting facility to the west of Farm 3 which contributes to the existing odour environment. The locations of the feedlot and composting facility are presented in Figure 2.

The odours from the feedlot and composting facility have not been considered in the OERA as these odours have different odour characters when compared to chicken farm odour.

3.4.2 Proposed fertiliser facility

It is understood that a Fertiliser Facility is in the process of being constructed in between the existing broiler farms Farm 1 and Farm 2. The Fertiliser Facility is proposed to convert approximately 19,700 tonnes per annum of poultry litter and 10,000 tonnes per annum of other carbon rich organic waste typically paunch, dissolved air floatation sludge and cheese whey into 6,200 tonnes per annum of high-grade organic fertiliser. In addition to high-grade organic fertiliser, 8,000,000 cubic metres of biogas containing methane (60-65%), carbon dioxide and other trace gases will be produced, captured and combusted for electrical energy and heat production.

A technical risk based management review of the air quality and odour risks relating to the proposed Pavilion Farms Fertiliser Facility was undertaken by The Odour Unit Pty Ltd (TOU) in 2022 and presented in the Technical Review and the air and odour quality impact assessment. In the impact assessment, the key sources identified as likely to pose an air quality and odour emission risk from the Proposed Fertiliser Facility collectively or individually includes:

- Solid feedstock storage bunkers (non-combustion gases emission source)
- Dried & separated product storage (non-combustion gases emission source)
- Buffer process material storage (non-combustion gases emission source)
- Slurry dryer process (non-combustion gases emission source)
- Particle size reduction process of the input feedstock and digested material (non-combustion gases emission source)
- Drying of solid digestate and concentrated slurry (non-combustion gases emission source)
- CHPs (continuous combustion gas emission source)
- The flare and boiler exhaust stacks (transient combustion gas emission sources)

The air quality and odour impact assessment concluded that, with appropriate design and engineering controls incorporated into the designs of the proposed fertiliser facility, the proposed fertiliser facility is unlikely to contribute to offensive odour beyond the site boundary of Farm 1 and the odour is not considered to contribute significantly to the existing poultry odour. Therefore, odour impact from the proposed fertiliser facility is not included in the OERA.

4. Meteorology

GHD notes that Pavilion Farms has installed an Automated Weather Station (AWS) in 2019 and this is the only AWS providing site-specific data. It is understood that the onsite AWS is installed at the height of 2 m. The onsite AWS data recorded high frequency of calm winds (less than 0.5 m/s) and therefore is not used as an input in meteorological modelling. The nearest Bureau of Meteorology (BoM) stations are Avalon Airport⁸ (approximately 17 km southeast of the site) and She Oaks⁹ (approximately 16 km northwest of the site). In the absence of upper air data and suitable AWS data in the region, GHD has utilised a prognostic tool called the Weather Research Forecasting (WRF) model to generate a meteorological dataset for the site. The modelled meteorological data was then compared with meteorological data from the nearby BOM stations, namely Avalon Airport and She Oaks, and the onsite AWS station.

4.1 Representative meteorological year

The modelling year of 1 July 2019 to 30 June 2020 was selected and considered to be representative of a typical year because the annual period was not too wet or too dry. Between 1 July 2019 to 30 June 2020, the total rainfall recorded at both Avalon Airport and She Oaks are within 30% of the long-term annual rainfall median measured at the respective stations.

4.2 Weather Research and Forecasting Model

WRF Model (v4.1.5) is a mesoscale numerical weather prediction system designed for both atmospheric research and operational forecasting applications. WRF serves a wide range of meteorological applications, including physics options for parameterising cumulus clouds, microphysics, the planetary boundary layer, and atmospheric radiation. WRF provides surface level and vertical profiles of parameters that, when processed through Mesoscale Model Interface Program (MMIF), generates suitable 'initial guess' meteorological 3D datasets for ingestion directly into the dispersion model CALPUFF.

In addition to generating upper air data, WRF can model the complex wind flows in the upper air profile. WRF uses the latest developments for simulating and assimilating climate data, with many additional configuration options. WRF runs simulations with more microphysical capabilities, however, the trade-off WRF requires high-performance computing systems. The process of developing the WRF datasets involved using a nested approach for three domains which is presented in Appendix B of this report, along with the verification of MMIF simulated winds.

The effects of wind on dispersion patterns can be examined using the general wind climate and atmospheric stability class distributions. The general wind climate at a site is displayed by means of wind rose plots, giving the incidence of winds from different directions for various wind speed ranges. In this assessment, the prevailing wind directions and the relative incidence of more stable light wind conditions are of particular interest. These are assessed and presented in Section 4.3 and 4.4.

4.3 Wind pattern

4.3.1 Long term pattern in wind

The average wind rose for the data period is shown in Figure 5 and it shows the following features:

- The predominant annual average wind direction is from the west comprising 15% of all incident winds, followed by winds from the west-southwest (14%) and the west-northwest (12%)
- The average wind speed is at 4.9 m/s
- Winds from the northeast and east-northeast occur less than 1.3 % of the time for each direction

⁸ Avalon Airport – BOM station ID 87113

⁹ She Oaks – BOM station ID 87168

- The observed wind speed distribution indicates that the largest proportion of light winds (less than 2 m/s) are from the west-southwest (1.3%) and west (1.2%). This indicate poor dispersion conditions dispersion which odour is likely to disburse to the east-northeast and east than other directions.

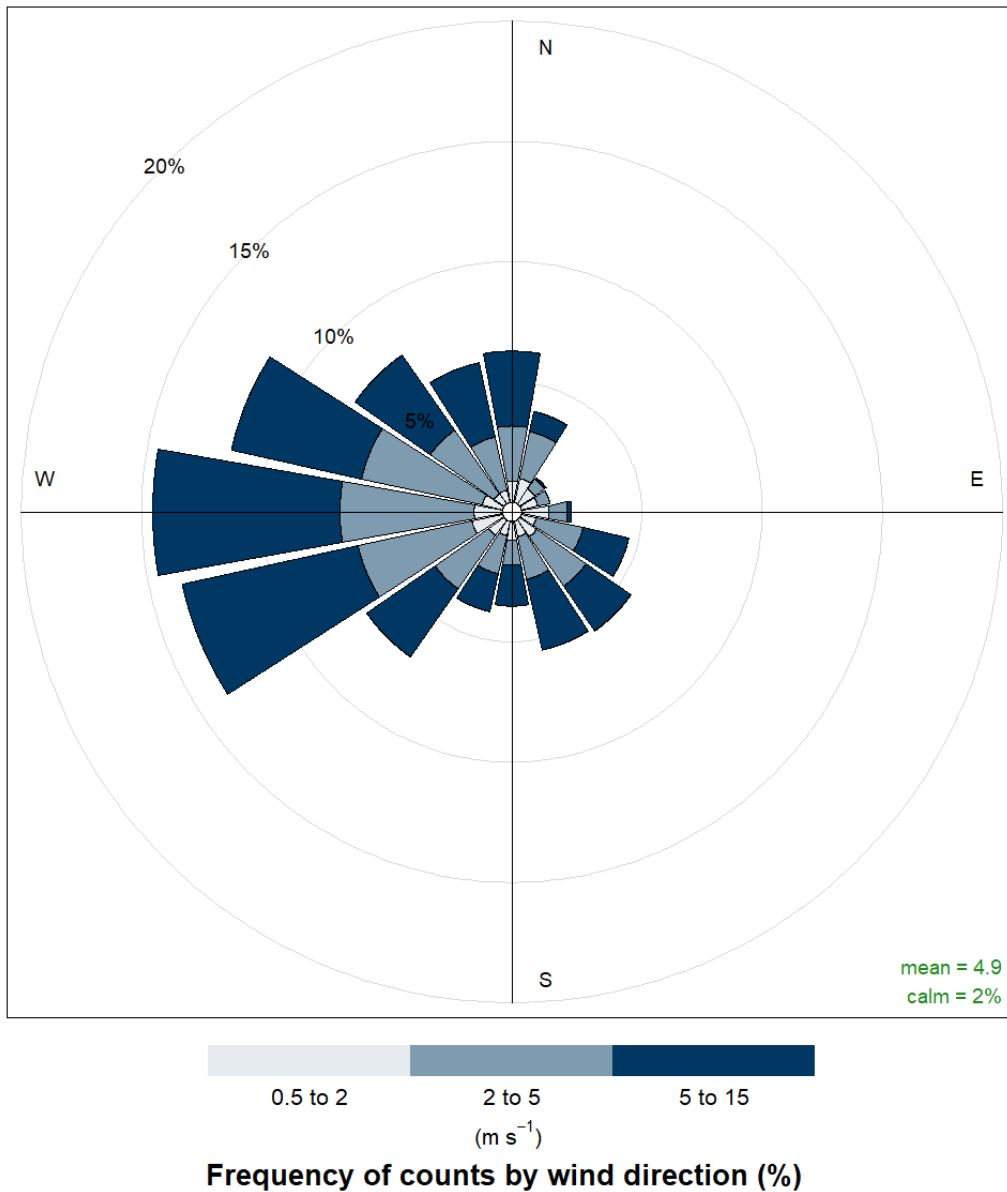


Figure 5 MMIF simulated wind extracted at the site for the period between 1 July 2019 and 30 June 2020

4.3.2 Seasonal pattern in wind

The seasonal wind roses for the same period are presented in Figure 6 and show that:

- The predominant wind direction in summer is west-southwest occurring approximately 15% of the time, followed by winds from the south-southeast (12%)
Light winds (< 2 m/s) occur approximately 15 % of time during the summer period
- The predominant wind direction in winter is west-northwest occurring approximately 18% of the time, followed by winds from the west (16%)
Light winds (< 2 m/s) occur approximately 12% of the time during the winter period
- The predominant wind direction in spring is west 18% of all incident winds, followed by winds from the west-southwest (15%)
Light winds occur approximately 15 % of the time during the spring period

- The predominant wind direction in autumn is west comprising 14% of all incident winds, followed by northwest (14%)
Light winds (< 2 m/s) occur approximately 10 % of the time
- The incidents of light winds (< 2 m/s) are greatest in summer, followed by winter

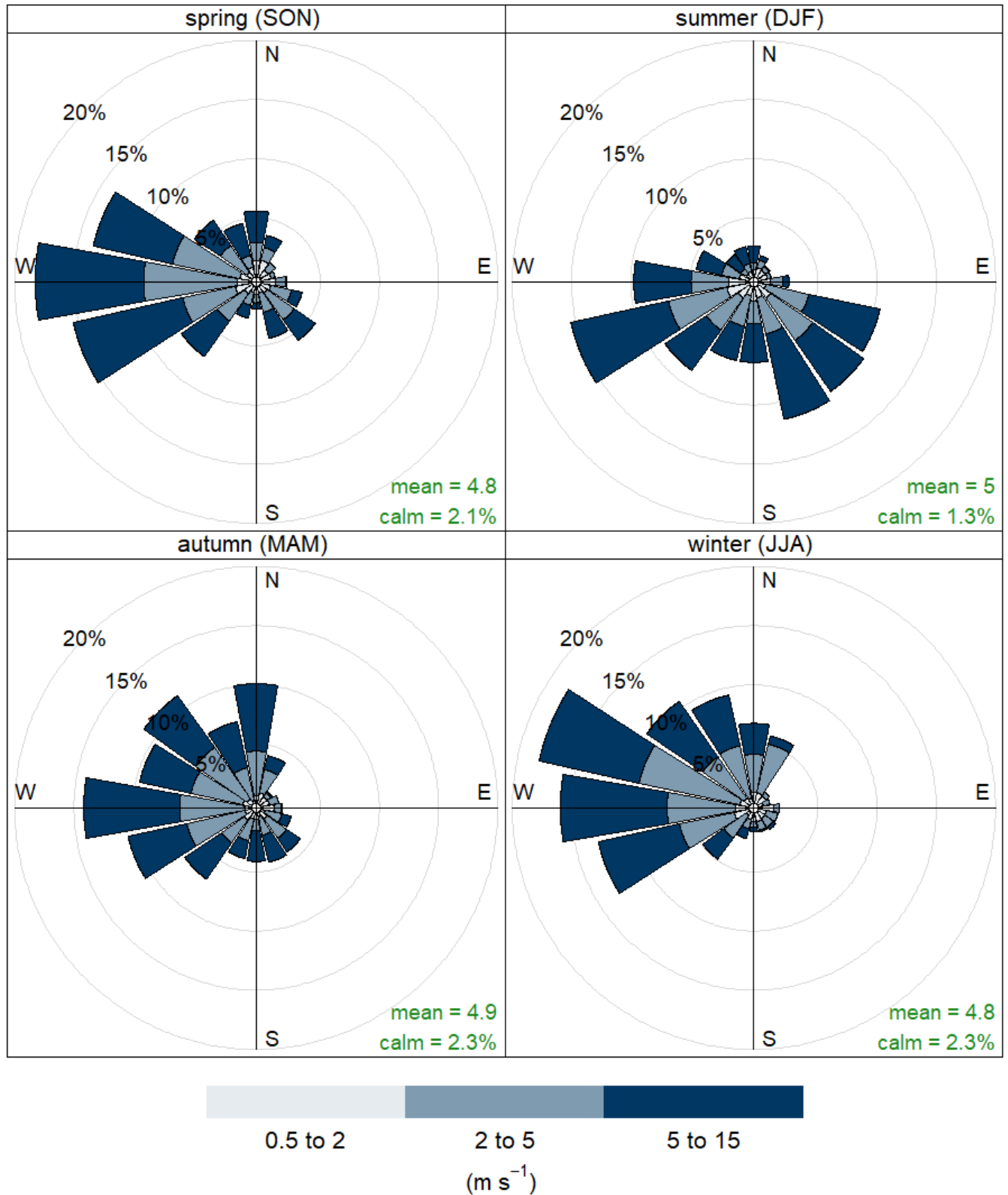


Figure 6 Seasonal windroses between 1 July 2019 and 30 June 2020

4.4 Pattern of atmospheric stability

Atmospheric stability substantially affects the capacity of a pollutant such as gas, particulate matter, or odour to disperse into the surrounding atmosphere upon discharge and is a measure of the amount of turbulent energy in the atmosphere.

There are generally six Pasquill – Gifford classes (A – F) used to describe atmospheric stability, and these classes are grouped into three stability categories:

- Unstable (classes A – C)
- Neutral (class D)
- Stable (classes E – F)

Under unstable conditions, dispersions of emissions from near-ground sources are good due to convectively vertical turbulent mixing. Neutral stability (Class D) denotes neutral atmospheric conditions, with stronger winds in moderate temperatures or lighter winds on overcast to partly cloudy days. Classes E and F denote slightly and moderately stable atmospheres when dispersion is poorest, as vertical mixing of air is suppressed.

4.4.1 Atmospheric stability

Figure 7 shows the frequency distribution of stability classes at the site as predicted by WRF. The figure shows that stable atmospheres (E and F) occur for approximately 31.9%, unstable atmospheres (A, B and C) occur 23.8% and neutral conditions (D) occur 44.3% of the modelled period.

Worst case pollutant dispersion typically occurs during stability class E and F conditions due to relatively low amounts of turbulence and therefore low levels of pollutant dispersion and mixing with ambient air. Stability class E and F conditions generally occur during calm periods at night and early in the morning.

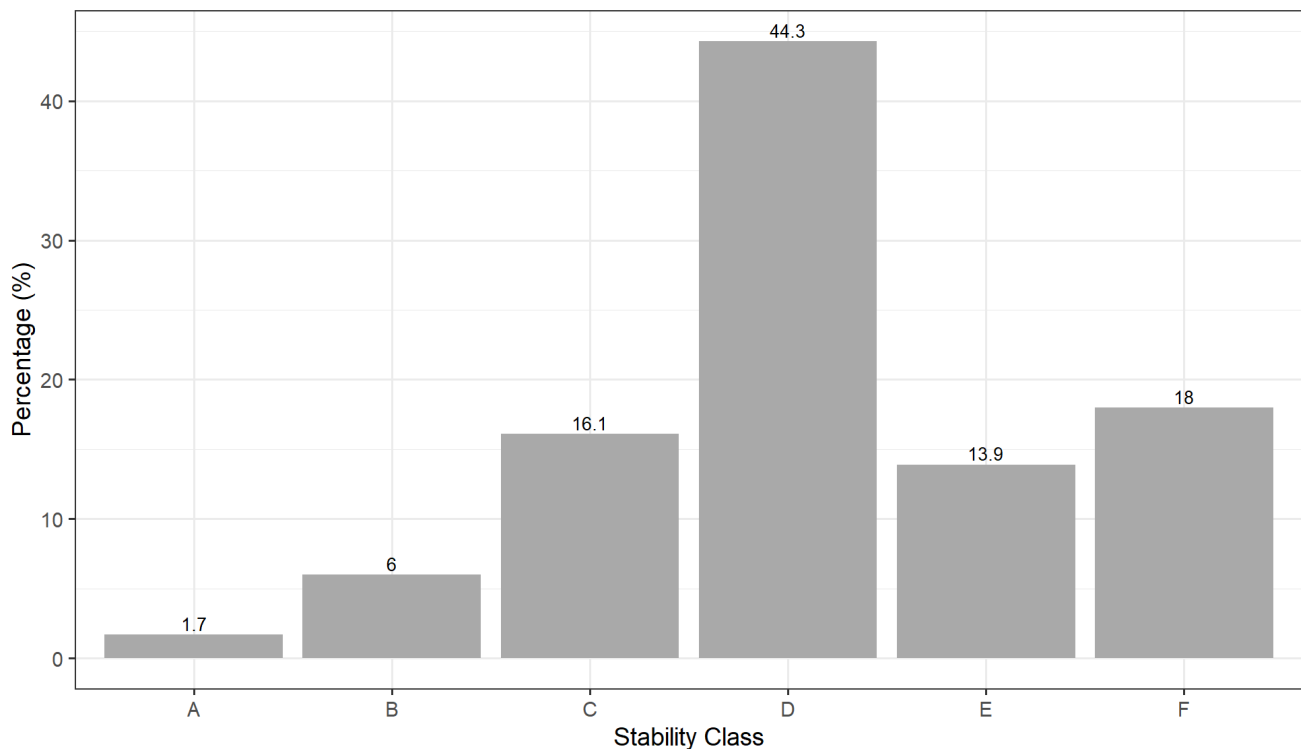


Figure 7 Stability class distribution predicted by WRF for the site

4.4.2 Mixing height

Mixing height signifies the height above the surface of the earth throughout which a pollutant can be disperse. It is often associated with a sharp increase in temperature with height (inversion), and a sharp decrease in pollutant concentration.

A box plot of WRF predicted mixing heights for the site is shown in Figure 8. During the night and early morning hours, mixing heights are lower with an average of approximately 200 m (7:00 pm to 7:00 am), which then increase after sunrise to an average of approximately 1,600 m during the day (7:00 am to 7:00 pm).

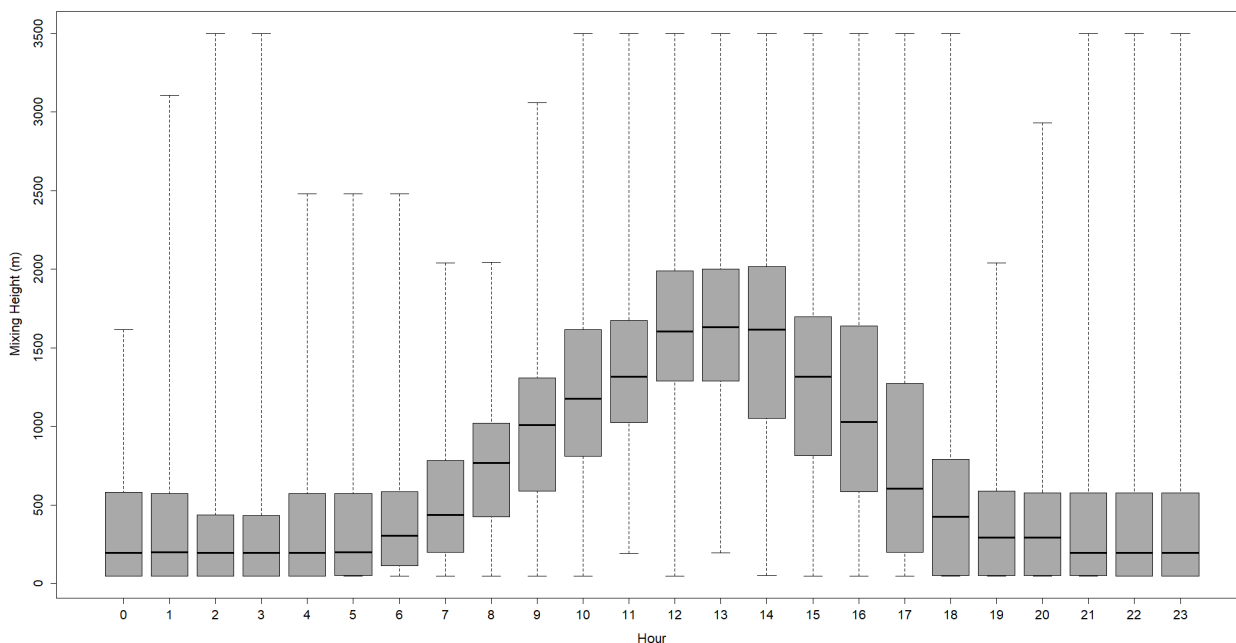


Figure 8 *Mixing heights predicted by WRF at the site*

5. Odour dispersion modelling

As recommended in the EPA Publication 1883, dispersion modelling is one of the Level 3 detailed risk assessment tools which can be used to support the evidence of odour risks of an activity and predict the likelihood of complaint. The purpose of odour dispersion modelling for this assessment is to provide an indication on the potential emission dispersion pattern from the proposed broiler farm and the likelihood of odour exposure for the nearby receptors. Modelling can also show the expected change in emissions for a proposed change or upgrade to a premises (relative modelling to determine how impacts from the existing use will change with the upgraded use).

