APPENDIX H

1 September 2015

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Dear Eryn

RE: EPA Review of Euroley Odour and Dust Assessment.

I refer to the EPA review of the air quality assessment for the Euroley Poultry Production Complex ("the subject site").

The review highlighted a number of areas, which included

1. No information regarding emergency standby diesel generators
2. The use of worst case odour emissions including
    a. The adopted K factor
    b. The batch length modelled
    c. Batch staging
3. Modelled shed particulate emission rates were not provided
4. Sources of particulate matter were excluded from the assessment
5. The representativeness of the year 2010 was not demonstrated
6. Modelled meteorological input parameters were not presented for verification
7. The modelled meteorological data was not evaluated
8. Project odour criterion should be 5 ou
9. Assessment of cumulative particulate impacts was not performed in accordance with the Approved Methods
10. No feasible mitigation measures that could be implemented should odour impacts occur once operational have been provided
11. Proponent has not assessed the odour risk of their project

These points have been considered by Pacific Environment (PE) and responses have been provided below.

1. No information provided regarding emergency standby diesel generators

Point 1 relates to the emergency standby generators at the site.

It is understood that there will be two 350 KVA (Prime Power 315kW) generators at each PPU, i.e. 10 in total. At each PPU, these will be at the front of the sheds opposite the swale drain between sheds 4 & 5 and 12 &13. There will also be two 150 KVA (Prime Power 119 kW) generators at each PPU i.e. 10 in total. These will be at the back of the sheds between sheds 4 & 5 and 12 & 13.

As detailed in Table 2, based on the information provided to us by Proten, the generators will comply with the relevant POEO (Clean Air) Regulations

Table 1: Generator parameters

Pollutant	Emission rate (mg/m^3)		POEO Regulation limit (mg/m^3)
	119 kW	315 kw	
NO_x	441	401	450
Solid particles	11	5	50

Based on experience at their other eight poultry production complexes within Australia (seven in NSW around the Griffith and Tamworth areas and one in Western Australia near Serpentine), ProTen has advised that the generators are typically only required a couple of days per year. They will be tested on a regular basis as per the manufacturer's recommendations.

Considering the size of the generators, the low level of usage and the location of the generators with regard to nearby sensitive locations it is not expected that the relevant air quality criteria (including NO_x) will be exceeded at nearby sensitive locations. In order to confirm this, a dispersion modelling exercise was completed using the AUSPLUME dispersion model to predict ground-level concentrations at the sensitive receivers. A meteorological file was extracted on from the CALMET file. These data were previously summarised in the meteorological summary in the original report.

The stack parameters of each of the generator types are provided in Table 2. For the purposes of the assessment it was conservatively assumed that 100% NO_x is converted to NO_2 and that the particulate matter are PM_{10}.

Table 2: Generator parameters

Parameter	Units	Generator 150 kVA	Generator 350kVa
Stack height	m	1.9	2.2
Stack diameter	m	0.121	0.16
Exit velocity	m/s	35.36	56.38
Exit Temperature	°C	467.8	479.0
CO	g/s	0.02	0.03
NOx[a]	g/s	0.18	0.46
Particulate Matter[b]	g/s	0.004	0.005

Notes:

(a) Assumed that 100% NO_x = NO_2
(b) Assumed equal to PM_{10}

It was assumed that all 20 generators were operating simultaneously and continuously. As shown in Table 3, the predicted concentrations at the nearby sensitive locations are all below the relevant assessment criterion.

Table 3: Predicted concentration's at sensitive receptors due to generators

Averaging period	CO 1-hour	CO 8-hour	NO_2 1-hour	NO_2 Annual	PM_{10} 24-hour	PM_{10} Annual
	Assessment criteria					
ID	*30 mg/m³*	*10 mg/m³*	*246 µg/m³*	*62 µg/m³*	*50 µg/m³*	*30 µg/m³*
R1	0.006	0.001	71.5	0.74	0.107	0.011
R2	0.007	0.002	80.1	0.83	0.174	0.013
R3	0.008	0.002	102.5	0.85	0.175	0.013
R4	0.009	0.002	105.2	1.07	0.215	0.016
R5	0.009	0.002	105.5	1.16	0.227	0.017
R6	0.006	0.002	66.7	1.37	0.144	0.020
R7	0.007	0.003	89.6	1.52	0.226	0.023
R8	0.005	0.002	66.3	0.78	0.126	0.011
R9	0.006	0.001	75.1	0.86	0.097	0.012
R10	0.004	0.001	51.2	0.76	0.112	0.011
R11	0.004	0.001	49.8	0.65	0.093	0.009