For this assessment, the dispersion model CALPUFF (v7) was used to simulate the dispersion characteristics of odour generated from the farms at the site. CALPUFF is a non-steady state, Lagrangian Gaussian puff model recommended in AgriFutures Guide 1 for poultry farm assessments.

5.1 CALPUFF configuration

The model parameters and inputs were:

- Three-dimensional wind field from WRF simulated wind as described in Section 4
- CALPUFF computational domain size of 48 km x 32 km with 2 km spacing, and a sampling grid of 18 km x 18 km with 0.5 km spacing
- CALPUFF model settings were selected based on *The Generic Guidance and Optimum Model Settings for the CALPUFF modelling System 2011* and the recommended settings in Appendix B of AgriFutures Guide 1
- The tunnel ventilation of each shed was modelled as time varying volume source

5.2 Odour emission rates

This assessment utilised the K-factor method, also known as the Ormerod and Holmes emissions method (Ormerod and Holmes 2005)¹⁰. This method is one of the odour emission models recommended in AgriFutures Guide 1.

The K-factor emissions method is based on the relationship between the number of birds present, the stocking density of the birds, the ventilation rate and overall farm management. The K-factor method estimates hourly varying odour emission rates (OER) from a poultry farm shed using the following equation:

$$OER = 0.025 \times K \times A \times D \times V^{0.5}$$

The parameters used for the estimation of odour emissions rates from each shed are summarised in Table 8. The hourly varying bird density (D) and ventilation rate (V) for a year of typical bird growth cycles, approximately six cycles in a year, are shown in Appendix C for all existing and proposed sheds. Based on the parameters in Table 8, the modelled odour emission rate for each shed for a year is shown in Appendix D. Note that the birds are placed in the sequence discussed in Section 3.2.4.

¹⁰ Ormerod and Holmes 2005. A study referenced in AgriFuture 2021 Guide – 1. However, the title and publisher of this study is not presented in Guide 1.

Table 8 *Parameters used in estimating odour emissions rates for each shed*

Parameter	Value	Unit	Description
K	1.9	-	A K-factor of 1.9 has been selected (Based on AgriFutures Guide 1)
A	Varies between farms	m ²	Calculated based on shed dimensions shown in Table 3 (Section 3.2.2)
D	Hourly varying	kg/m ²	Based on the number of birds and weight of each bird in the growth cycle
V	Hourly varying	m ³ /s	The estimated ventilation required for a tunnel ventilated shed is based on bird age, target temperature inside the shed and ventilation profile as a percentage of maximum ventilation provided in Appendix B of AgriFutures Guide 1.

5.3 Modelled results

This section presents the odour dispersion modelling results for this assessment.

The five odour unit (OU) 99.9th percentile 3-minute average of odour modelling results is generally used to assess the predicted downwind odour concentrations during short time worst-case, poor dispersive meteorological conditions. This 99.9th percentile is generally taken as the level that if the odour is obvious and has an offensive character, it may lead to nuisance and resultant complaint.

Table 9 presents the odour impact predicted at the fourteen receptors identified within 2 km radius from the current and proposed farms, showing the 99.9th percentile 3-minute average odour concentrations and the estimated increase in odour impact as a result of bird number increase. The predicted results are also plotted in Figure 9, showing contour plots for the modelled 99.9th percentile 3-minute average odour concentrations from the current and proposed farms, over one year of modelled meteorology.

The German standard VDI 3882/1 'Determination of Odour Intensity' is also presented in Table 10 which shows the link between odour level and perceived intensity (a subjective measure) for poultry odour. Note that the Weber Fechner Law has been used to find the line of best fit of the individual presentations.

Based on the modelling results presented in Table 9 and Figure 9, as well as Table 10 on perceived intensity, the following features of the predicted results are observed:

- From the current and proposed farms, the 99.9th percentile offsite concentrations are predicted to be above the 5 OU 99.9th percentile at R1 – R4, R7, R13 – R28 (total of twenty-one receptors).
- The increase in odour impact, as a result of increase in bird numbers, is most prominent at R1, followed by R28.
- Table 10 shows that for poultry odour, the odour level needs to almost treble before an increase in perceived intensity is registered. This comparatively gradual response to increased odour level is a relevant factor when assessing predicted peak odour levels. Hence this suggests that the increase at all receptors including the largest increase of 4.9 at R1 will not be perceived as the factor of increase is below 2.7.

As the 99.9th percentile odour concentrations at R1 – R4, R7, R13 – R28 (total of twenty-one receptors) are predicted to be above 5 OU, it is important to consider the likelihood of adverse odour impact at the receptors. GHD has undertaken a risk assessment on the identified receptors, presented in Section 5.4.

Table 9 Predicted odour impact at nearby receptors

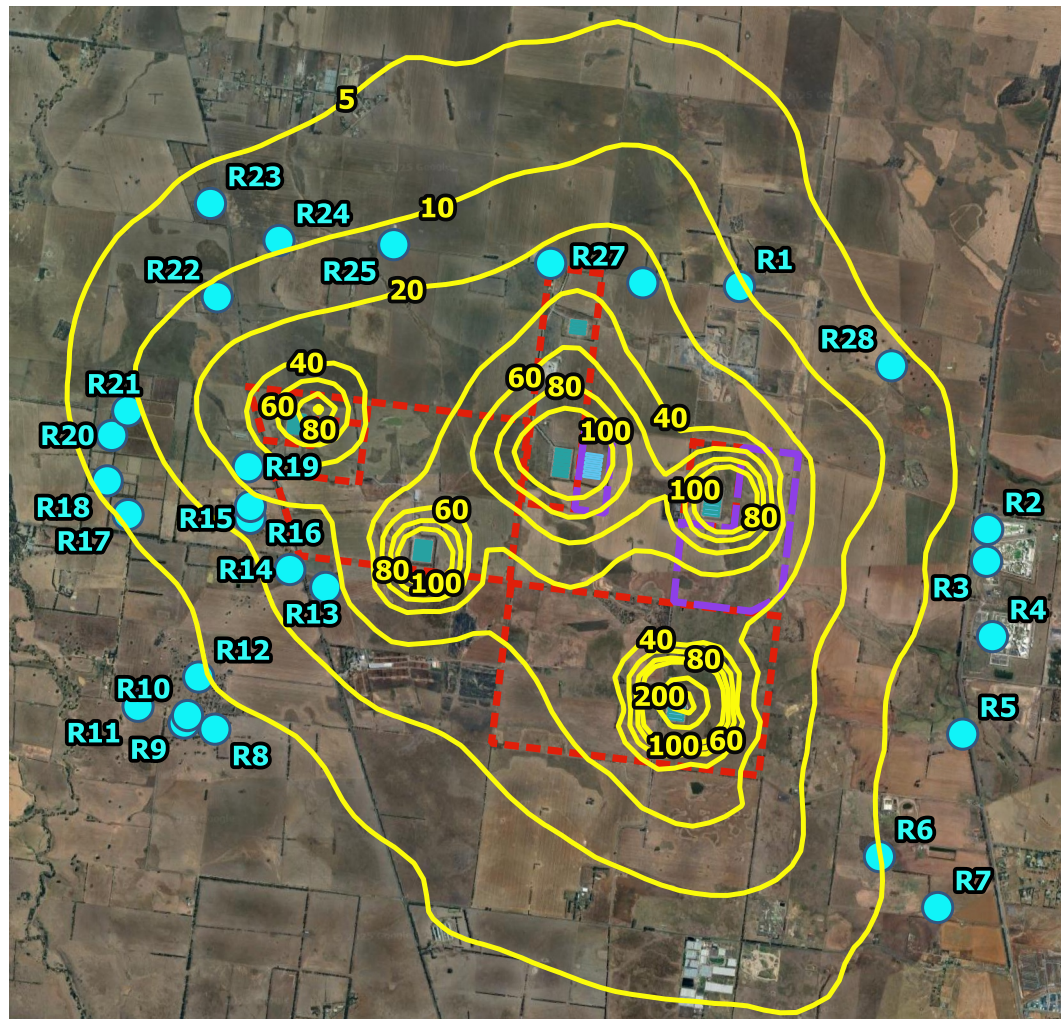
Receptor	Odour impact from current farms	Odour impact from current and proposed farms	Increase in odour impact as a result of bird number increase (OU)	Factor of increase
	99.9 th percentile, 3-min average (OU)	99.9 th percentile, 3-min average (OU)		(Increase/odour from current farms)
R1	10.4	15.3	4.9	0.5
R2	4.3	7.2	2.9	0.7
R3	3.7	6.3	2.5	0.7
R4	4.0	5.8	1.9	0.5
R5	3.2	4.9	1.7	0.5
R6	3.4	4.5	1.1	0.3
R7	4.8	7.0	2.2	0.4
R8	4.1	4.4	0.3	0.1
R9	4.0	4.0	0.0	0.0
R10	4.3	4.3	0.0	0.0
R11	3.4	3.5	0.1	0.02
R12	4.8	4.9	0.1	0.02
R13	16.3	16.5	0.2	0.01
R14	13.1	13.1	0.0	0.0
R15	12.1	12.1	0.0	0.0
R16	16.9	16.9	0.0	0.0
R17	5.3	5.4	0.1	0.01
R18	5.7	5.7	0.0	0.0
R19	26.5	26.5	0.0	0.0
R20	7.0	7.0	0.0	0.0
R21	8.9	8.9	0.0	0.0
R22	11.2	11.4	0.2	0.02
R23	6.2	6.2	0.0	0.0
R24	9.1	9.1	0.0	0.0
R25	12.1	12.5	0.4	0.03
R26	25.4	25.8	0.5	0.02
R27	24.9	28.1	3.2	0.1
R28	5.8	9.5	3.7	0.6

Table 10 *Perceived Intensity vs Odour Level – Poultry Odour^[1]*

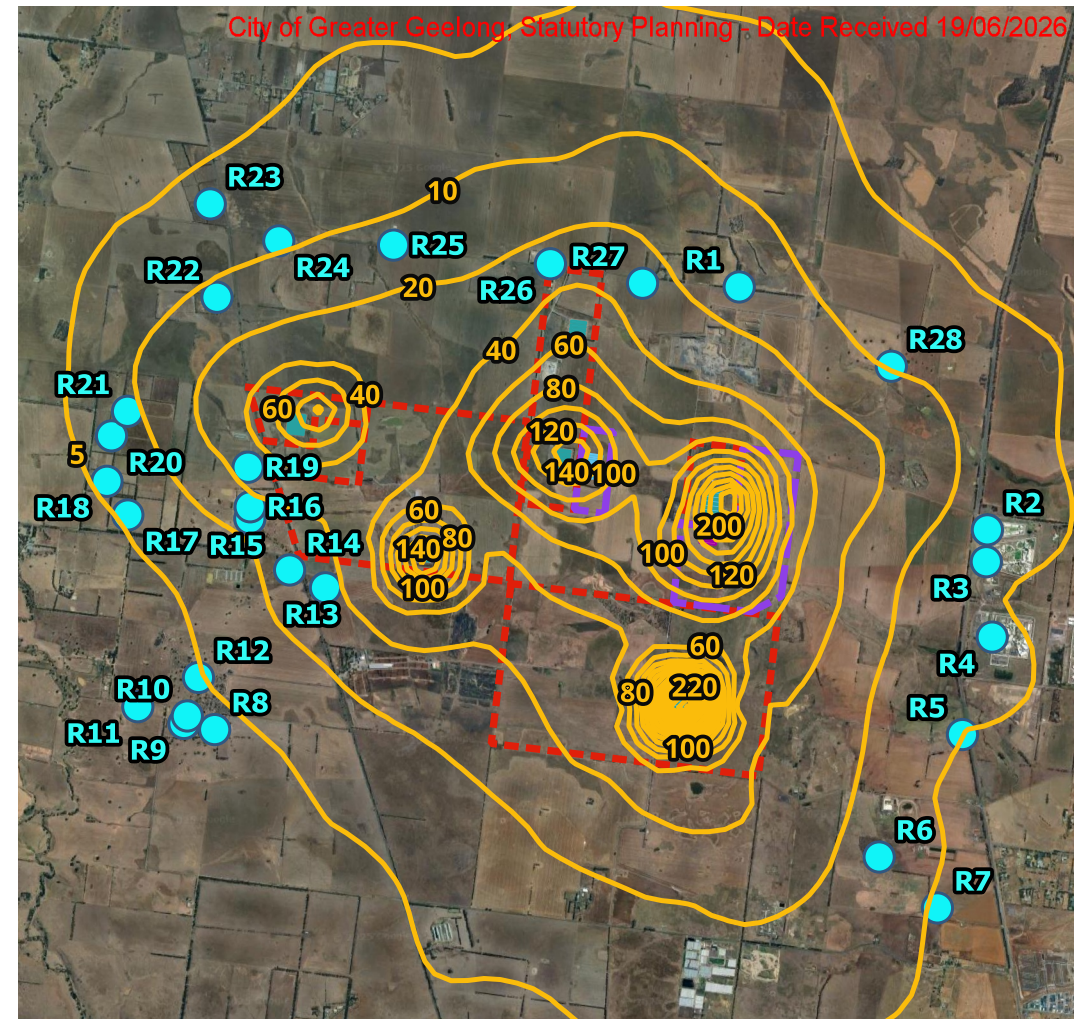
Odour Strength	Intensity Level	Concentration ¹ OU	Ratio between Intensity levels
Extremely Strong	6	144	2.7:1
Very Strong	5	52	
Strong	4	19	
Distinct	3	7.0	
Weak	2	2.5	
Very weak	1	0.92	
Not Perceptible	0	0.34	

¹ WA DEP 2002, "Odour Methodology Guideline", Table 3 Department of Environmental Protection Perth March 2002

^[1] WA DEP 2002, "Odour Methodology Guideline", Table 3 Department of Environmental Protection Perth March 2002



Existing farms



Existing and proposed F3 farm expansion

Legend

SiteBoundary

- Pavilion Farms owned properties
- Land to be acquired by Pavilion Farms
- Sensitive receptors

Farms

- Existing farm sheds
- Proposed farm sheds

Modelled results

- Predicted existing farms odour impact
- Predicted existing and proposed farms odour impact

Paper Size ISO A4
0 1,000 2,000 m
Map Projection: Universal Transverse Mercator
Horizontal Datum: WGS84 - UTM
Grid: UTM 55 S



Pavilion Farms
Anakie Broiler Farm Odour Assessment

Predicted odour impact
99.9%ile 3-minute average odour concentration (OU)

Project No. 12629546
Revision No. -
Date. 09/10/2025

FIGURE 9.0

5.4 Risk assessment

As shown in Section 5.2, the predicted 99.9th percentile concentrations at R1 – R4, R7, R13 – R28 (total of twenty-one receptors) are predicted to be above 5 OU. GHD has undertaken a risk assessment to assess the likelihood of adverse impact from the current and proposed farm on the identified receptors.

At the time this assessment was undertaken, there are no established risk assessment for assessing odour impact using predicted results from odour dispersion model. GHD has therefore adopted the assessment for risk of odour exposure presented in Section 6.3 of EPA Publication 1883 – *Risk of Offensive Odour using Area Surveillance Method* to assess the likelihood of the identified receptors in experiencing offensive odour from the poultry farm.

5.4.1 Method

The risk of offensive odour (area surveillance method) assessment outlined in EPA 1883 involves four steps when assessing the likelihood of the receiving environment in experiencing offensive odour. The description of each step, the method used and its application to this assessment are summarised in Table 11.

Table 11 Summary of recommended methods used when undertaking risk of offensive odour assessment

As described in EPA Publication 1883			Application to this assessment
Step	Description	Method	
1	Determining when source odours have been confirmed	This step is to determine if an odour was recognized, there are single or multiple odours and if the odours were obvious or subtle. The odour character is determined using Appendix B of EPA Publication 1883.	Based on Appendix B of EPA Publication 1883, the odour character from the chicken (sheds) is categorised to have an “Unwelcome character”. GHD has categorised the intensity of odour experienced at each receptor based on the maximum 99.9 th percentile 3-minute average odour concentration predicted at the receptor. Obvious odours are odour concentrations predicted to be above 5 OU.
2	Determining the frequency at which source odours were confirmed for each odour character and its associated offensiveness potential	In EPA Publication 1883, the frequency of odour occurrence is determined from odour surveillance.	GHD determines the frequency of odour occurrence based on the number of hours the 99.9 th percentile 3-minute average maximum odour concentration has exceeded the 5 OU 99.9 th percentile at all identified receptors.
3	Combining odour frequency with odour character and intensity to determine the likelihood of odour exposure at a given point or series of points (for example in a suburb or a block)	This step involves determining the risk of odour exposure by combining odour character, intensity and frequency using Table 11, Table 12 and Table 13 from EPA Publication 1883. These tables are presented in this report as Figure 10, Figure 11, Figure 12, respectively.	As described in method.
4	Combining the likelihood of odour exposure with the sensitivity of the receiving environment to determine the overall risk that there will be offensive odour impacts.	This step assesses the land use of the site where odour is observed and the associated beneficial uses. The overall risk of offensive odour is determined using Table 14 and Table 15 from EPA Publication 1883, based on the surrounding land use and the risk of odour exposure outcome determined in Step 3. Table 14 and Table 15 from EPA Publication 1883 are presented here as Figure 13 and Figure 14, respectively as a reference.	Land use is based on the land use terms and nesting diagrams in the Victoria Planning Provisions (VPP) groups, which are grouped into three categories. The dwellings surrounding the site boundary are single, isolated dwellings located in a Farming Zone so it can be assumed the receiving environment falls within the agriculture VPP land use term. The receiving environment is therefore classified as low sensitivity.

	Negligible exposure	Almost no chance of odour exposure
	Low exposure	Odour exposure unlikely
	Moderate exposure	Likely chance of odour exposure
	High exposure	Highly likely to have odour exposure
	Very high exposure	Odour exposure near certain

Figure 10 Risk of odour exposure potential – colour key. This is Table 11 from EPA Publication 1883.

Frequency	Hours per year (indicative)	Obvious odour character		
		unsafe	unwelcome	innocuous
0.5 - 2.0%	< 200			
2.1% - 6.0%	200 to 525.			
6.1% - 10%	526 to 875			
> 10%	(> 875 hrs/yr.)			

Figure 11 Risk of odour based on character, obvious odour intensity and frequency of predicted odour. This is Table 12 from EPA Publication 1883.

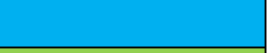
Frequency	Hours per year (indicative)	Subtle odour character (Obvious odour is < 2%)		
		unsafe	unwelcome	innocuous
0 - 2.0%	< 200			
2.1% - 6.0%	200 to 525.			
6.1% - 10%	526 to 875			
> 10%	(> 875 hrs/yr.)			

Figure 12 Risk of odour based on character, subtle odour intensity and frequency of predicted odour. This is Table 13 from EPA Publication 1883.

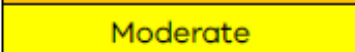
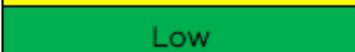
Rating	Likelihood of offensive odour
 Very high	Almost certain
 High	Highly likely
 Moderate	Likely
 Low	Unlikely but still possible

Figure 13 Risk of offensive odour key. This is Table 14 from EPA Publication 1883.

	Receiving environment sensitivity		
Risk of odour exposure	High	Medium	Low
Very high exposure	Very high	High	Moderate
High exposure	High	High	Moderate
Moderate exposure	High	Moderate	Low
Low exposure	Moderate	Moderate	Low
Negligible exposure	Low	Low	Low

Figure 14 Risk of offensive odour. This is Table 15 from EPA Publication 1883.

5.4.2 Risk assessment outcome

The overall risk of offensive odour impact at the identified receptors are derived using the method described in Section 5.4.1. GHD assessed the overall risk of offensive odour impacts as shown below:

- Overall risk of offensive odour impacts from current farms, summarised in Table 12
- Overall risk of offensive odour impacts from current and proposed farms, summarised in Table 13

Based on Table 12, the risk of offensive odour is low at all the identified receptor locations. This means all receptors are unlikely to experience offensive odour from the current farms.

Based on Table 13, with the establishment of the proposed farm, receptor R2 is likely to experience offensive odour from the current and proposed farms, while other twenty-seven receptors are unlikely to experience offensive odour from the current and proposed farms.

Table 12 Risk of offensive odour from current farms

Receptor	Land use sensitivity	99.9 th percentile, 3-min average (OU)	Odour intensity ¹	Number of 5 OU exceedance over a year	Frequency (%)	Risk odour exposure potential	Risk of offensive odour
R1	Low	10.4	Obvious	53	0.6	Moderate	Low
R2	Medium	4.3	Subtle	2	0.02	Negligible	Low
R3	High	3.7	Subtle	1	0.01	Negligible	Low
R4	High	4.0	Subtle	1	0.0	Negligible	Low
R5	Low	3.2	Subtle	0	0.0	Negligible	Low
R6	Low	3.4	Subtle	0	0.0	Negligible	Low
R7	Low	4.8	Subtle	8	0.1	Negligible	Low
R8	Low	4.1	Subtle	4	0.0	Negligible	Low
R9	Low	4.0	Subtle	2	0.0	Negligible	Low
R10	Low	4.3	Subtle	2	0.0	Negligible	Low
R11	Low	3.4	Subtle	1	0.0	Negligible	Low
R12	Low	4.8	Subtle	6	0.1	Negligible	Low
R13	Low	16.3	Obvious	133	1.5	Moderate	Low
R14	Low	13.1	Obvious	107	1.2	Moderate	Low
R15	Low	12.1	Obvious	107	1.2	Moderate	Low
R16	Low	16.9	Obvious	119	1.4	Moderate	Low
R17	Low	5.3	Obvious	13	0.1	Negligible	Low
R18	Low	5.7	Obvious	12	0.1	Negligible	Low
R19	Low	26.5	Obvious	134	1.5	Moderate	Low
R20	Low	7.0	Obvious	24	0.3	Negligible	Low
R21	Low	8.9	Obvious	34	0.4	Negligible	Low
R22	Low	11.2	Obvious	46	0.5	Moderate	Low
R23	Low	6.2	Obvious	14	0.2	Negligible	Low
R24	Low	9.1	Obvious	28	0.3	Negligible	Low
R25	Low	12.1	Obvious	45	0.5	Moderate	Low

Receptor	Land use sensitivity	99.9 th percentile, 3-min average (OU)	Odour intensity ¹	Number of 5 OU exceedance over a year	Frequency (%)	Risk odour exposure potential	Risk of offensive odour
R26	Low	25.4	Obvious	125	1.4	Moderate	Low
R27	Low	24.9	Obvious	144	1.6	Moderate	Low
R28	Low	5.8	Obvious	13	0.1	Negligible	Low

Note:

1. GHD has categorised the intensity of odour experienced at each receptor based on the maximum 99.9th percentile 3-minute average odour concentration predicted at the receptor. Obvious odours are odour concentrations predicted to be above 5 OU.

Table 13 Risk of offensive odour from current and proposed farms

Receptor	Land use sensitivity	99.9 th percentile, 3-min average (OU)	Odour intensity ¹	Number of 5 OU exceedance over a year	Frequency (%)	Risk odour exposure potential	Risk of offensive odour
R1	Low	15.3	Obvious	80	0.9	Moderate	Low
R2	Medium	7.2	Obvious	40	0.5	Moderate	Moderate
R3	High	6.3	Obvious	21	0.2	Negligible	Low
R4	High	5.8	Obvious	15	0.2	Negligible	Low
R5	Low	4.9	Subtle	8	0.1	Negligible	Low
R6	Low	4.5	Subtle	5	0.1	Negligible	Low
R7	Low	7.0	Obvious	18	0.2	Negligible	Low
R8	Low	4.4	Subtle	4	0.0	Negligible	Low
R9	Low	4.0	Subtle	2	0.0	Negligible	Low
R10	Low	4.3	Subtle	2	0.0	Negligible	Low
R11	Low	3.5	Subtle	1	0.0	Negligible	Low
R12	Low	4.9	Subtle	7	0.1	Negligible	Low
R13	Low	16.5	Obvious	153	1.7	Moderate	Low
R14	Low	13.1	Obvious	120	1.4	Moderate	Low
R15	Low	12.1	Obvious	119	1.4	Moderate	Low
R16	Low	16.9	Obvious	129	1.5	Moderate	Low
R17	Low	5.4	Obvious	14	0.2	Negligible	Low
R18	Low	5.7	Obvious	12	0.1	Negligible	Low
R19	Low	26.5	Obvious	150	1.7	Moderate	Low
R20	Low	7.0	Obvious	24	0.3	Negligible	Low
R21	Low	8.9	Obvious	35	0.4	Negligible	Low
R22	Low	11.4	Obvious	48	0.5	Moderate	Low
R23	Low	6.2	Obvious	15	0.2	Negligible	Low
R24	Low	9.1	Obvious	33	0.4	Negligible	Low
R25	Low	12.5	Obvious	55	0.6	Moderate	Low

Receptor	Land use sensitivity	99.9 th percentile, 3-min average (OU)	Odour intensity ¹	Number of 5 OU exceedance over a year	Frequency (%)	Risk odour exposure potential	Risk of offensive odour
R26	Low	25.8	Obvious	143	1.6	Moderate	Low
R27	Low	28.1	Obvious	171	1.9	Moderate	Low
R28	Low	9.5	Obvious	50	0.6	Moderate	Low

Note:

1. GHD has categorised the intensity of odour experienced at each receptor based on the maximum 99.9th percentile 3-minute average odour concentration predicted at the receptor. Obvious odours are odour concentrations predicted to be above 5 OU.

5.5 Model result summary

The odour modelling results show the following features:

- From the current and proposed farms, the 99.9th percentile offsite concentrations are predicted to be above the 5 OU 99.9th percentile at R1 – R4, R7, R13 – R28 (total of twenty-one receptors)
- The increase in odour impact, as a result of increase in bird numbers, is most prominent at R1, followed by R28. However, the modelled increases are unlikely to be perceived as the odour level needs to almost treble before an increase in perceived intensity is registered

Using the odour dispersion modelling results, GHD has undertaken a risk of offensive odour assessment to assess the likelihood of the identified receptors in experiencing offensive odour from the existing and proposed farms. GHD has categorised the intensity of odour experienced at each receptor based on the maximum 99.9th percentile three-minute average odour concentration predicted at the receptor. Obvious odours are odour concentrations predicted to be above 5 OU. The risk assessment results indicate that:

- All identified receptors are unlikely to experience offensive odour from the current farms
- When the proposed farms are in place, receptor R2 is likely to experience offensive odour from the current and proposed farms, while other twenty-seven receptors are unlikely to experience offensive odour from the current and proposed farms

6. Model calibration using odour survey observations

In this section of the report, the odour dispersion model results are spot calibrated using the odour surveillance observations conducted by GHD at a broiler farm located at Sale – Toongabbie Road which has similar shed size and ventilation set up. This approach was discussed with and approved by EPA Victoria representative¹¹ on 8 February 2024.

The aim of this calibration is to compare and identify the likely modelled odour concentrations which could describe the 'Obvious' odour experienced by the surveyors. The identified odour concentrations for 'Obvious' odour is then used as the level which may lead to nuisance and resultant complaint to undertake another risk assessment with the methodology as described in Section 5.4.1.

Details of the odour surveys, calibration methodology and calibrated results used in the odour assessment prepared for Sale – Toongabbie broiler farm are presented in Appendix E. Based on the calibration results, the odour concentration which could describe as 'Obvious' odour is 6 OU.

6.1 Updated risk assessment

As shown in Section 5.3, the 99.9th percentile concentrations at R1 – R4, R7, R13 – R28 (total of twenty-one receptors) are predicted to be above 5 OU and GHD has undertaken a risk assessment to assess the likelihood of adverse impact from the current and proposed farm on the identified receptors, as shown in Section 5.4.2. In this section of the report, another risk assessment is undertaken using the odour concentrations which could be described as 'Obvious' odour – 6OU.

The overall risk of offensive odour impact at the identified receptors are derived using the method described in Section 5.4.1. GHD assessed the overall risk of offensive odour impacts as shown below:

- Overall risk of offensive odour impacts from current farms, summarised in Table 14
- Overall risk of offensive odour impacts from current and proposed farms, summarised in Table 15

Based on Table 14, the risk of offensive odour is low at all the identified receptor locations. This means all identified receptors are unlikely to experience offensive odour from the current farms.

Based on Table 15, with the establishment of the proposed farm, the risk of offensive odour is low at all the identified receptor locations (total of twenty-eight receptors). Figure 15 presents the risk of offensive odour plot around the current and proposed farms which shows the area of moderate and low offensive odour risks.

¹¹ EPA Victoria Odour Expert – Chris Bydder

Table 14 Risk of offensive odour from current farms – Updated assessment

Receptor	Land use sensitivity	99.9 th percentile, 3-min average (OU)	Odour intensity ¹	Number of 6 OU exceedance over a year	Frequency (%)	Risk odour exposure potential	Risk of offensive odour
R1	Low	10.4	Obvious	34	0.4	Negligible	Low
R2	Medium	4.3	Subtle	0	0.0	Negligible	Low
R3	High	3.7	Subtle	0	0.0	Negligible	Low
R4	High	4.0	Subtle	0	0.0	Negligible	Low
R5	Low	3.2	Subtle	0	0.0	Negligible	Low
R6	Low	3.4	Subtle	0	0.0	Negligible	Low
R7	Low	4.8	Subtle	2	0.02	Negligible	Low
R8	Low	4.1	Subtle	2	0.0	Negligible	Low
R9	Low	4.0	Subtle	0	0.0	Negligible	Low
R10	Low	4.3	Subtle	0	0.0	Negligible	Low
R11	Low	3.4	Subtle	0	0.0	Negligible	Low
R12	Low	4.8	Subtle	2	0.0	Negligible	Low
R13	Low	16.3	Obvious	103	1.2	Moderate	Low
R14	Low	13.1	Obvious	79	0.9	Moderate	Low
R15	Low	12.1	Obvious	68	0.8	Moderate	Low
R16	Low	16.9	Obvious	80	0.9	Moderate	Low
R17	Low	5.3	Subtle	7	0.1	Negligible	Low
R18	Low	5.7	Subtle	6	0.1	Negligible	Low
R19	Low	26.5	Obvious	113	1.3	Moderate	Low
R20	Low	7.0	Obvious	15	0.2	Negligible	Low
R21	Low	8.9	Obvious	22	0.3	Negligible	Low
R22	Low	11.2	Obvious	34	0.4	Negligible	Low
R23	Low	6.2	Obvious	10	0.1	Negligible	Low
R24	Low	9.1	Obvious	17	0.2	Negligible	Low

Receptor	Land use sensitivity	99.9 th percentile, 3-min average (OU)	Odour intensity ¹	Number of 6 OU exceedance over a year	Frequency (%)	Risk odour exposure potential	Risk of offensive odour
R25	Low	12.1	Obvious	34	0.4	Negligible	Low
R26	Low	25.4	Obvious	101	1.1	Moderate	Low
R27	Low	24.9	Obvious	112	1.3	Moderate	Low
R28	Low	5.8	Subtle	7	0.08	Negligible	Low

Note:

1. GHD has categorised the intensity of odour experienced at each receptor based on the maximum 99.9th percentile 3-minute average odour concentration predicted at the receptor. Obvious odours are odour concentrations predicted to be above 6 OU.

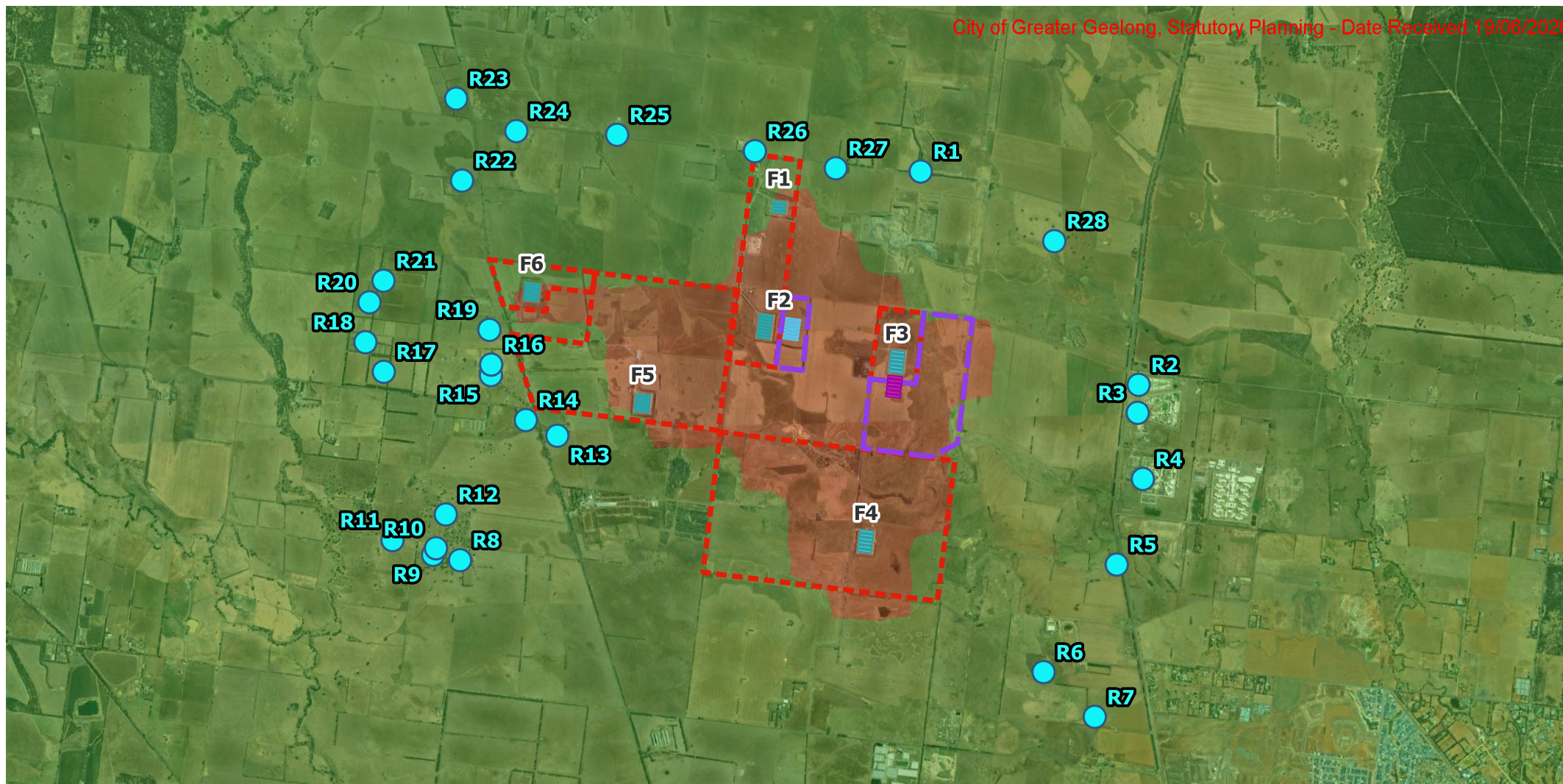
Table 15 Risk of offensive odour from current and proposed farms – Updated assessment

Receptor	Land use sensitivity	99.9 th percentile, 3-min average (OU)	Odour intensity ¹	Number of 6 OU exceedance over a year	Frequency (%)	Risk odour exposure potential	Risk of offensive odour
R1	Low	15.3	Obvious	61	0.7	Moderate	Low
R2	Medium	7.2	Obvious	19	0.2	Negligible	Low
R3	High	6.3	Obvious	11	0.1	Negligible	Low
R4	High	5.8	Subtle	8	0.09	Negligible	Low
R5	Low	4.9	Subtle	1	0.0	Negligible	Low
R6	Low	4.5	Subtle	1	0.0	Negligible	Low
R7	Low	7.0	Obvious	12	0.1	Negligible	Low
R8	Low	4.4	Subtle	2	0.0	Negligible	Low
R9	Low	4.0	Subtle	1	0.0	Negligible	Low
R10	Low	4.3	Subtle	1	0.0	Negligible	Low
R11	Low	3.5	Subtle	0	0.0	Negligible	Low
R12	Low	4.9	Subtle	2	0.0	Negligible	Low
R13	Low	16.5	Obvious	119	1.4	Moderate	Low
R14	Low	13.1	Obvious	91	1.0	Moderate	Low
R15	Low	12.1	Obvious	74	0.8	Moderate	Low
R16	Low	16.9	Obvious	85	1.0	Moderate	Low
R17	Low	5.4	Subtle	7	0.1	Negligible	Low
R18	Low	5.7	Subtle	6	0.1	Negligible	Low
R19	Low	26.5	Obvious	120	1.4	Moderate	Low
R20	Low	7.0	Obvious	15	0.2	Negligible	Low
R21	Low	8.9	Obvious	23	0.3	Negligible	Low
R22	Low	11.4	Obvious	39	0.4	Negligible	Low
R23	Low	6.2	Obvious	10	0.1	Negligible	Low

Receptor	Land use sensitivity	99.9 th percentile, 3-min average (OU)	Odour intensity ¹	Number of 6 OU exceedance over a year	Frequency (%)	Risk odour exposure potential	Risk of offensive odour
R24	Low	9.1	Obvious	22	0.3	Negligible	Low
R25	Low	12.5	Obvious	42	0.5	Moderate	Low
R26	Low	25.8	Obvious	109	1.2	Moderate	Low
R27	Low	28.1	Obvious	134	1.5	Moderate	Low
R28	Low	9.5	Obvious	33	0.4	Negligible	Low

Note:

1. GHD has categorised the intensity of odour experienced at each receptor based on the maximum 99.9th percentile 3-minute average odour concentration predicted at the receptor. Obvious odours are odour concentrations predicted to be above 6 OU.



Legend

Site boundary

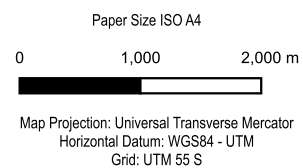
- ▬ Pavilion Farms owned properties
- ▬ Land to be acquired by Pavilion Farms
- Sensitive receptors

Farms

- Existing farm sheds
- Proposed farm sheds

Level of risk of offensive odour

- Low risk
- Moderate risk



Pavilion Farms
Anakie Broiler Farm Odour Assessment

Level of risk of offensive odour plot

Project No. 12629546
Revision No. -
Date. 09/10/2025

FIGURE 15.0

6.2 Updated risk assessment summary

Using the odour dispersion modelling results presented in Section 5.3 of this report, GHD has undertaken a second risk of offensive odour assessment incorporating the peak odour survey results to assess the likelihood of the identified receptors in experiencing offensive odour from the existing and proposed farms. GHD has categorised the intensity of odour experienced at each receptor based on the maximum 99.9th percentile three-minute average odour concentration predicted at the receptor. Obvious odours are odour concentrations predicted to be above 6 OU based on the peak odour survey results.

The updated risk assessment results indicate that when the proposed farm is in place all identified receptors are unlikely to experience offensive odour from the current and proposed farms.

7. Complaint data analysis

GHD requested historical complaints from 2019 – 2023 from Council and from EPA Victoria. However, no responses were received from Council at the time the assessment was undertaken.

GHD received historical complaint data from EPA Victoria for the period between 2019 and 2023. A total of 72 complaints were recorded. The type of odour complaints received includes chemical odour such as ammonia, livestock smell especially of cattle, manure, offal, sewerage, and petroleum. Majority of these complaints were regarding a livestock smell of cattle or manure and were mostly recognised to be from the source of Jalna Feedlot, Anakie. This is a cattle farm/feedlot located at 1280 Geelong-Ballan Road, directly south of Pavilion Farms.

No recorded odour complaints have been alleged to be of the source of the Pavilion Farms broiler farm.

8. Conclusion

Pavilion Farms, operates six broiler farms in Anakie. GHD understands that Pavilion Farms is proposing to develop a special class farm at the site. To support the proposed expansions, Pavilion Farms has requested an Odour Environmental Risk Assessment (OERA) to be undertaken to assess the resultant odour impacts on the surrounding areas.

This report presents the OERA undertaken in accordance with EPA Publication 1883 – *Guidance for assessing odour* and AgriFutures – *Planning and environment guideline for establishing meat chicken farms: Guide 1 – Assessment guide* for the proposed expansion of the existing broiler farm at Anakie (the site), to understand odour risks associated with proposed operations.

Odour dispersion modelling results

The odour impact from the proposed expansion of Farm 3 and the current farms (including expansion of Farm 2 under construction) was assessed using CALPUFF model. The predicted 99.9th percentile 3-minute average of off-site odour concentrations over five years of modelled meteorology were assessed against the five odour unit (5 OU) level to understand the predicted downwind odour concentrations during short time worst-case, poor dispersive meteorological conditions. The 5 OU is generally taken as the level that if the odour is obvious and has an offensive character, it may lead to nuisance and resultant complaint.

The 99.9th percentile offsite concentrations are predicted to be above the 5 OU 99.9th percentile at R1 – R4, R7, R13 – R28 (total of twenty-one receptors). The increase in odour impact, as a result of increase in bird numbers, is most prominent at R1, followed by R28. However, the modelled increases are unlikely to be perceived as the odour level needs to almost treble before an increase in perceived intensity is registered.

Risk of offensive odour assessment

GHD calibrated the odour dispersion model and compared the modelled results with odour survey observations undertaken at a broiler farm located in Sale – Toongabbie Road. GHD identified the likely modelled odour concentrations which could describe the 'Obvious' odour experienced by the surveyors to be 6 OU. The identified odour concentrations for 'Obvious' odour is then used as the level which may lead to nuisance and resultant complaint to update the risk assessment. The updated risk assessment results indicate that the risk of offensive odour is low at all identified receptor locations.

Complaint Analysis

GHD requested historical complaints from 2019 – 2023 from both the Greater Geelong City Council and EPA Victoria. However, no response has been provided to GHD by the Greater Geelong City Council at the time this assessment was completed.

GHD reviewed the complaint records provided by EPA Victoria for the period between 2019 and 2023 and the records show that the broiler farms have not received complaints related to odour in the past five years. This supports the conclusions of the risk assessment.