The predicted concentrations of CO and PM_{10} are so low (ranging between 0.01% and 0.45% of the relevant criterion) that cumulative concentrations have not been considered.

As defined in the Approved Methods section 8.1.1, a Method 1, Level 1 approach has been taken for the NO_x emissions. It was assumed that 100% of NO_x is converted to NO_2, when in reality only a fraction will be. The closest OEH monitoring station that records NO_2 concentrations (and has publically available data for 1-hour averages) is Wollongong, located approximately 420km east of the site. Given the industrial/residential nature of the area, compared with the rural setting of the project, the NO_2 concentrations measured at Wollongong are considered to be conservative. As reported in the NSW NEPM Annual Review for 2010 (OEH, 2010), the maximum 12-hour average NO_2 concentration measured in 2010 was 106.8 µg/m³, giving a resultant maximum NO_2 concentration of 212.3 µg/m³ at R5, which is below the assessment criterion of 246 µg/m³.

Given the conservative approach taken in the assessment, it is concluded that no air quality criteria will be exceeded as a result of the operation of the generators.

2. Worst Case Emissions

Emissions

The EPA review highlighted that worst case emissions were not adopted and that batch staging was not investigated.

The emissions used for the project were based on the following assumptions

1. A K factor of 2.2 was appropriate
2. The minimum ventilation rates were based on birds placed, not birds present.
3. The change to finisher feed didn't reduce the emissions after week 5.

The method of Ormerod & Holmes (2005) was the basis for the modelling. The method is based on odour emission rate data collected at a number of meat chicken farms over time. The farms included both poorly run farms and well run farms, and based on this Ormerod & Holmes (2005) developed what is known as the "K factor" method. The method relies on the use of a "K factor" to describe the relative emission potential from the farm. The higher the K factor, the higher the emissions potential.

The method has been in use since prior to 2005 and was recently adopted as the base model for use in Queensland as detailed in DAFF (2012). It has been used in regulatory matters in New South Wales, Victoria, South Australia and Queensland.

The use of a K factor of 2 was historically based on test data collected at a number of farms in Queensland and New South Wales over time. Whilst older, poorly managed farms typically had K factors of above 2, experience showed that all new farms typically had a K factor of 2 or less. Certainly the majority of chicken farms approved in Queensland in the last 10 years were modelled using a K factor of 2, and have successfully been constructed and have operated without complaint. This is a reflection of not only improvements in the industry, but that the better managed the farm, the less risk of elevated odour emissions.

However, even though a K factor of 2 was considered appropriate, with the adoption of Queensland Guidelines Meat Chicken Farms a 10% increase in K factor was used to incorporate the potential for variation in emissions. Work was performed using randomised emission rates which showed that a 10% increase in K factor would encompass the majority of potential emission variation on farm. This did not mean that farms were expected to have a K factor of 2.2, but that the maximum K factor they were assessed against was 2.2. Moreover, the K factor of 2.2 was typically applied to new farms where no history of compliance was available. For example, most existing farms we have sampled at have had a K factor below 2.

In the year prior to the publication of the DAFF guidelines we reviewed the results of 10 samples collected at a ProTen farm near Tamworth in 2011by The Odour Unit. The first six samples (in three sheds) were collected in the week leading up to first pickup (days 27 and day 28) and the remaining samples were collected at day 41. These data are summarised in Figure 1 where the red line represents where a K factor of 2.2 would be. The average K factor for this period was k=1.5. Other data was mistakenly collected at day 55 but was discarded as sampling this late in the batch produces unrealistic values due to the fact that the shed was nearly empty and had just been thinned.