Conclusion

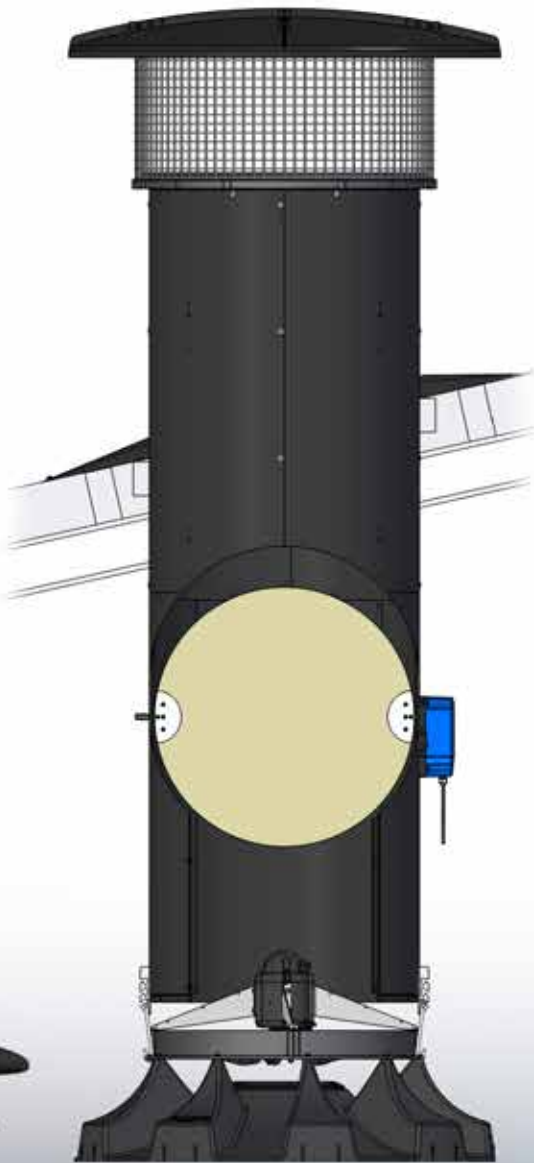
For the proposed expansion of Farm 3, the risk assessment indicates that odour from the proposed expansion remains low at all identified receptor locations. Therefore, based on the assessment results, the proposed farm expansions are considered to not adversely impact the surrounding areas.

Appendices

Appendix A

Pavilion Farms Ventilation and Heating technologies

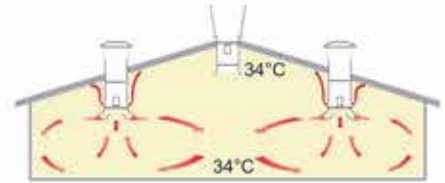
Corona Inlet Fan



Corona – an active roof mounted air inlet

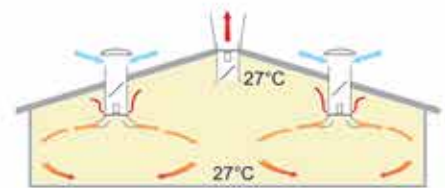
The Corona is an active fan assisted air distribution unit. The active distribution of preheated, oxygen rich air ensures a supreme climate in the house from day one to finish, no matter the outside conditions. By providing ideal airspeed and plenty of oxygen at floor level, the systems support the animals' metabolism and growth.

Tests have shown that by utilizing the warm air trapped in the roof space the Corona averagely returns 10 kW of heat for each 1 kW of electricity used and cuts the overall heat consumption by 50%.



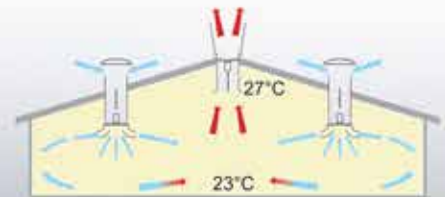
De-stratification

At low ventilation rates, when it is cold outside and/or when the animals are small, the Corona preheats the air by mixing small portions of cold incoming air with warm room air, before distributing the air evenly throughout the house.



Mixing

The Corona works with partially opened dampers and mixes an increasingly larger portion of incoming air with warm room air, maintaining ideal climate conditions in the house.



Full flow

When temperatures soar, the dampers go to vertical position for maximum airflow. The mixing action is suppressed by the main flow, and air is shot outwards and downwards, creating unsurpassed thermal comfort.

TECHNICAL SPECIFICATIONS

Motor 3×230 V / 3×400 V	1.6 A / 0.95 A
Shaft output power	0.3 kW
Volume flow	12000 m³/h @ 0 Pa
Chimney diameter	760 / 740 mm
Damper	Turning
Materials	ABS / stainless steel



More about DACS ventilation on

vimeo



MagFan1

MagFan1 has revolutionized the market for ON/OFF fans by setting new standards in terms of efficiency, capacity and pressure performance. The MagFan1 is identical to the existing MagFans except it is an on/off fan. It is still a direct drive fan, so no belts and pulleys – hence no maintenance.

Technological advantages

Our technological advantages stem from the perfectly shaped body of the MagFan where the air passing through the unit meets a minimum of resistance. The proof is that the MagFan1 outperforms all other fans of similar size.

MagFan1 stands out

With 22.2 cfm/Watt MagFan1 has one of the highest Energy Efficiency Ratings of all top 1% on/off fans tested at Bess Lab. It has the best Air Flow Ratio (0.855) of all the top 1% fans. Throughout the pressure range the MagFan1 delivers a good 35% higher capacity than the best of the rest. MagFan1 simply outperforms all the other on/off fans in terms of raw performance.



MagFan1 in short:

- **Capacity up to 69 500 m³/h (40 900 cfm)**
- **Pressure capability up to –100 Pascal (0.40")**
- **Runs voltages from 380 VAC to 440 VAC 50 Hz**
- **Asynchronous 3-phase motor 1.8 kW @ 720 rpm**





MagFan3 takes you further for less

MagFan3 offers high capacity, high pressure capability and extreme efficiency. Wherever energy is a limited resource and/or high capacity, high flow rates and high pressures are needed, MagFan3 is the answer.

... and returns your investment

The combination of high-quality materials, extreme efficiency, unrivalled performance, and simplified installation results in a very attractive Return on Investment (ROI) of maximum two years. In a direct comparison against similar products, MagFan3 offers up to 80% lower energy consumption at equivalent flow rates.

Variable Frequency Drive (VFD)

Via the dedicated VFD (MagDrive) the MagFan3 starts slowly and quietly and accelerates to the requested speed. With its precise airflow control, MagFan3 can be used even during brooding. As the need for more air increases, the fan simply accelerates smoothly and effortlessly, always matching the airflow and pressure requirements.

MagFan3 in short:

- Capacity up to 79 700 m³/h (46 900 cfm)
- Pressure capability up to 75 Pa (0.30" WC)
- Runs on any voltage from 85 VAC to 265 VAC
- 3-phase motor 0.3 – 2.5 kW @ 160 – 900 rpm

MagFan5 takes you even further

The combination of unprecedented capacity, extreme pressure capability and very high efficiency makes the MagFan5 attractive wherever energy is a limited resource and/or high capacity, high flow rates and high pressures are needed.

Unrivalled performance

The high-quality materials, the unrivalled performance and simplified installation result in a very attractive Return On Investment (ROI) of maximum two years. In a direct comparison against similar products, MagFan5 offers up to 80% lower energy consumption at equivalent flow rates.

Wide duty point

MagFan5 can be used even at very low ventilation rates. As the need for more air increases, the MagDrive simply accelerates the MagFan5, always matching the airflow and pressure requirements. MagFan5 has an unrivalled, wide duty point, ranging from neutral to –150 Pa (0.60" WC). Even at high air speeds, the fan operates at low loads and has an abundance of spare capacity.

MagFan5 in short:

- Capacity up to 77 200 m³/h (45 400 cfm)
- Pressure capability up to 137 Pa (0.55" WC)
- Runs on any voltage from 85 VAC to 265 VAC
- 3-phase motor 0.3 – 2.5 kW @ 160 – 900 rpm



More about MagFan on [vimeo](#)

HEAT60 Warm Water Radiator

The warm water radiator from DACS produces plenty of dry, warm air that allows for better climate control in poultry houses.

The HEAT60 warm water radiator from DACS provides warm and dry air that allows for efficient heating and dehumidification in poultry houses. Each HEAT60 unit is equipped with a 60 kW radiator and a 0.3 kW blower. The open sides allow for suction of 8000 m³ air per hour over the radiator.

The low-pressure water flow inside the heating element means that only a small circulation pump is needed for the entire installation. This adds to the very low energy consumption of the entire heating system. The performance on the radiator is stated at a room temperature of 30 °C (86 °F) and an average temperature in the radiator of 80 °C (176 °F). The open structure of the radiator allows for a fast and thorough cleaning.

Advantages:

- **Total elimination of CO₂ emission compared to open flame gas heaters**
- **20% humidity reduction compared to open gas heaters**
- **Significant improvement of FCR due to improved in-house air quality**
- **Significantly improved litter control due to better in-house climate**



Closed – unit ready for operation



Open – unit ready for cleaning

TECHNICAL SPECIFICATIONS

Heat capacity:

60 kW at -10 Pa and 30 °C ambient, calculated at nominal fluid flow

T- ambient °C	30	25	20	15	10	5	0
P (kW)	60	66	72	78	84	90	96

Pressure loss through unit: 0.2 Bar at 50 ltr/min through unit

Air exchange capacity: 8000 m³/h at -10 Pa

Fluid supply requirement: Nominal: 50 l/min per unit, 80 °C at inlet. Fluid content 14 ltr.
Long Life Antifreeze suitable for aluminium must be added
(25–60% concentration depending on climate conditions; consult installer)

Fluid temperature drop: Approximately 20 °C at nominal flow and 30 °C ambient air

Fan motor: 3 × 400 VAC 6-pole (950 RPM) 0.3 kW IP55 Insulation Class F

Heat Exchanger AddAir

AddAir is a versatile and highly efficient heat exchanger, combining the simplicity of traditional heating systems with the efficient humidity control of heat exchangers – but at a fraction of the initial cost. Due to its supreme dehumidification capability AddAir quite simply is a game changer for the entire poultry industry.

Advantages:

- **Better distribution of the air in the house**
- **Better litter condition**
- **Better integration with ventilation**
- **Significantly lower power consumption**
- **Significant saving in heating costs**
- **No cleaning and maintenance during production**
- **Open construction – easy to clean**
- **Much lower initial costs and running costs**

System description

The AddAir unit is a water carried heat exchanger and connects to a conventional boiler.



Roller door closed – suction from inside



Roller door open – suction from outside

When the roller door in the unit is closed, the unit serves as a traditional heater, recirculating room air over the heater and distributing it evenly throughout the building.

When the roller door is open, the unit serves as a heat exchanger and provides superior humidity control and ample supplies of preheated fresh air. The air entering the building passes through the heater and is warm and extremely dry when entering the house. This warm and dry air will absorb moisture quickly and efficiently. The fact that it is warm air leaving the AddAir unit also ensures against draft and condensation in the house.

TECHNICAL SPECIFICATIONS

Heat capacity:

60 kW at –10 Pa and 30 °C ambient, calculated at nominal fluid flow

T- ambient °C	30	25	20	15	10	5	0
P (kW)	60	66	72	78	84	90	96

Pressure loss through unit: 0.2 Bar at 50 ltr/min through unit

Air exchange capacity: 8000 m³/h at –10 Pa

Fluid supply requirement: Nominal: 50 l/min per unit, 80 °C at inlet. Fluid content 14 ltr. Long Life Antifreeze suitable for aluminium must be added (25–60% concentration depending on climate conditions; consult installer)

Fluid temperature drop: Approximately 20 °C at nominal flow and 30 °C ambient air

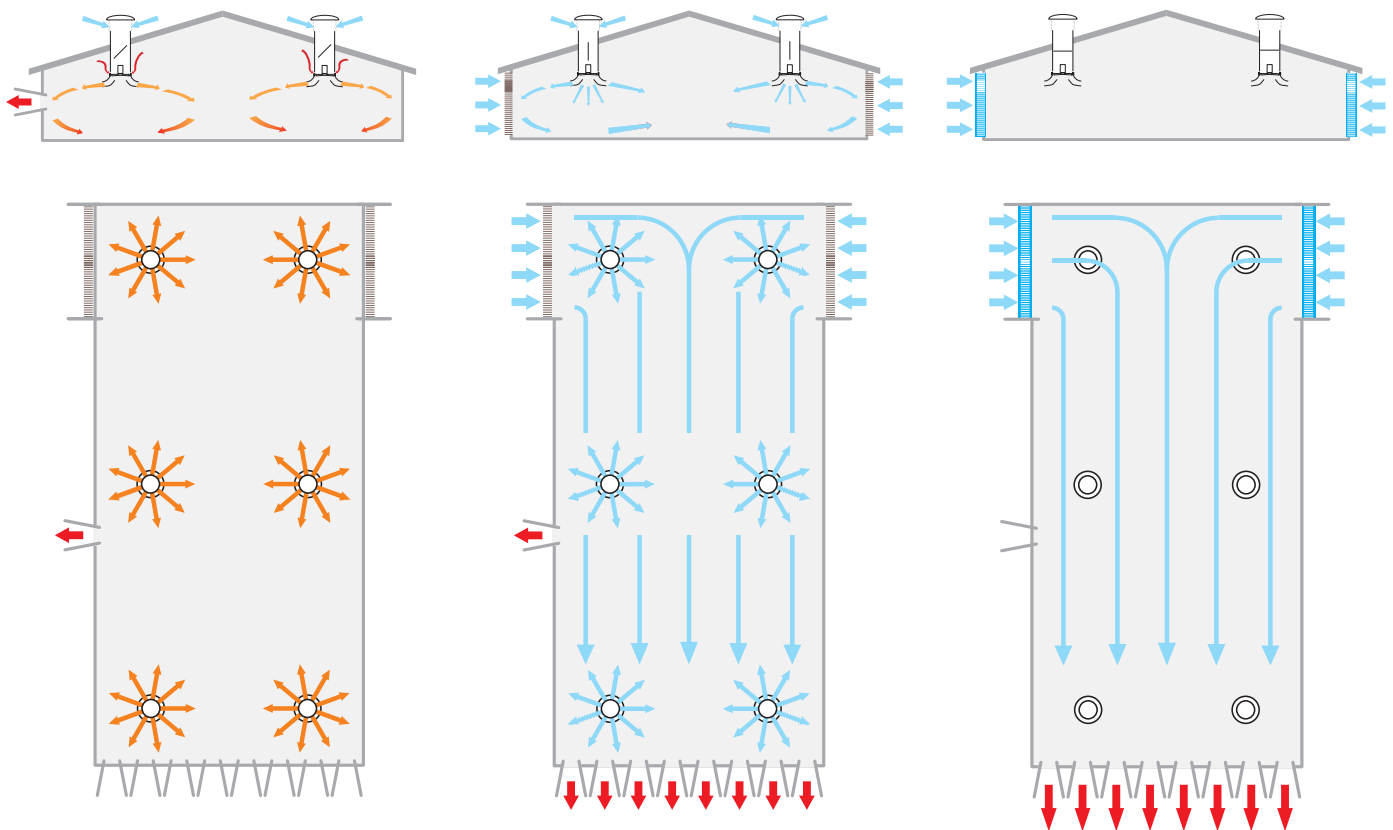
Fan motor: 3 × 400 VAC 6-pole (950 RPM) 0.3 kW IP55 Insulation Class F

ActiveProgressiveTunnel



The ActiveProgressiveTunnel system is designed for the warmer parts of the subtropical zones and into the cooler tropical climates.

These houses are equipped with Corona inlets, cooling system, tunnel doors and MagFans.



In brooding and during cooler periods all Corona inlets will be in operation to create a constant flow of air and a precise air exchange.

The MagFans gradually accelerate and air enters partly through tunnel doors while the Coronas stay in operation.

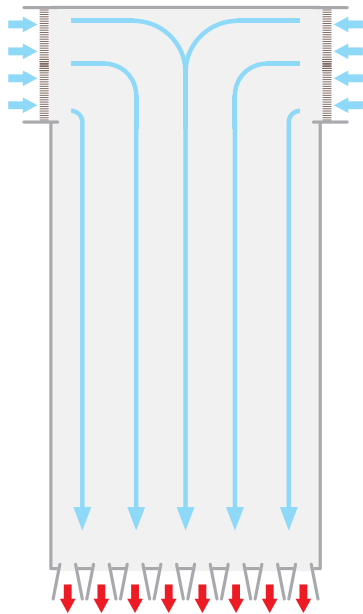
MagFans create high air speed and air exchange in tunnel mode. Corona inlets shut down. Cooling is active.

ProgressiveTunnel

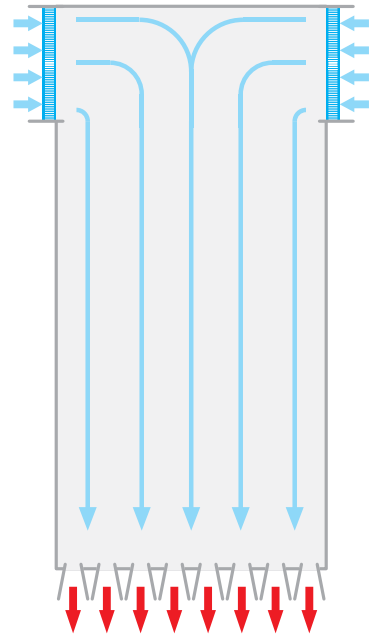


The ProgressiveTunnel system is ideal for the warm and humid tropical climates. Tunnel doors and cooling systems work in conjunction with the MagFans to provide cooling.

The system operates at a fraction of the operating expenses normally associated with tunnel ventilation.



In brooding, MagFans will operate at low speed to create uniform air exchange and airspeed. The MagFans adjust their running speed very precisely, eliminating the hassling, noisy and inefficient stage control.



During hot spells, MagFans accelerate to create high efficiency cooling. Cooling is active. Very high air exchange and superior energy efficiency.

Appendix B

WRF

B-1 WRF pre-processing system

WRF meteorological datasets for the period July 2019 to June 2020 were developed using initialising data sourced from the ECMWF atmospheric reanalysis version 5 (ERA5)¹² produced by the Copernicus Climate Change Service. ERA5 data is on 31 km x 31 km grids prepared hourly.

B-2 WRF

The process of developing the WRF datasets involved a nested approach for three domains with their centre at - 37.981° south, 144.087° east. The WRF meteorological datasets for the period between 1 July 2019 and 30 June 2020 were developed using initialising data sourced from the ERA5 reanalysis dataset.

Parameters used in WRF model for this assessment are presented in Table B.1. The modelling packages were minimally changed from CONUS defaults. The modelling domain locations are shown in Figure B.1.

Table B.1 WRF model parameters

Parameterisation scheme	Domain 1	Domain 2	Domain 3
Modelling domain	50 km	10 km	2 km
Grid resolution	31 x 26	41 x 31	46 x 36
Number of vertical levels	40	40	40
Cumulus	Tiedtke	Tiedtke	Tiedtke
Longwave radiation	RRTMG	RRTMG	RRTMG
Shortwave radiation	RRTMG	RRTMG	RRTMG
Surface layer	Monin-Obukhov	Monin-Obukhov	Monin-Obukhov
Land surface	Unified Noah land-surface	Unified Noah land-surface	Unified Noah land-surface
Planetary boundary layer	Mellor-Yamada-Janjic (MYJ)	MYJ	MYJ
Soil layers	Four	Four	Four
Grid nudging	Spectral	None	None

¹² Copernicus (2023) *ERA5 hourly data on single levels from 1940 to present*. DOI: 10.24381/cds.adbb2d47

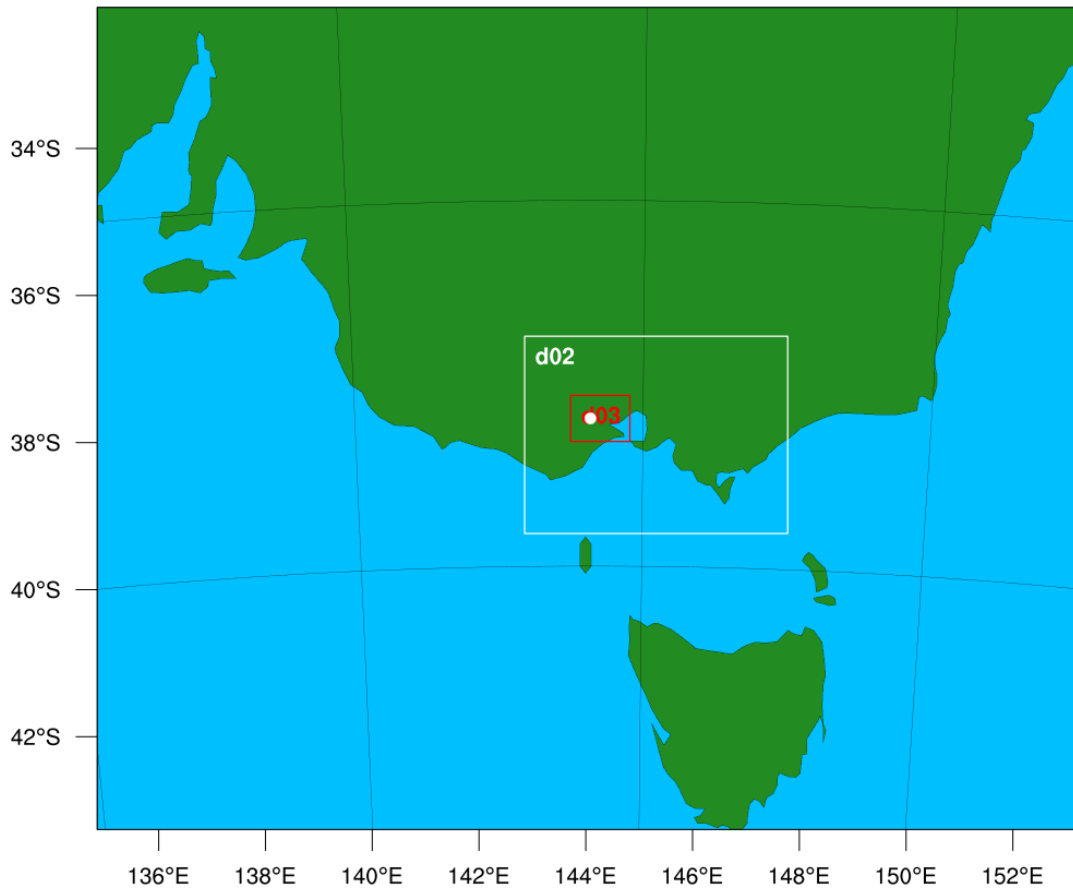


Figure B.1 WRF modelling domains

B-3 Mesoscale Model Interface Program

The US EPA's Mesoscale Model Interface Program (MMIF) was used to process raw WRF output. MMIF can produce four output files (TXT, DAT, GRD, and AUX). MMIF writes CALPUFF-ready input files equivalent to the CALMET 'NOOBS' option (number of surface, upper air, and over-water sites are all zero) and the CALGRID option (3-D gridded fields of wind components and temperature).

Execution of MMIF was done according to the recommendations found in the User Manual for *The Mesoscale Model Interface Program Version 4.0* (US EPA, 2022). MMIF writes the following variables to a CALMET.DAT file:

- Time-invariant fields
 - 2D surface roughness length (m)
 - 2D landuse code, dimensionless
 - 2D topographic elevation (m)
 - 2D leaf area index, dimensionless
- Time-variant fields
 - 3D U-component (west-east) scalar wind (m/s)
 - 3D V-component (south-north) scalar wind (m/s)
 - 3D W-component (vertical) scalar wind(m/s);
 - 3D temperature (Kelvin)
 - 3D cloud liquid water mixing ratio to CALMET.AUX file
 - 2D PG stability, dimensionless
 - 2D surface friction velocity scale (m/s) (u^*)
 - 2D PBL depth (m)

- 2D Monin-Obukhov length (m)
- 2D convective velocity scale (m/s)
- 2D rainfall rate (mm/hr)
- 2D surface temperature (Kelvin)

A summary of the CALMET.DAT file is presented in Table B.2.

Table B.2 CALMET file parameters

Parameter	Specification
Modelled period	July 2019 to June 2020
Model	NOOBS
Domain origin (south-west corner)	Easting: 243.048 Northing: 5775.040
Domain size	24 x 16 at 2 km resolution (48 km x 32 km)
Number of vertical levels	11
Vertical levels (m)	20, 40, 80, 120, 160, 320, 640, 1200, 2000, 3000, 4000
Initial guess field	WRF wind simulations
Land use	The land use data for the modelling domain was derived from the Global Land Cover Characterization Version 2 for Australia Pacific (sourced from Lakes CALPUFF View), with a resolution of approximately 1 km. The land use file was edited to more accurately reflect the land use in the area. Land use data code: 10 – Urban 20 – Agricultural Land 30 – Rangeland 40 – Forrest Land 51 – Streams and canals Land use data for the CALMET modelling is presented in Figure B.2.
Terrain data	The terrain data was extracted from 1 arc-second (~30 m) spaced elevation data obtained via NASA's Shuttle Topography Radar Missions (STRM1 – Version 3). Terrain data for the CALMET modelling is presented in Figure B.3.

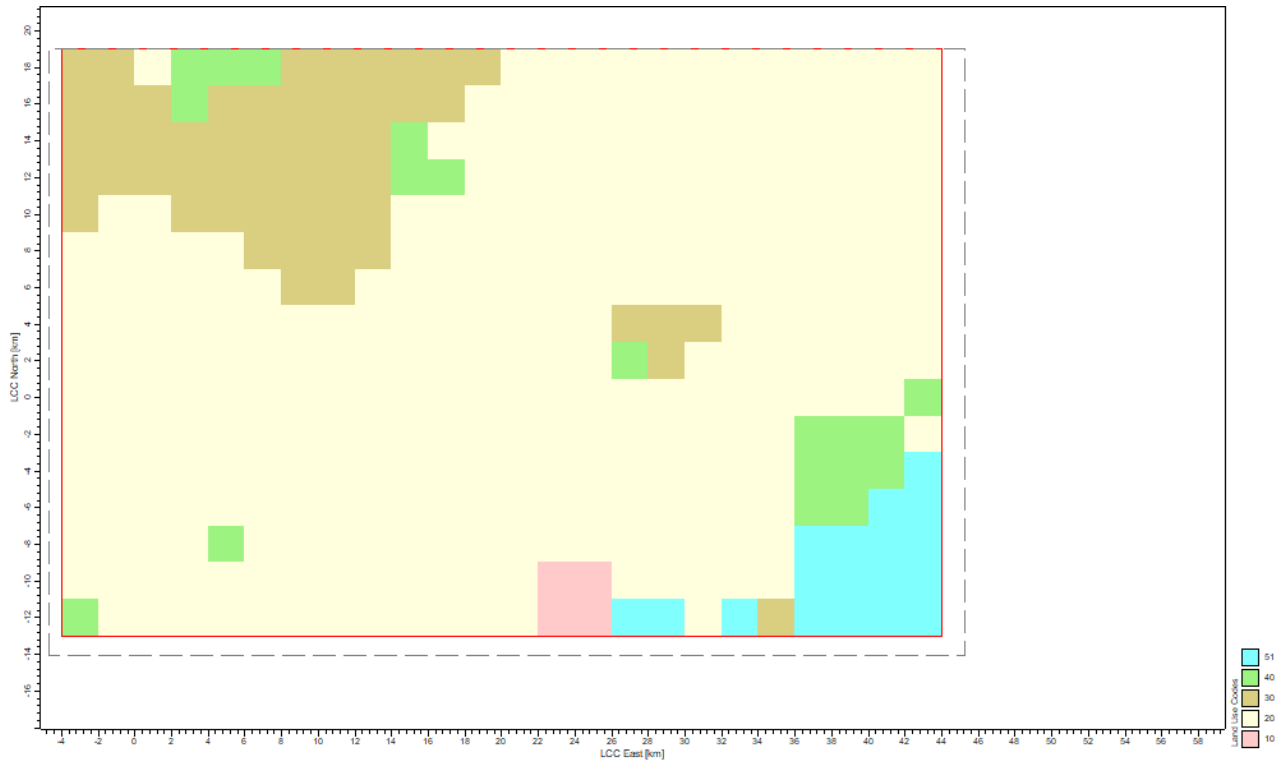


Figure B.2 Land use data for CALMET (48 km X 32 km), centred at the site

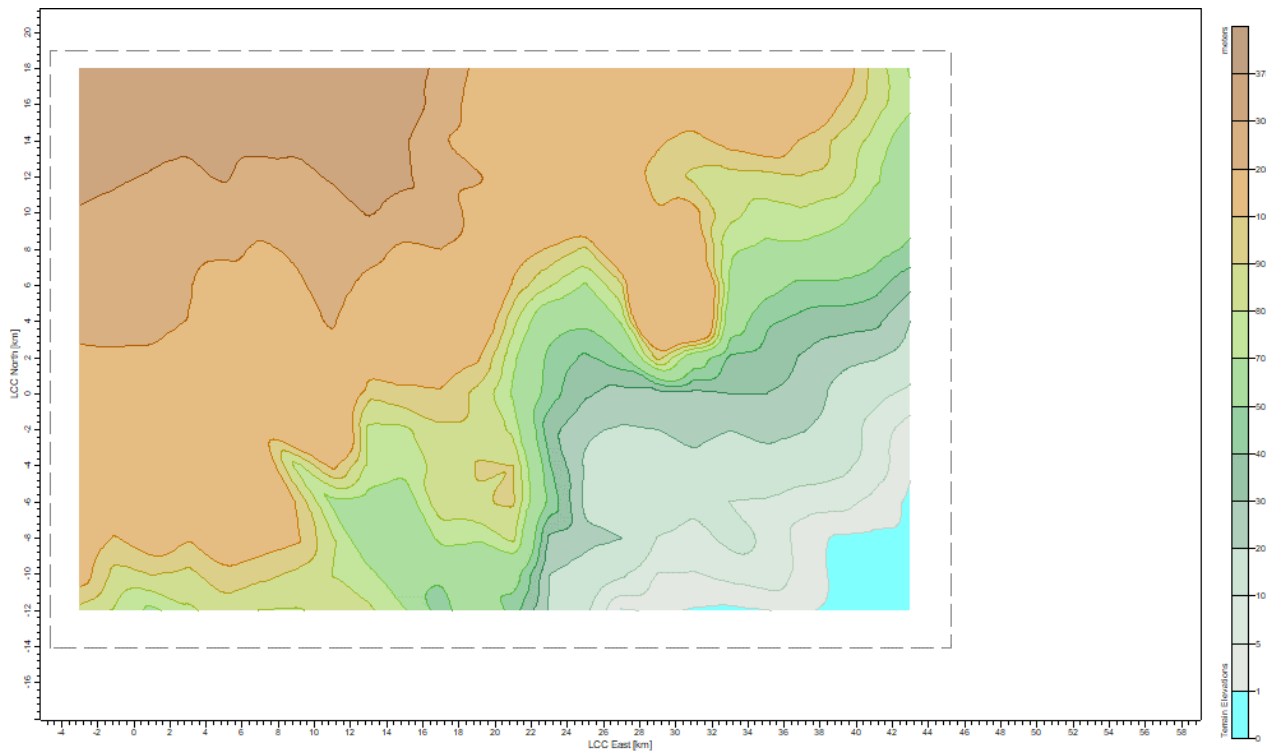


Figure B.3 Terrain data used for CALMET modelling (48 km X 32 km), centred at the site

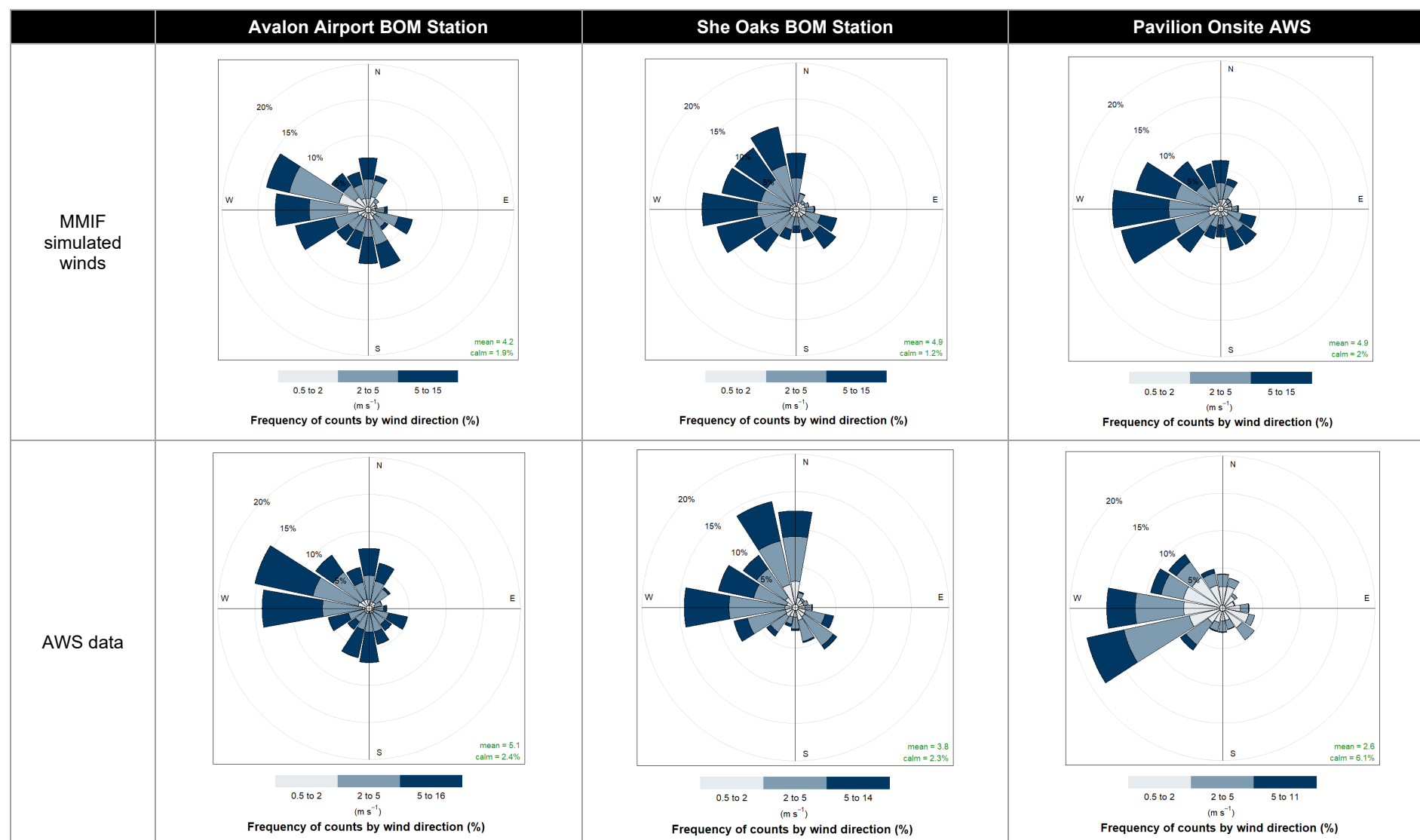
B-4 Model validation

The modelled meteorological data at Avalon Airport and She Oaks BOM stations and Pavilion Farms are compared with the meteorological data measured at the respective AWS to assess the validity of MMIF simulated winds. The data is presented in Table B.3, in the form of annual wind roses, for the period between 1 July 2019 and 30 June 2020. Figure B.4, Figure B.5 and Figure B.6 present the MMIF simulated winds and measured winds, in the form of seasonal wind roses, at Avalon Airport and She Oaks BOM stations and Pavilion Farms, respectively.

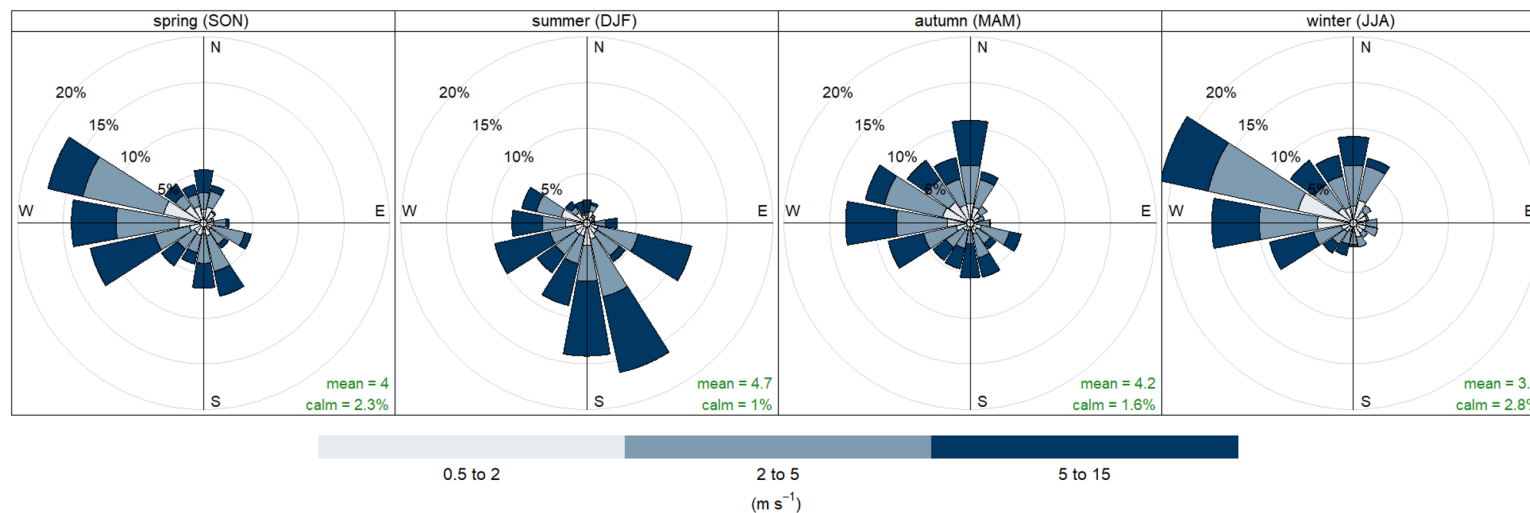
Based on Table B.3, Figure B.4, Figure B.5 and Figure B.6, the following are observed:

- MMIF simulate winds underpredicts the frequency of calm winds. The predicted calms are 0.5 %, 1.1% and 4.1% less than that measured at Avalon Airport, She Oaks and Pavilion Farms, respectively
- MMIF simulated mean wind speeds are within 30% of the mean wind speed measured at Avalon Airport and She Oaks BOM stations
- MMIF simulated overpredicted wind speed and underpredicted calms at Pavilion Farms. Note that Pavilion Farms AWS recorded high frequency of calm winds
- Overall, MMIF simulated winds produces very similar annual and seasonal wind patterns at each of the location

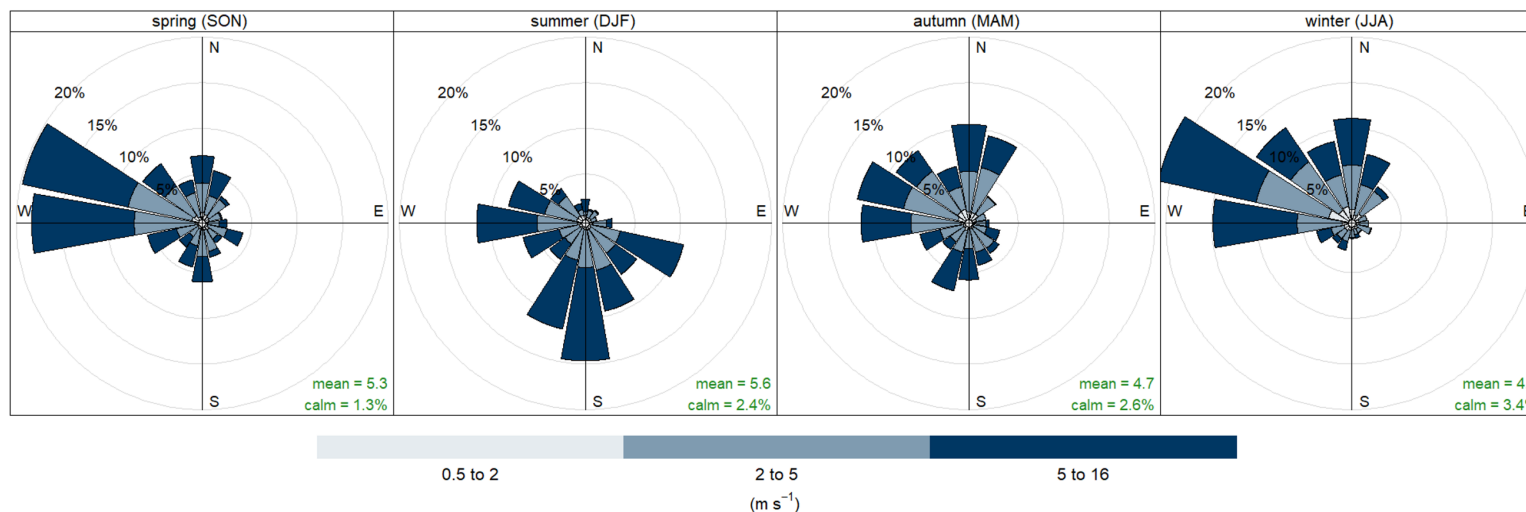
Table B.3 *Modelled meteorological data compared with AWS measured data in the form of annual wind roses*



Avalon Airport – MMIF simulated winds (seasonal)



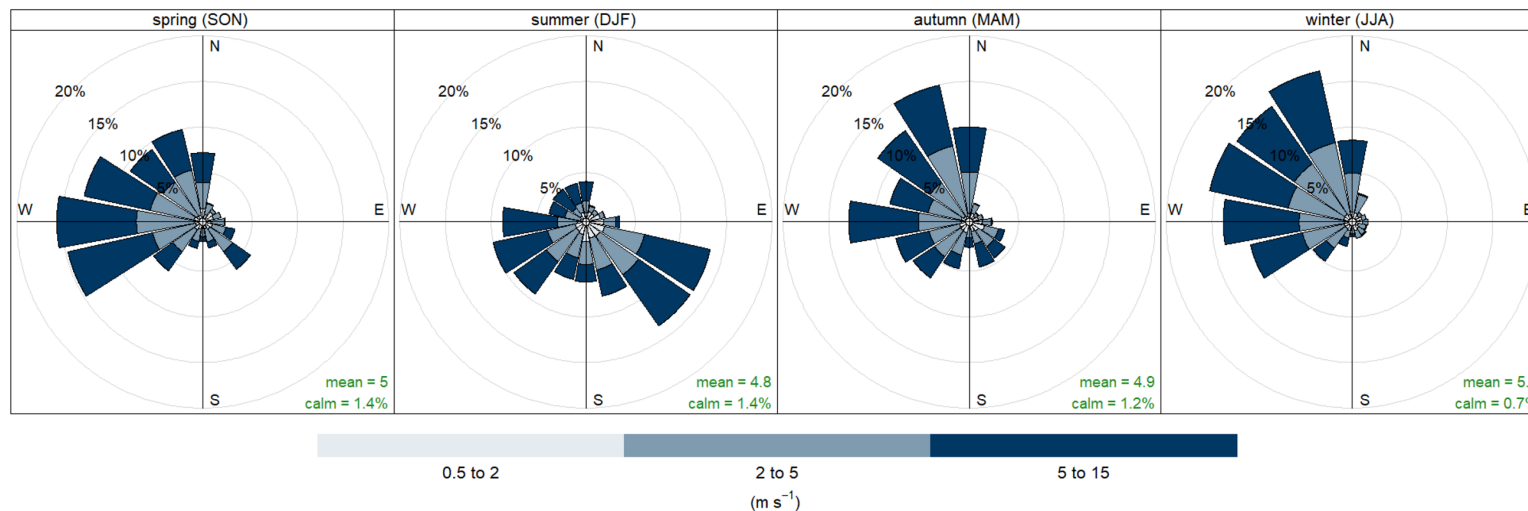
Avalon Airport BOM Station data (seasonal)