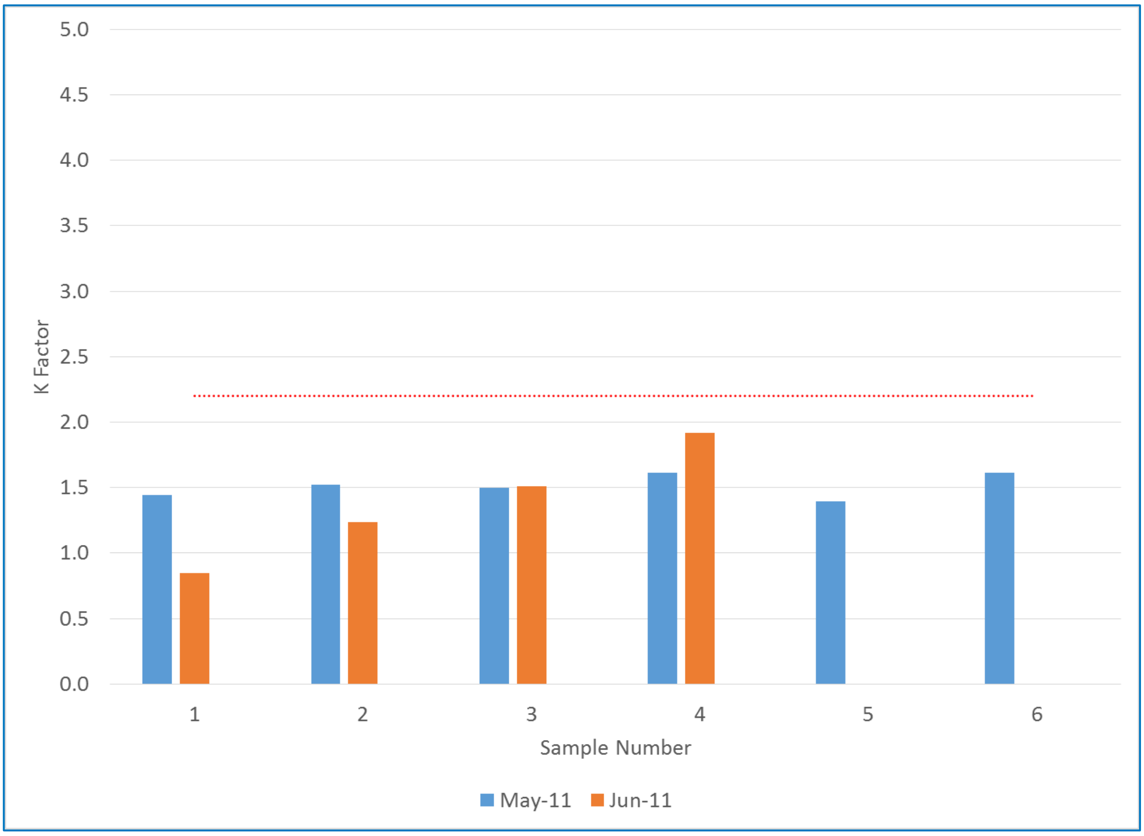

Figure 1: K factors - Proten Tamworth – May and June 2011

The data above is consistent with sample data held by PE for sites in Queensland and New South Wales collected between 2012 and the present for bird ages between 26 and 38 days, which are shown in Figure 2. The dotted red line shows a K factor of 2.2, and the blue dotted line is a trend line showing the trend in K factors over time which is downward. It is important to note that the highest K factor value shown in Figure 2 was one sample from two sets of paired samples collected at the same farm in different sheds. Given that the other three samples were much lower than the elevated sample, it is likely that the higher value is an artefact of the sampling and analysis method rather than an actual representation of the emissions at that point in time. Irrespective of this, the average K factor for this farm was below 2.

The average K factors by year are summarised below in Table 4. A K factor of 1.5 represents emissions one third lower than a K factor of 2.2.