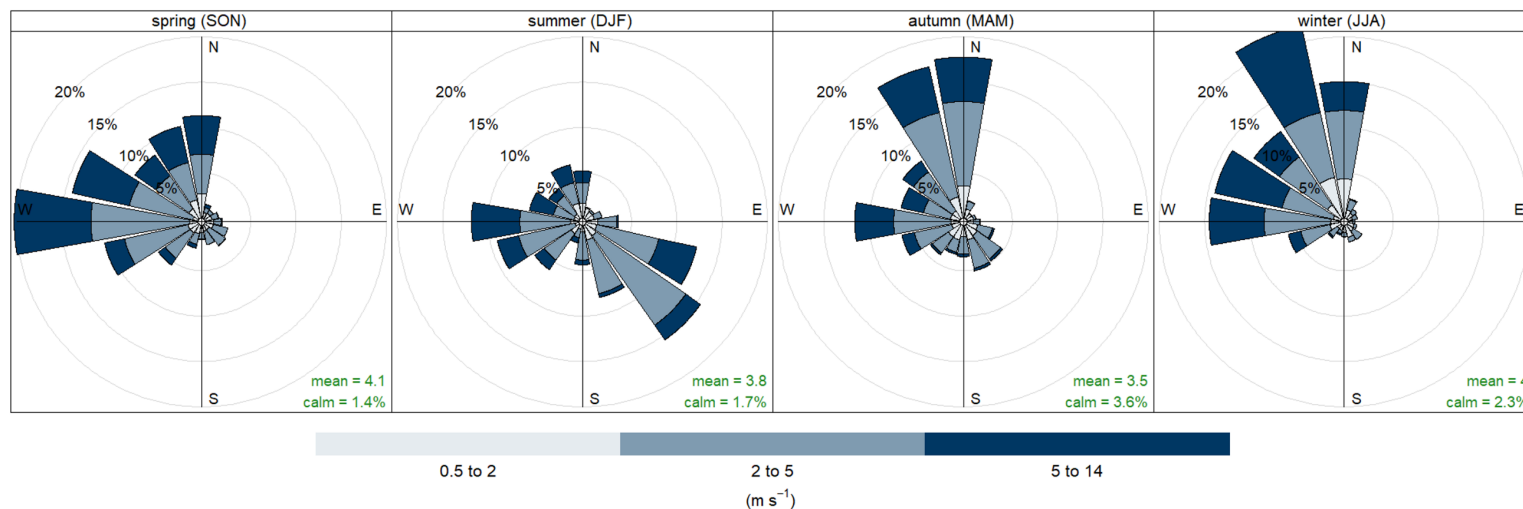
Frequency of counts by wind direction (%)

Figure B.4 Avalon Airport seasonal winds for the period between 1 July 2019 and 30 June 2020

She Oaks – MMIF simulated winds (seasonal)



She Oaks BOM Station data (seasonal)



Frequency of counts by wind direction (%)

Figure B.5 She Oaks seasonal winds for the period between 1 July 2019 and 30 June 2020



Figure B.6 Pavilion Farms seasonal winds for the period between 1 July 2019 and 30 June 20

Appendix C

**Hourly varying bird density (D) and
ventilation rate (V)**

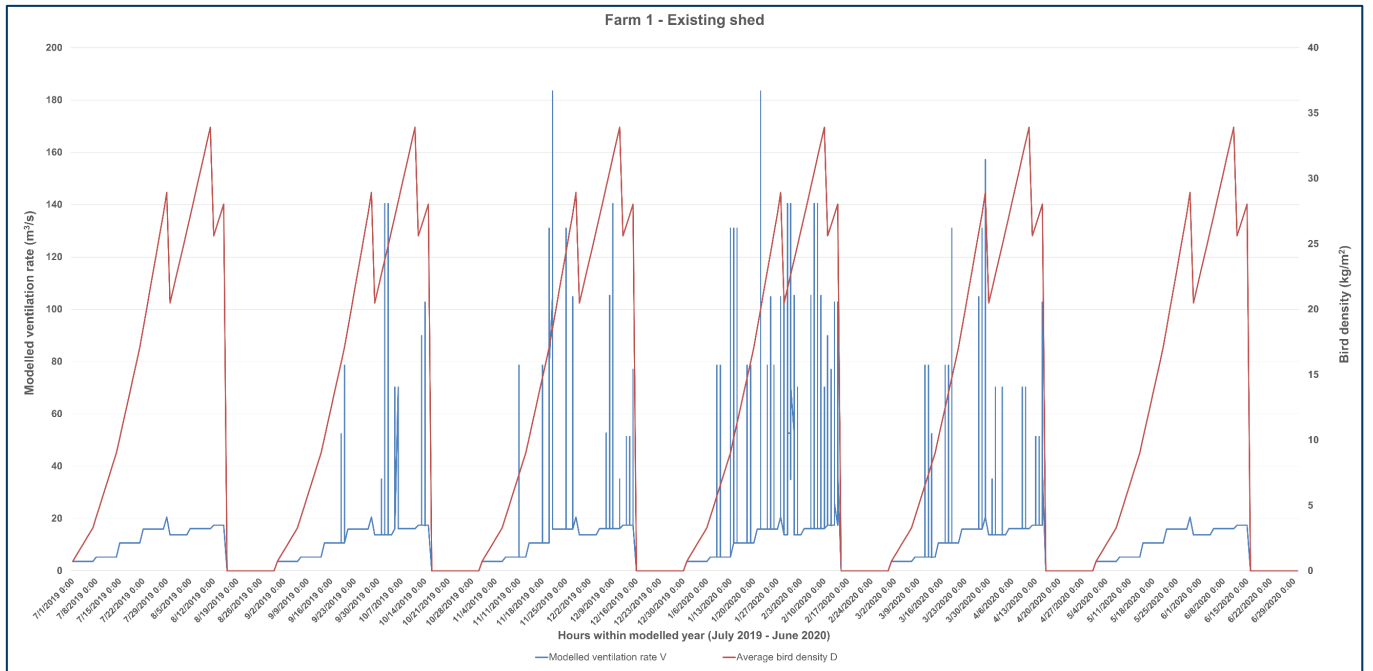


Figure C.1 Farm 1 – Existing farm sheds

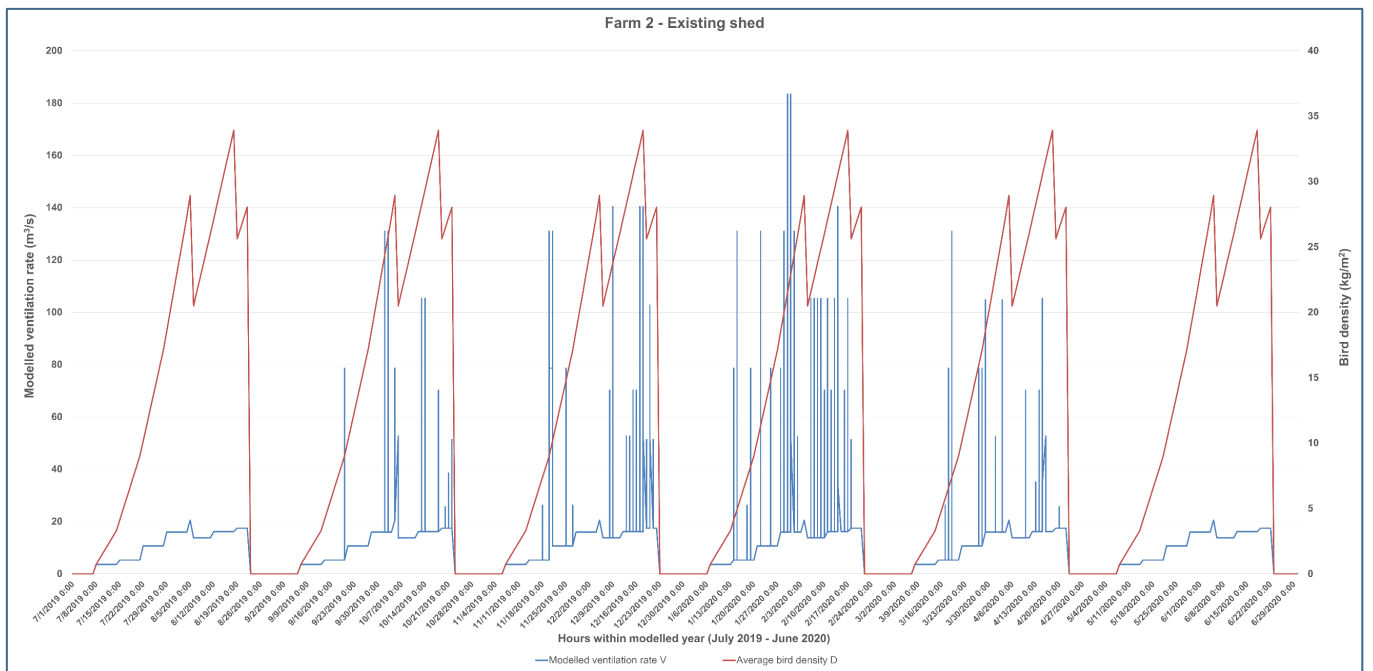


Figure C.2 Farm 2 – Existing farm sheds

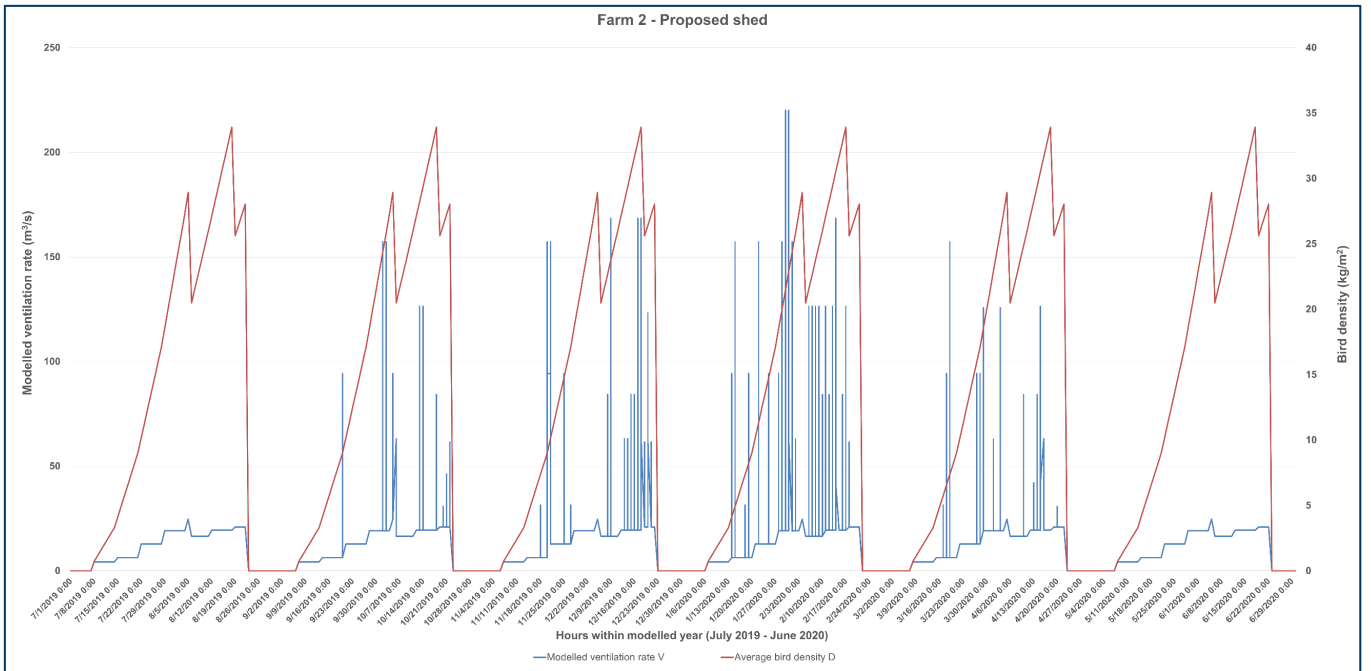


Figure C.3 Farm 2 expansion – Existing farm sheds

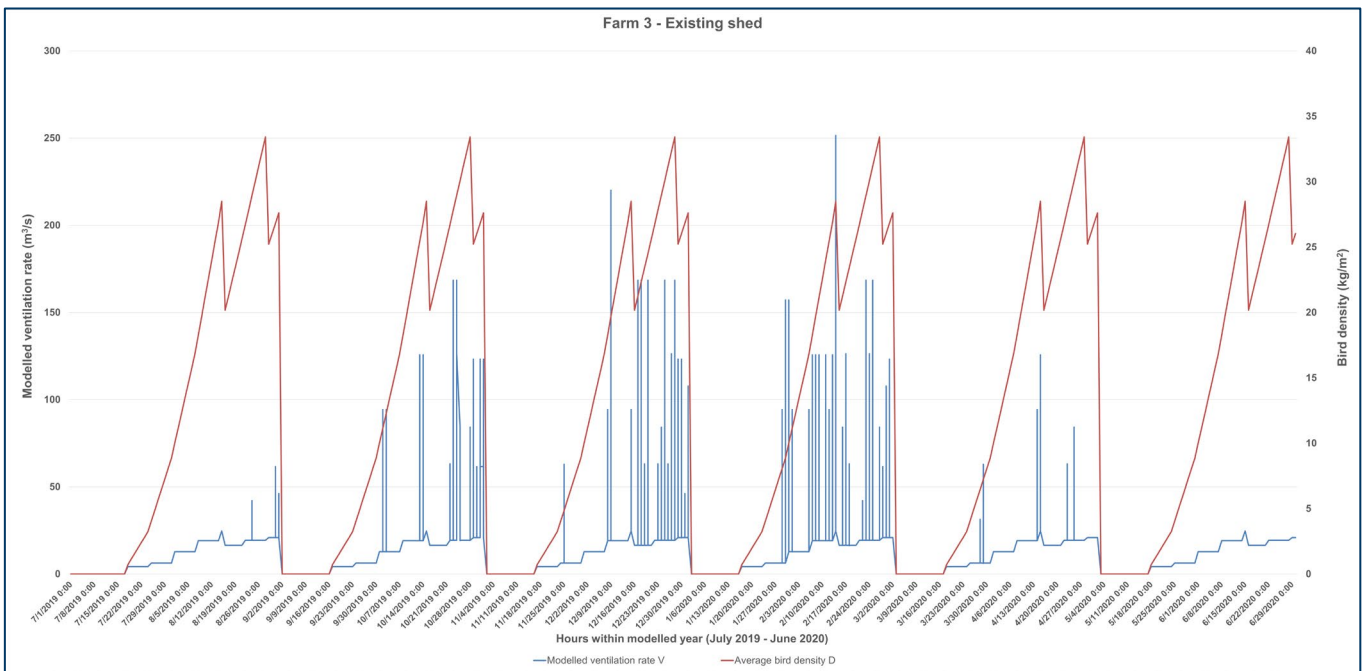


Figure C.4 Farm 3 – Existing farm sheds

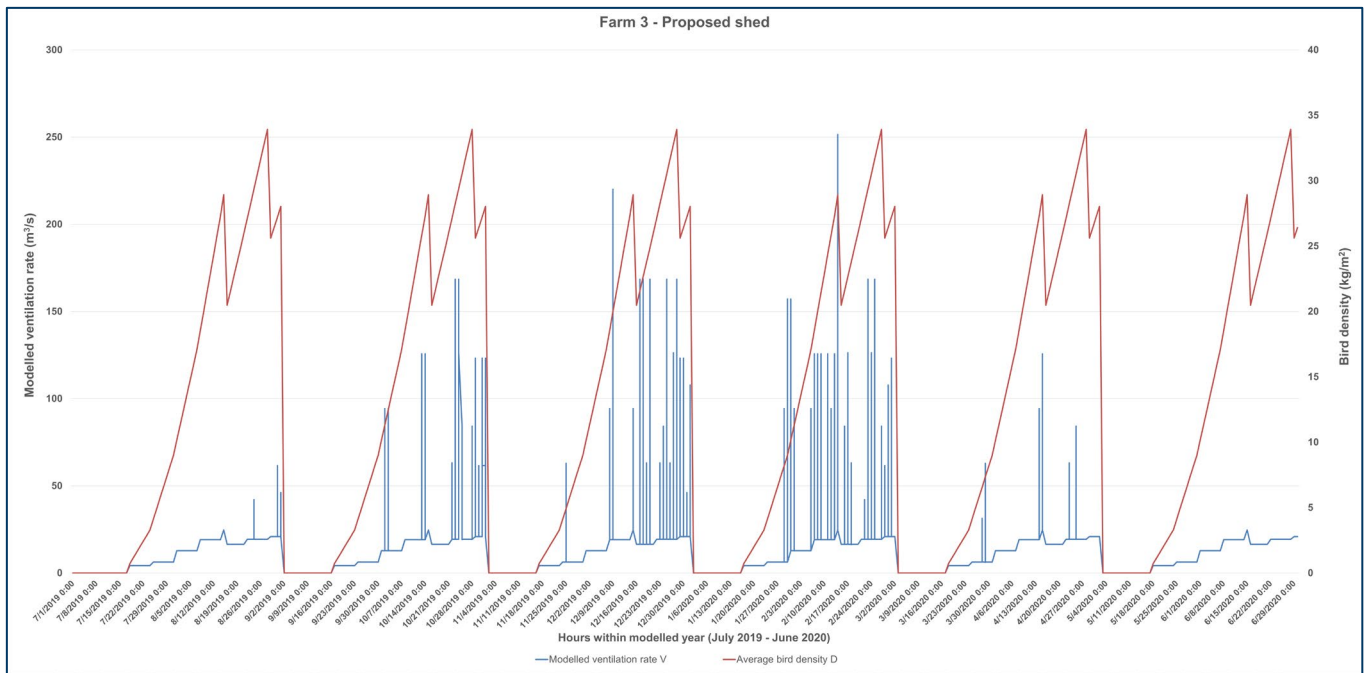


Figure C.5 Farm 3 – Proposed farm sheds

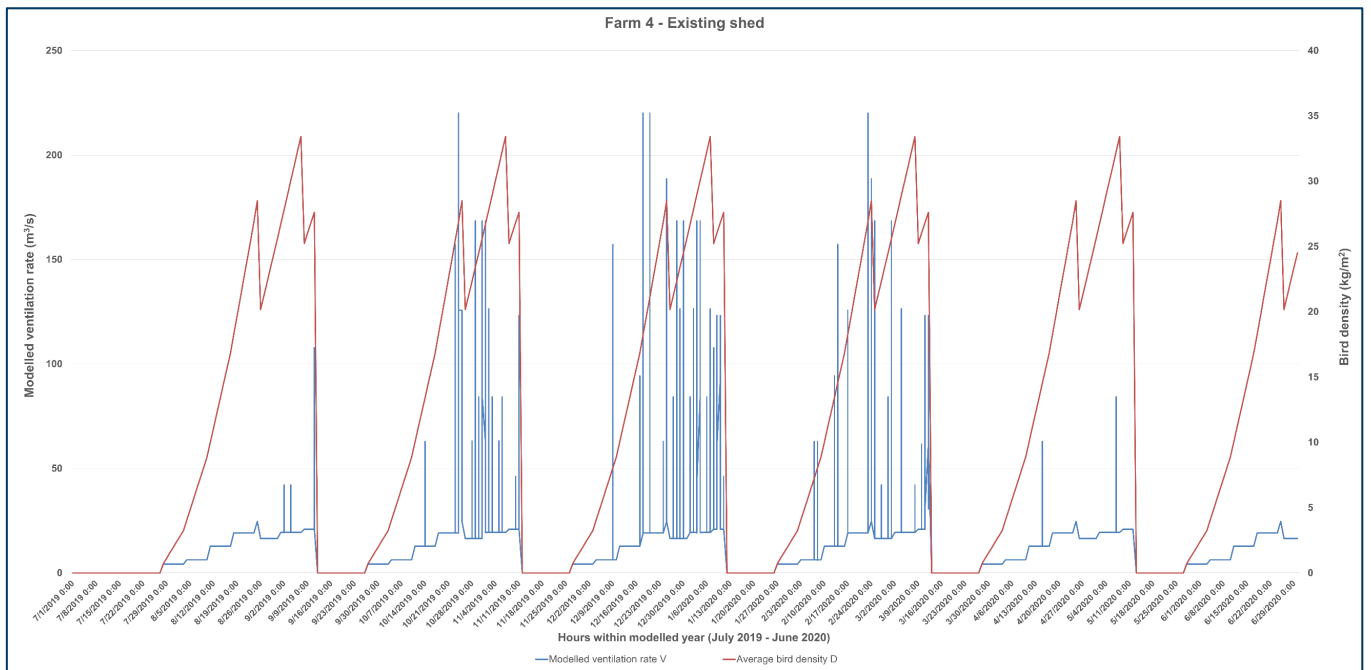


Figure C.6 Farm 4 – Existing farm sheds

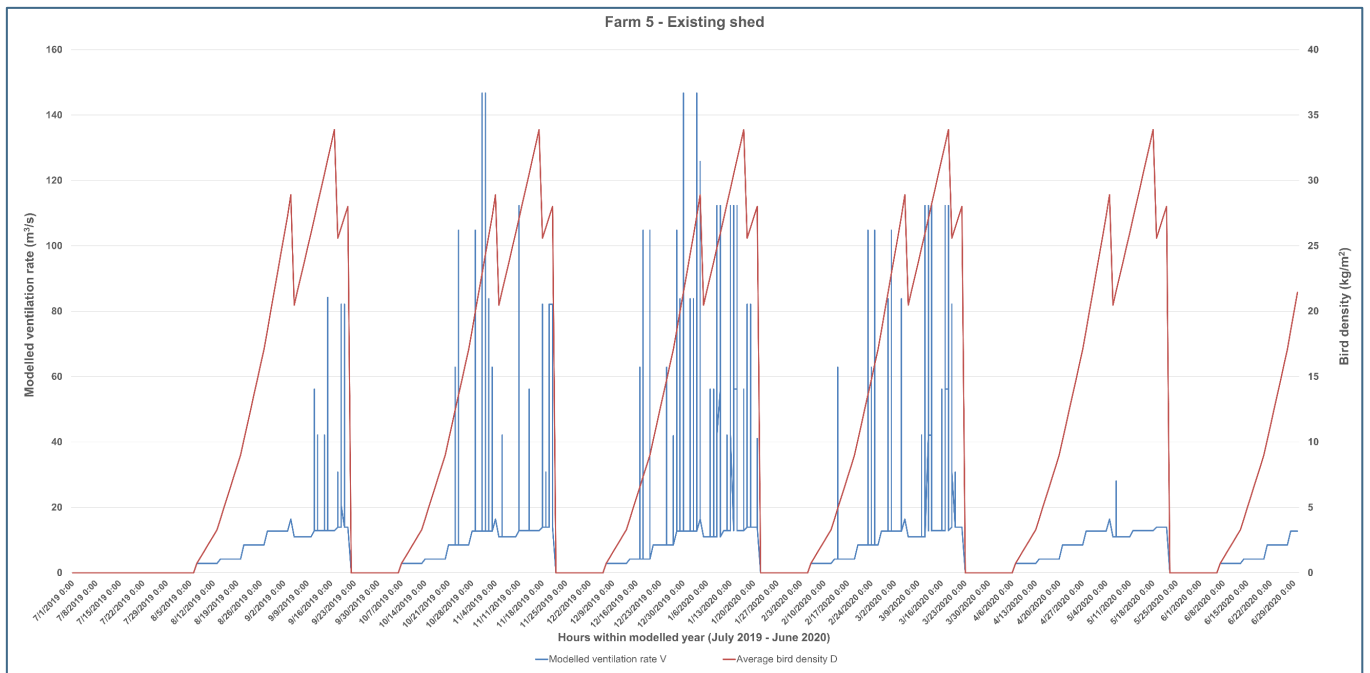


Figure C.7 Farm 5 – Existing farm sheds

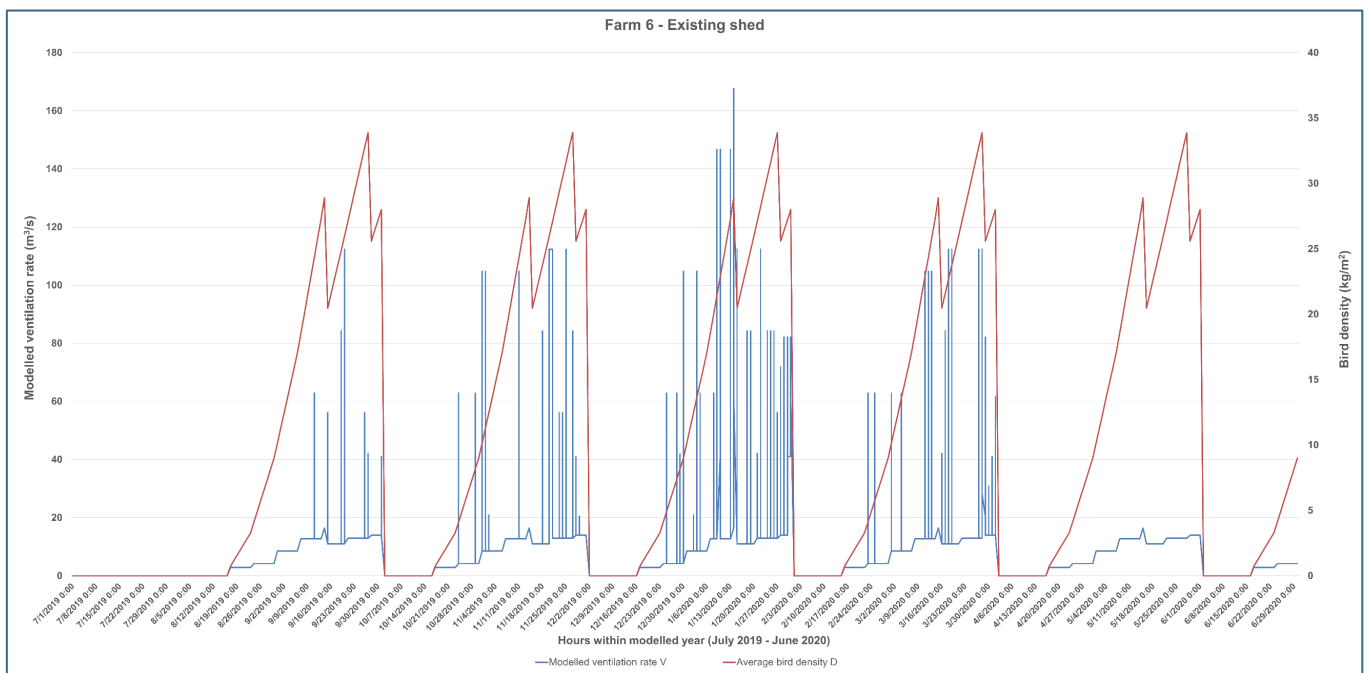


Figure C.8 Farm 6 – Existing farm sheds

Appendix D

Modelled odour emission rates

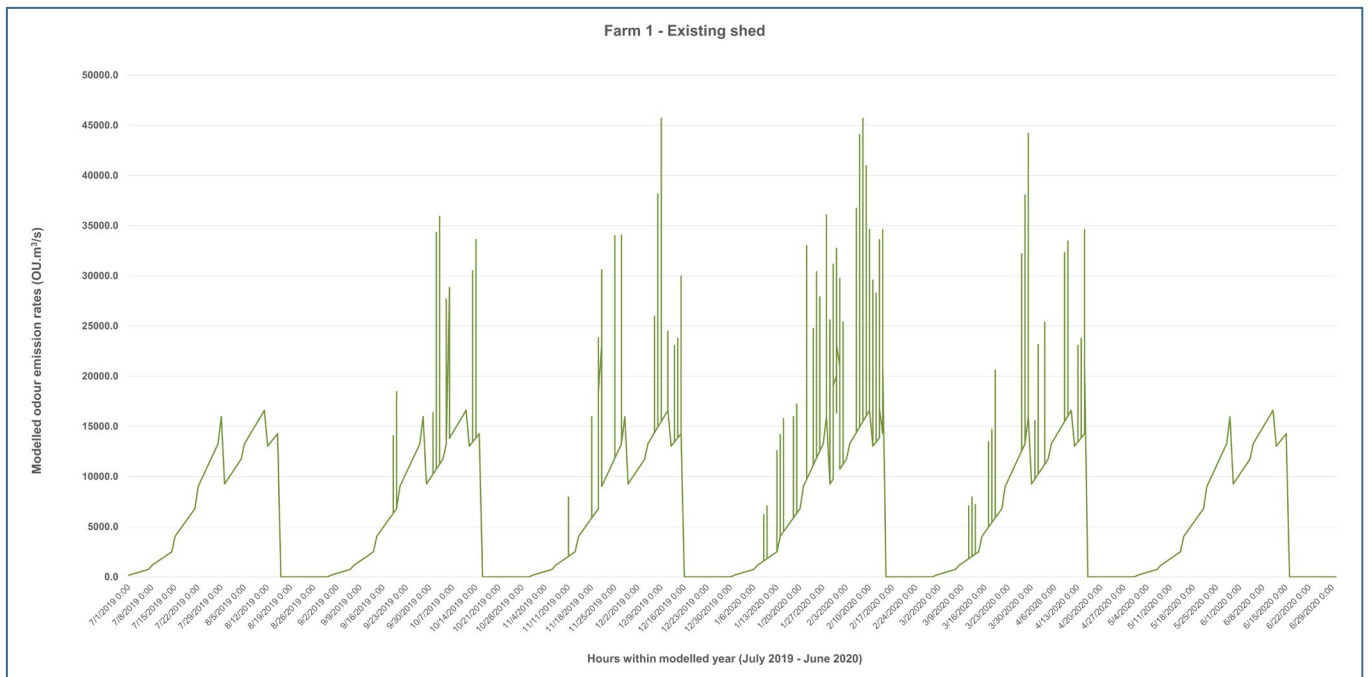


Figure D.1 Farm 1 – Existing farm sheds

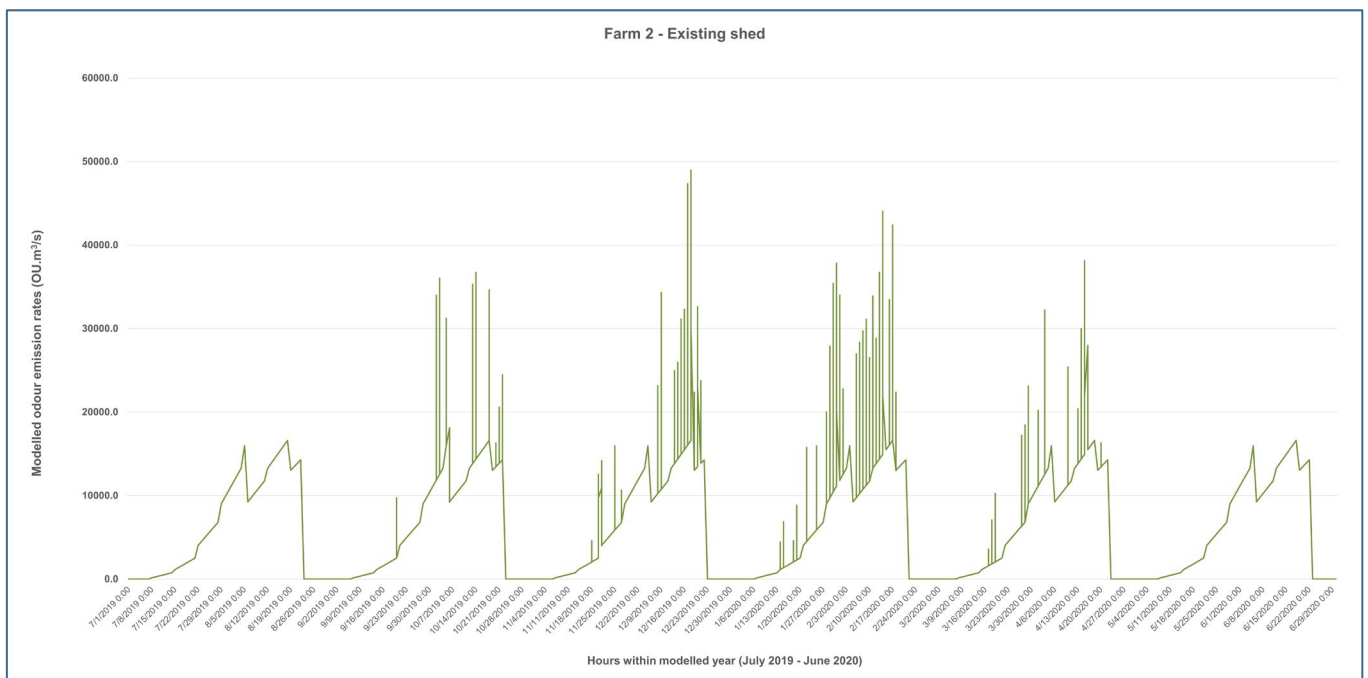


Figure D.2 Farm 2 – Existing farm sheds

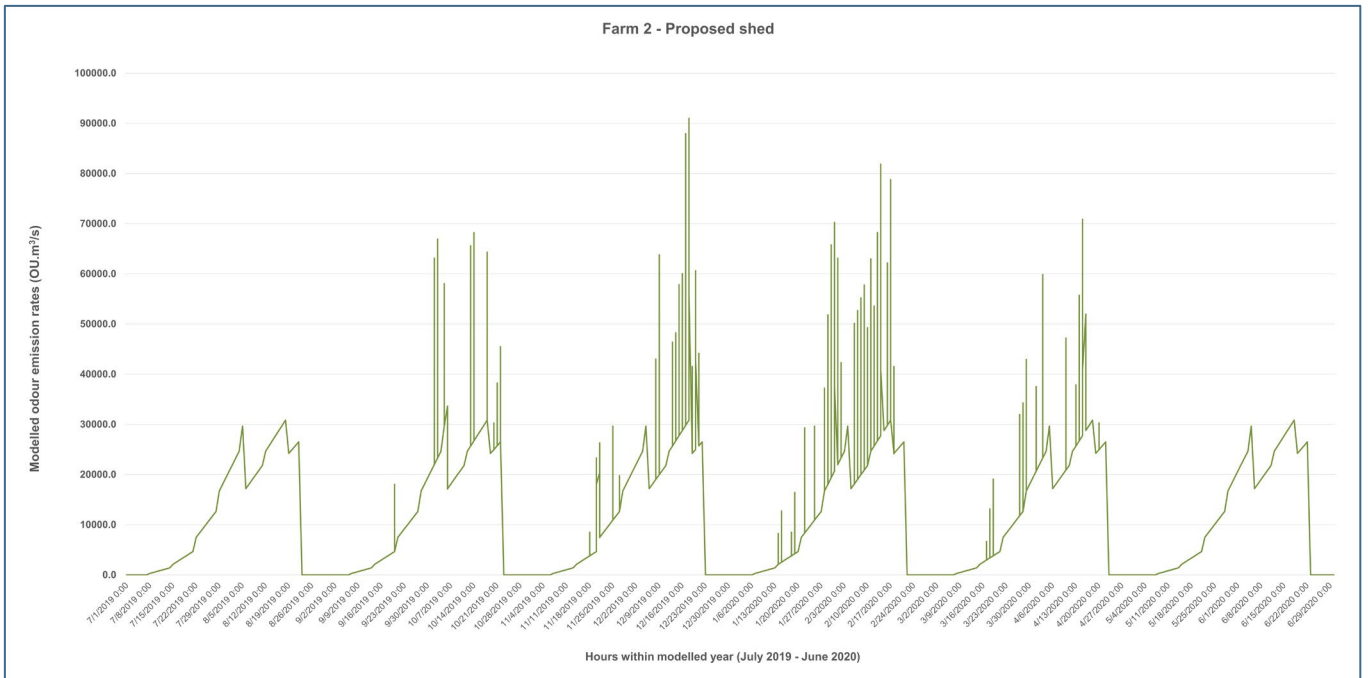


Figure D.3 Farm 2 expansion – Existing farm sheds

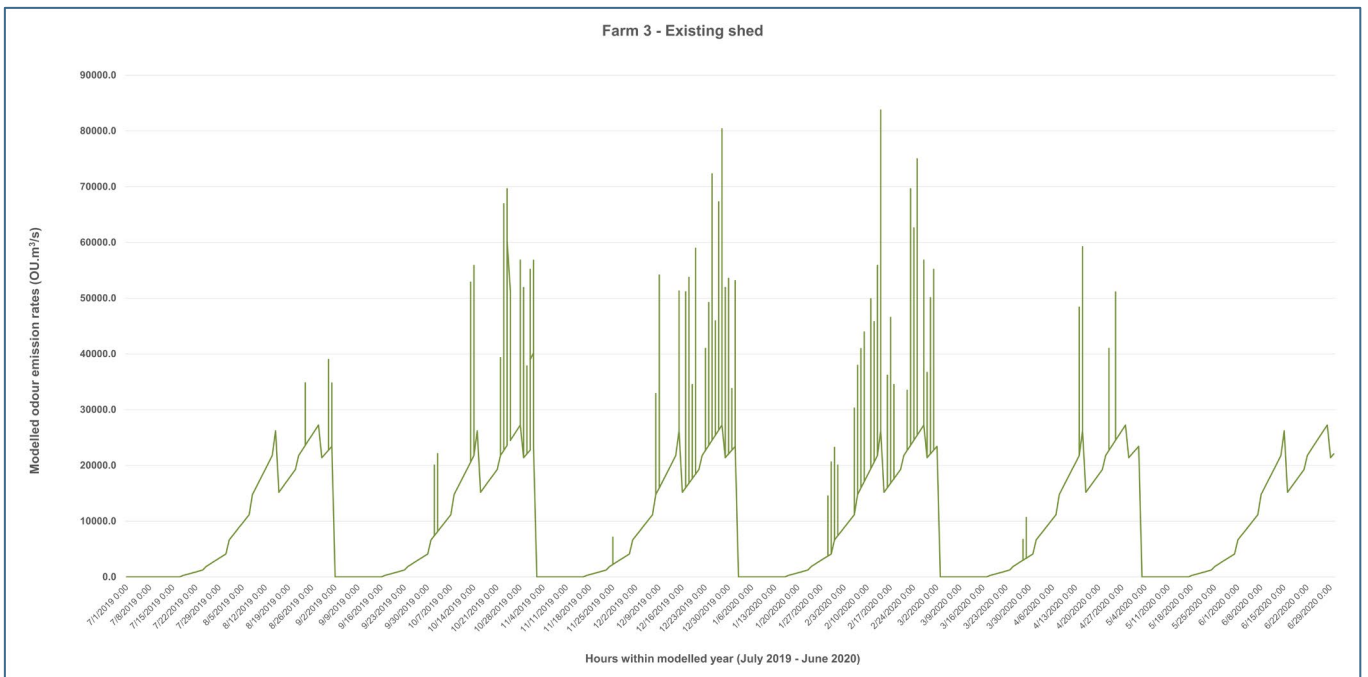


Figure D.4 Farm 3 – Existing farm sheds

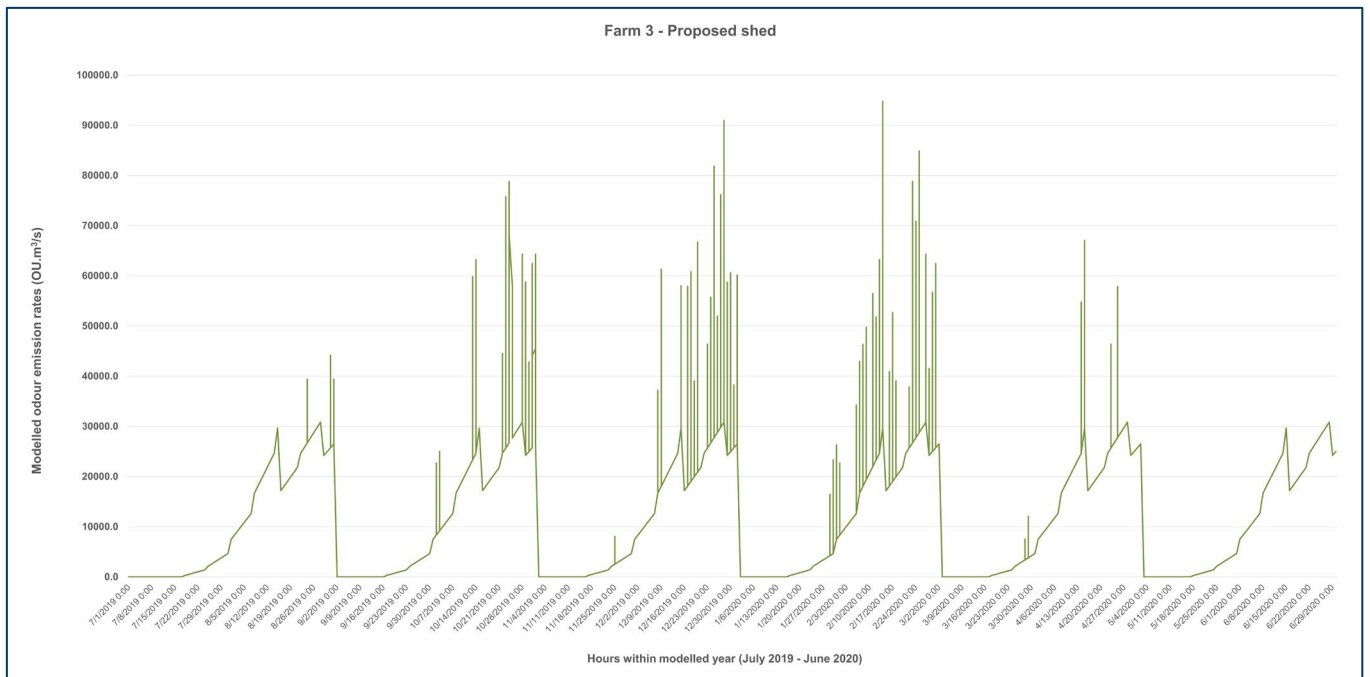


Figure D.5 *Farm 3 – Proposed farm sheds*

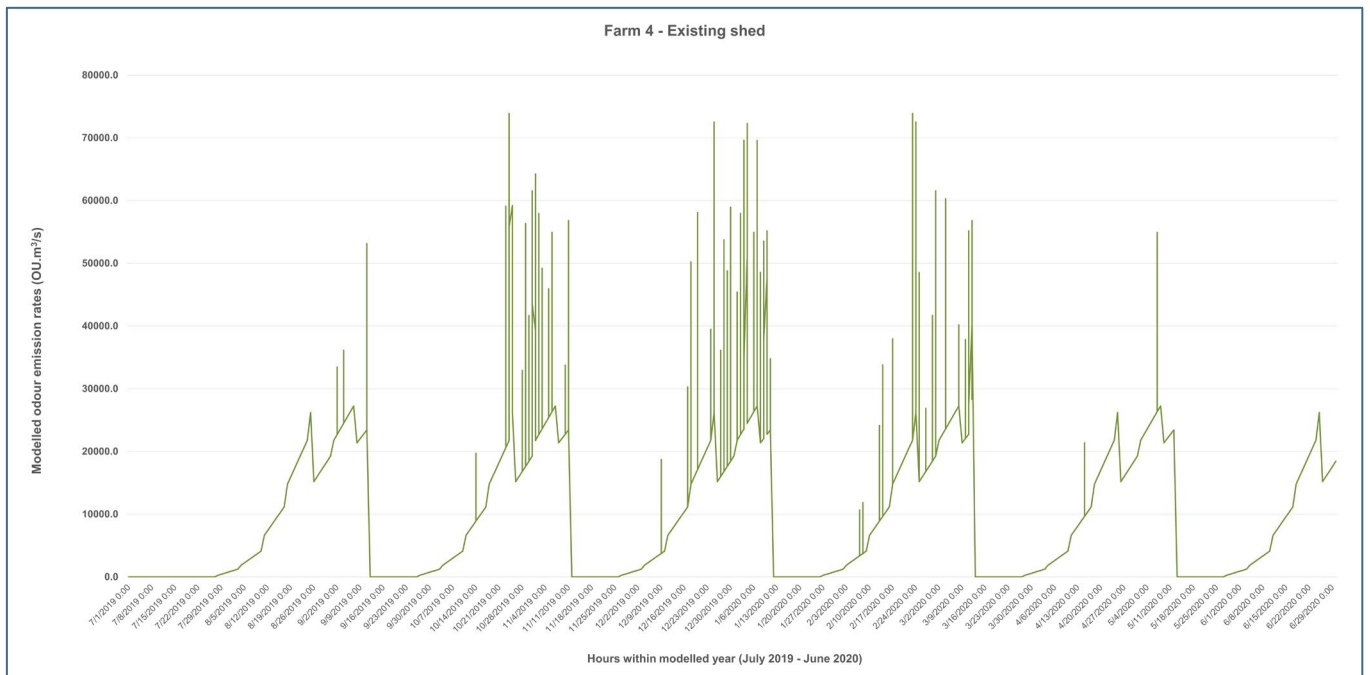


Figure D.6 *Farm 4 – Existing farm sheds*

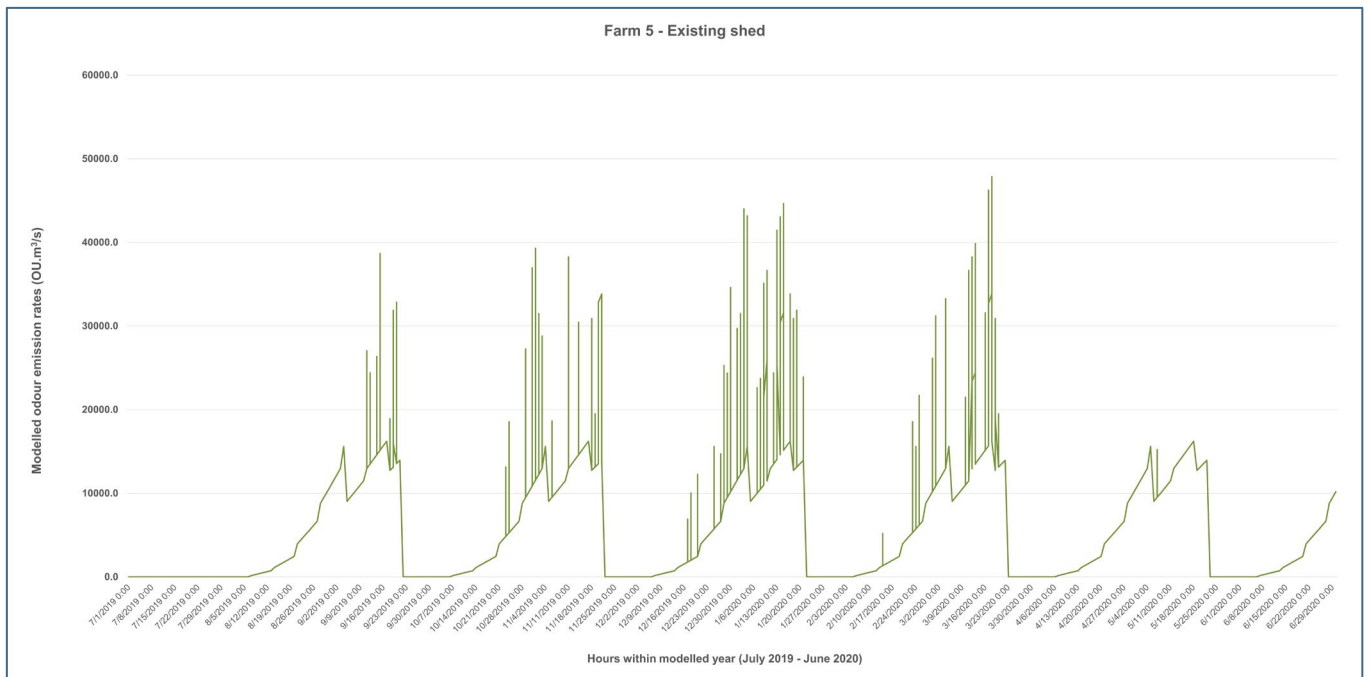


Figure D.7 Farm 5 – Existing farm sheds

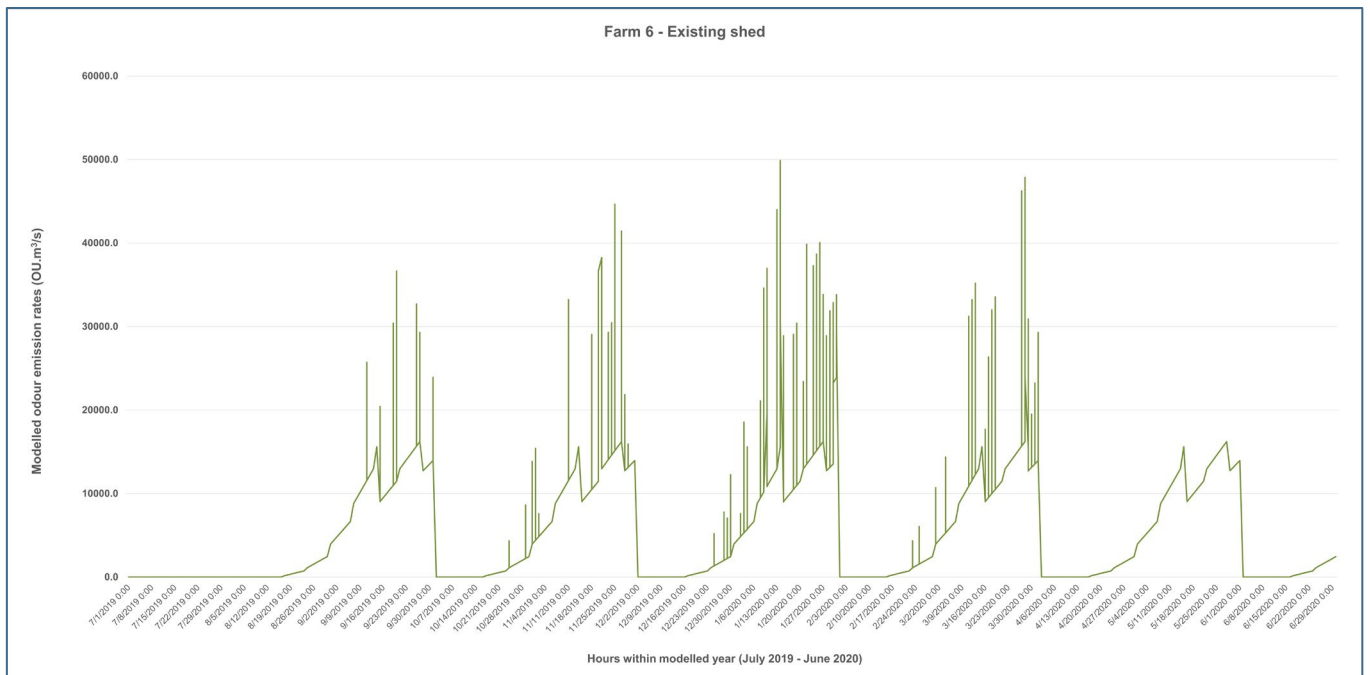


Figure D.8 Farm 6 – Existing farm sheds

Appendix E

**Sale-Toongabbie broiler farm odour
survey observations and model
calibration**

E-1 Sale-Toongabbie Farm information

The Sale-Toongabbie Farm currently consists of four farms, and each farm has eight sheds. Each of the current shed has a floor area of 3,520 m² (176 m x 20 m), with the capacity to hold 50,000 birds. The mainly ventilation used to manage internal shed temperatures at the Sale – Toongabbie Farm is tunnel ventilation fan.

E-2 Odour surveys

Odour emanating from the Sale-Toongabbie Farm was observed during all ten odour surveys conducted by GHD in accordance with EPA guidance 1881. The odour surveys were undertaken on three separate days, listed as follows:

- Odour survey 1 – 5 were undertaken on 23 November 2023, between 10:00 and 16:00 prior to first pick
- Odour survey 6 – 8 were undertaken on 11 December 2023, between 12:00 and 19:00 prior to final pick
- Odour survey 9 – 10 were undertaken on 12 December 2023, between 06:45 and 09:30 prior to final pick

The odour surveys were undertaken at times to capture peak odour conditions at Farm 2 (just prior to first pick and just prior to final pick) and during early morning and late evening. The age of the birds during the two events were 28 days and 47 days respectively.

As the operations for both Farm 1 and Farm 2 at Sale-Toongabbie Farm are similar, the odour surveillance program was undertaken for Farm 2 only. It is expected for odour emissions from Farm 1 to be similar to Farm 2, therefore surveillance results have been applied to Farm 1.

E-3 Model calibration using odour survey observations

The odour dispersion model results prepared for Sale-Toongabbie Farm are spot calibrated using the odour surveillance observations with the aim to compare and identify the likely modelled odour concentrations which could describe the 'Obvious' and 'Subtle' experienced by the surveyors.

E-4 Calibration methodology