Table 4: Average k factors over time

Year	Average K factor
2012	1.4
2013	1.3
2014	1.4
2015	1.1

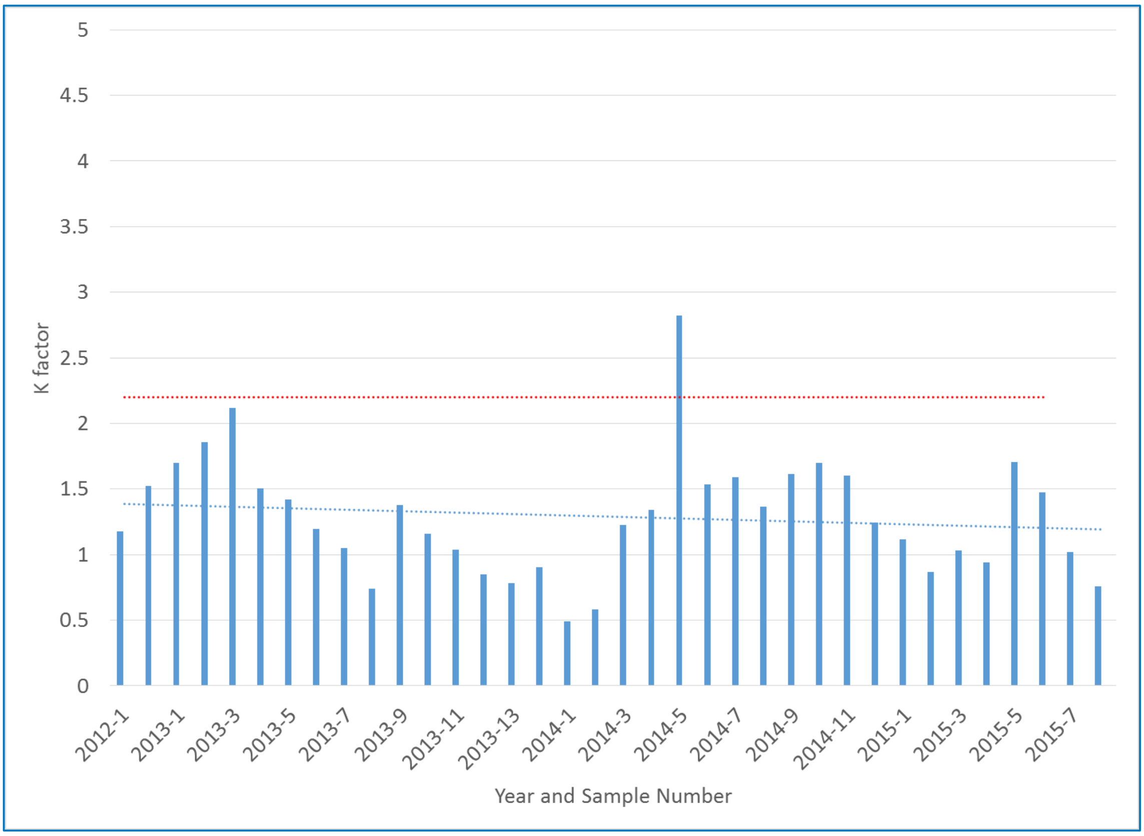

Figure 2: K factors – All meat chicken data 2012 to 2015

Overall, the emission rate data held by PE shows a downward trend in emissions, which means the K factor of 2.2 used is likely a worst case, rather than average emission rate value. It is critical to note that the industry, as a whole, has improved farm management over time, which has led to better managed litter, and lower odour emissions. It is our experience that the majority of modern farms comply with the best practice management requirements detailed in *Best Practice Management for Meat Chicken Production in New South Wales - Manual 2 – Meat Chicken Growing Management* (DPI, 2012b). As such the lower K factors are expected. And with the movement toward the RSPCA requirements, additional management measures which include rotary hoeing the litter during the batch (many farms use this irrespective of being RSPCA compliant or not) has led to even better on-site management, compared to 10 years ago when farms (with high K factors) were observed to not comply with current best practice.

As noted above, the EPA has requested a sensitivity analysis using K factors up to 3, however there is nothing in the data we hold to suggest that any modern farm will be represented by a K factor of 3. The data PE holds shows the industry on average (from paired samples) is currently around 1.5, with a long term (~10 year) maximum average of 2. To say the K factor will sit long term at 3 is unrealistic and would indicate that the farm was not being well managed in accordance with industry standards for environmental management and not operating as profitably as it should be. The emissions adopted by PE in the assessment of the project are considered conservative and further analysis of the K factor is not warranted.

Other factors which also need to be considered as part of the overall odour assessment are discussed below.

The emissions model uses a minimum ventilation rate to define the minimum emissions over a year. Minimum ventilation is the minimum amount of air required to keep the air quality in a chicken shed suitable for bird growth (i.e. minimising carbon monoxide build up overnight and during cool periods), and is also used to regulate temperature during winter as the bird mass can increase the temperature in the sheds.

It is our experience that odour impacts can occur at any point in time, but occur more frequently during calm (low wind speed) conditions. This is because dispersion during these conditions is poor, which can result in odour impacts.

The minimum ventilation rates used in the modelling are roughly a factor of two higher than the minimum ventilation rates detailed in *Poultry Housing Tips – Minimum Ventilation Rates* (University of Georgia, 2007) for both carbon dioxide. This combined with the fact that we calculated the minimum ventilation after week 5 based on birds placed, not birds present, means that for minimum ventilation conditions the emissions were overestimated, especially for emissions after first thinout, which are typically the highest in the batch.

A factor which has not been included is the use of finisher feed, which is typically introduced around day 337 of the batch. Finisher feed is a lower value feed ration given to the birds after peak density, which slows their growth down compared to the higher value feed earlier in the batch. This results in less waste and therefore lower emissions per bird towards the end of the batch. We have not accounted for finisher feed in the assessment.

Therefore, again, the emissions used are conservative.

Batch Length and Staging

Another factor raised in the EPA's review was batch length. We modelled a 52 day batch with a 10 day cleanout. EPA recommended that 56 day batch length be modelled with a 7 day cleanout. This requires clarification.

EPA correctly noted that we modelled a 52 day batch without assessing the batch staging. After our recent discussion with EPA we have modelled the farm three times, to assess the batch staging as requested by EPA. Proten have informed us that they expect a cleanout period of 8 days, the sheds the PPUs to be placed as follows:

- PPU1 – Birds placed first, on day 1
- PPU2 – Birds Placed on day 3

- PPU3 – Birds placed on day 5
- PPU4 – Birds placed on day 8
- PPU 5 – Birds placed on day 10

The above placements were modelled assuming starting on day 1, day 14 and day 28 of the year. The emission profiles are shown in Figure 3 to Figure 5.