The odour dispersion model is updated and run based on the following:

- The number and age of birds present at Sale-Toongabbie Farm 2 during the three days when odour surveys were undertaken
- Average temperature, wind speed, wind direction, relative humidity and cloud amount observed on those days

A summary of the above data used to update the odour dispersion model is summarised in Table E.1. The updated odour dispersion model results are then compared with the odour survey results to identify odour concentrations for 'Obvious' and 'Subtle' odour.

Table E.1 Summary of data used to update odour dispersion model prepared for Sale-Toongabbie Farm

Odour survey number	Farm 2 bird		Average temperature	Average wind speed	Average wind direction	Relative humidity	Cloud amount ¹³
	Maximum Age	Number	°C	m/s	°	%	tenths
1 – 5	28	400,000	20 – 24	2.5	80 – 90	53	6
6 – 8	47	200,000	21	2	80 – 90	90 – 95	10
9 – 10	47	200,000	19 – 20	3	80 – 90	90 – 95	10

¹³ Based on La Trobe Airport data which is measured in eighths

E-5 Calibrated results

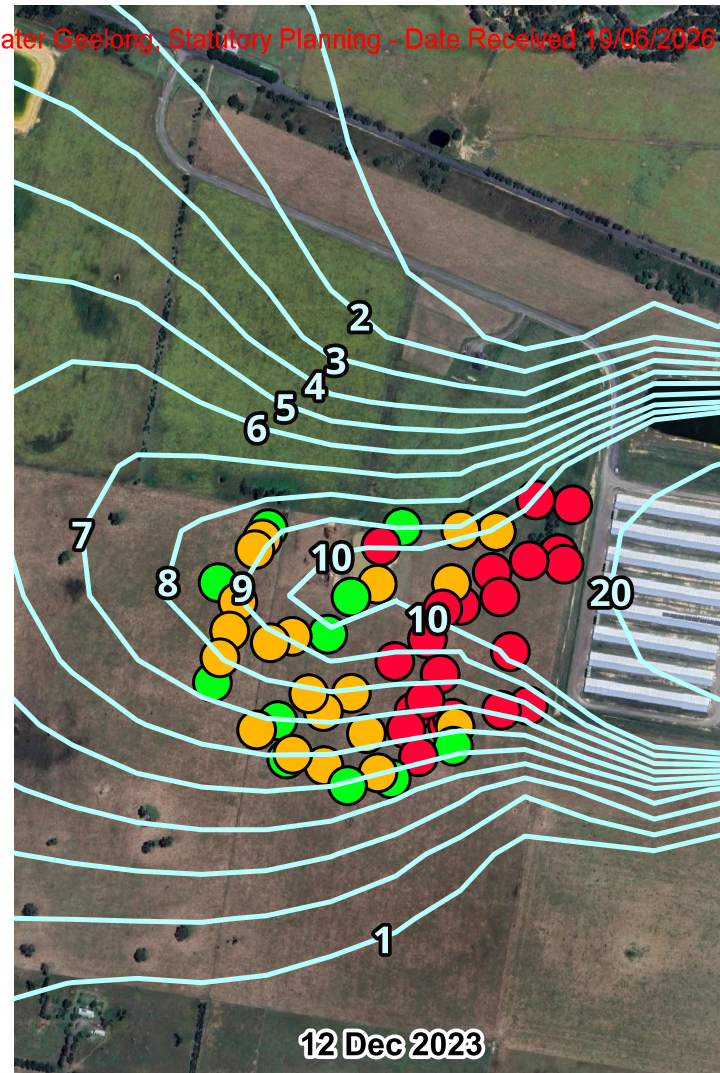
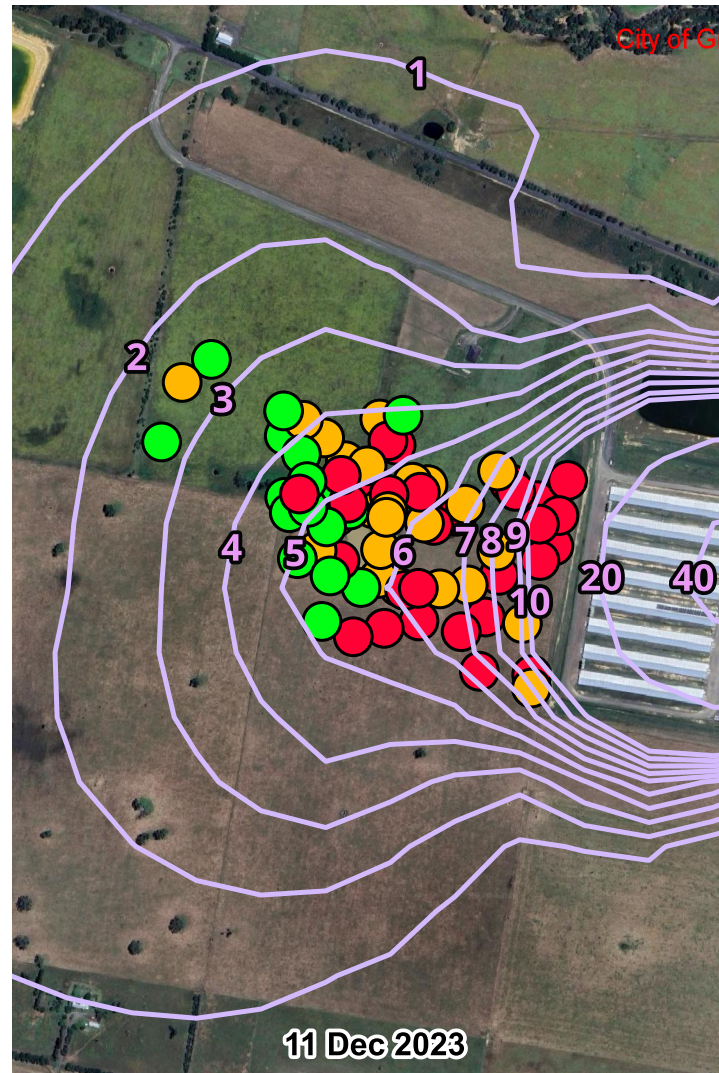
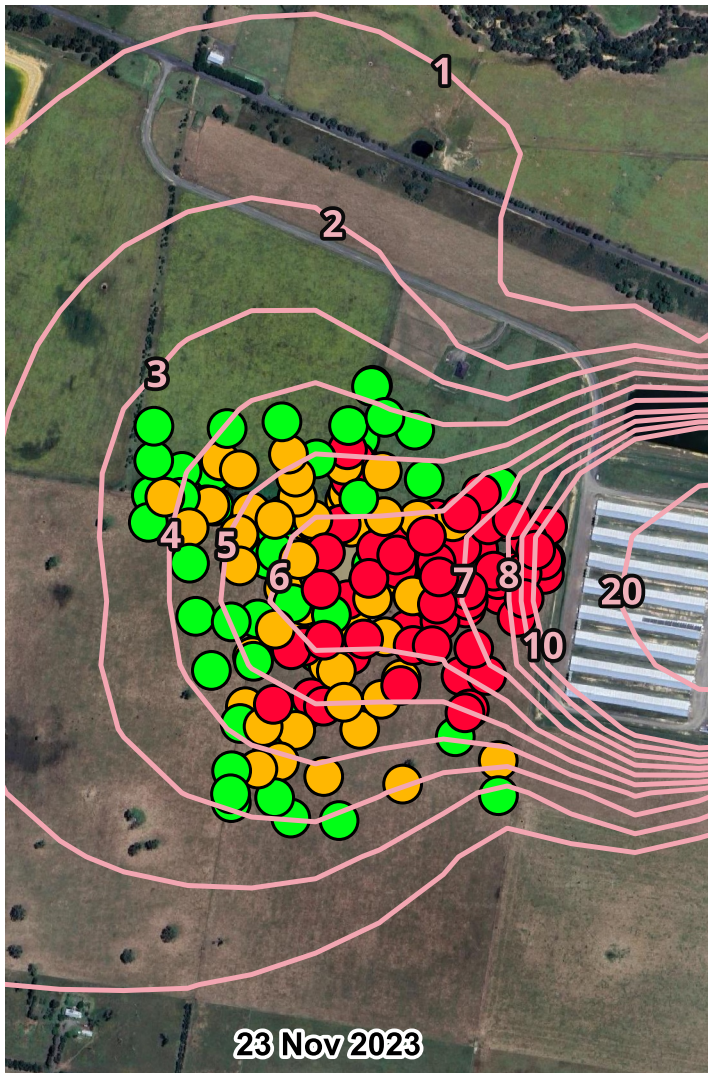
The odour dispersion model, updated with the data presented in Table E.2, are plotted with the odour intensities recorded during the odour surveys and are presented in Figure E.1. Using Figure E.1, odour concentrations which could be described as 'Obvious' and 'Subtle' are determined as follows:

- 'Obvious' odour – Identifying the mean of the two lowest contour areas of odour concentrations where the odour intensity was still observed as obvious
- 'Subtle' odour – Identifying the mean of the two lowest contour areas of odour concentrations where the odour intensity was still observed as subtle

Table E.2 presents the derivation of odour concentrations identified as 'Obvious' and 'Subtle' odours. It shows that the odour concentration which could describe 'Obvious' and 'Subtle' odour are 6 OU and 4.5 OU, respectively.

Table E.2 Determining odour concentrations which could be described as 'Obvious' and 'Subtle'

Obvious odour				
Areas of lowest odour concentrations	Average value within the contour	Number of points observed as ‘obvious’ within the area		
		23 Nov	11 Dec	12 Dec
4 – 5 OU	4.5	2	5	-
5 – 6 OU	5.5	11	6	1
6 – 7 OU	6.5	-	-	3
Mean of the two lowest contour areas (in OU)		5.35	5.05	6.25
Average concentration described as ‘Obvious’		5.6 (approximately 6 OU)		
Subtle odour				
Areas of lowest odour concentrations	Average value within the contour	Number of points observed as ‘subtle’ within the area		
		23 Nov	11 Dec	12 Dec
3 – 4 OU	3.5	6	1	-
4 – 5 OU	4.5	9	4	-
5 – 6 OU	5.5	-	-	3
6 – 7 OU	6.5	-	-	3
Mean of the two lowest contour areas (in OU)		4.1	3.58	6.0
Average concentration described as ‘Subtle’		4.5 OU		



Legend

-  Site Boundary
-  Predicted odour impact on 23 Nov 2023
-  Predicted odour impact on 11 Dec 2023
-  Predicted odour impact on 12 Dec 2023

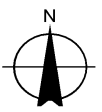
Odour survey observations

-  Obvious
-  Subtle
-  No odour

Paper Size ISO A4

0 200 400 m

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 55



Johnson Poultry Farm Pty Ltd
Sale-Toongabbie Road Broiler Farm Odour Assessment

Calibrated odour impact 99.9%ile 3-minute average odour concentration (OU) from Farm 2 compared with odour survey observations

Project No. 12619933
Revision No. -
Date. 05/02/2024

FIGURE E.1