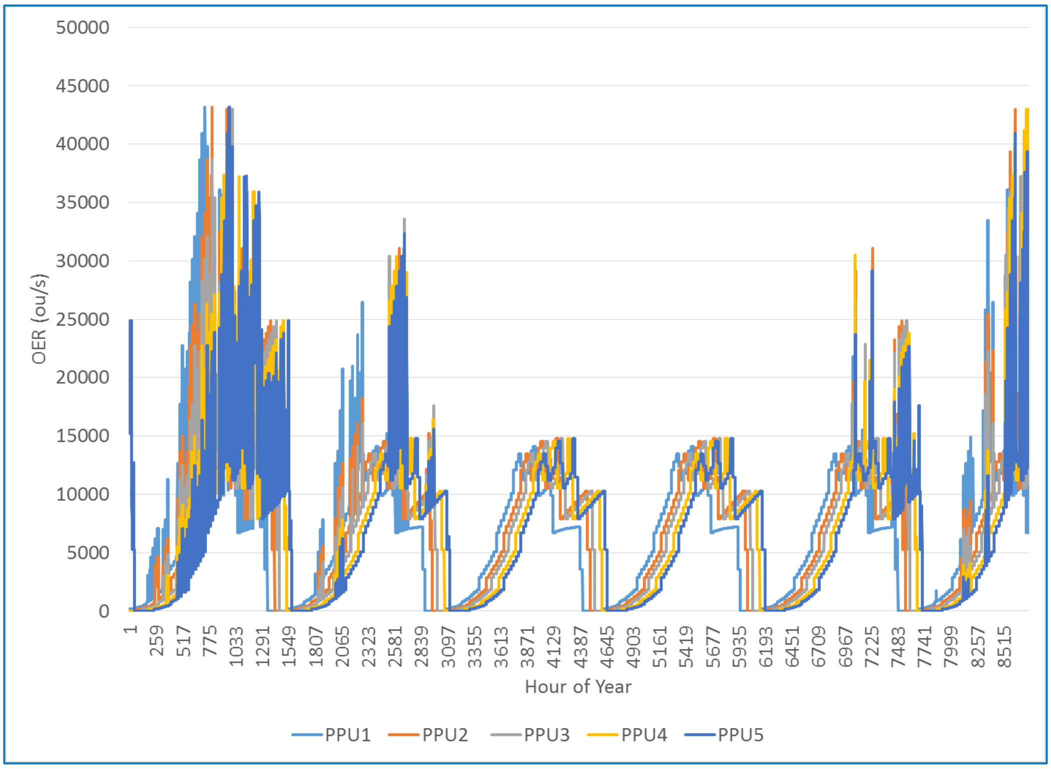

Figure 3: Emission Profile – Run 1

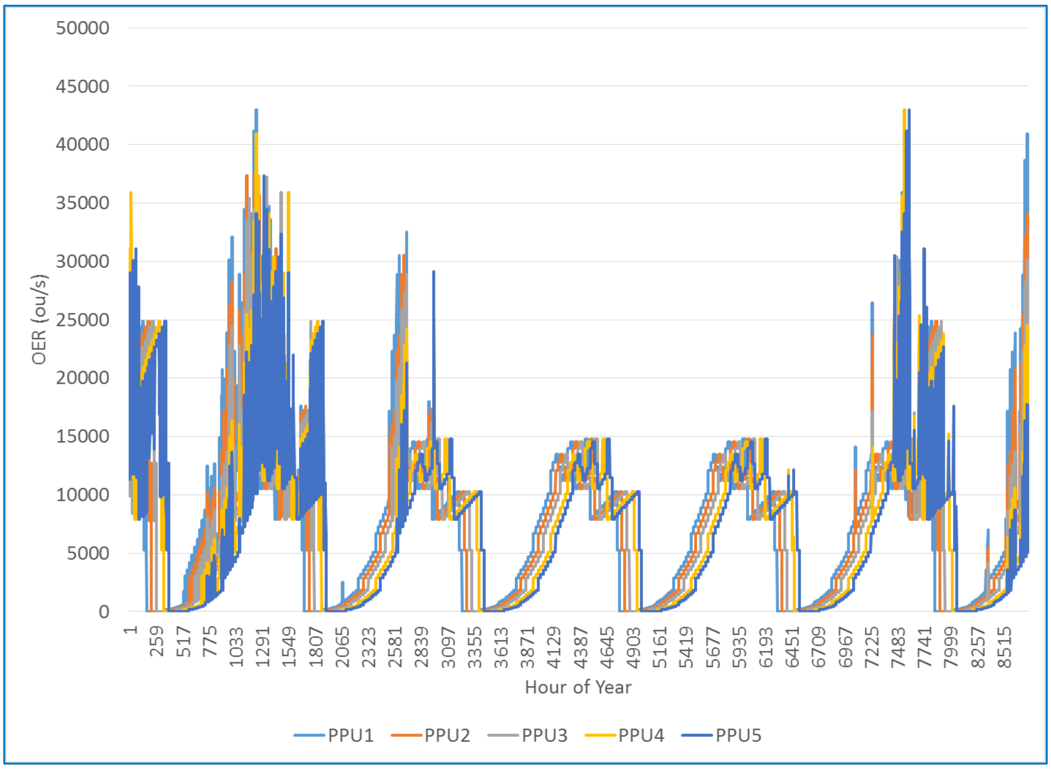

Figure 4: Emission Profile – Run 2

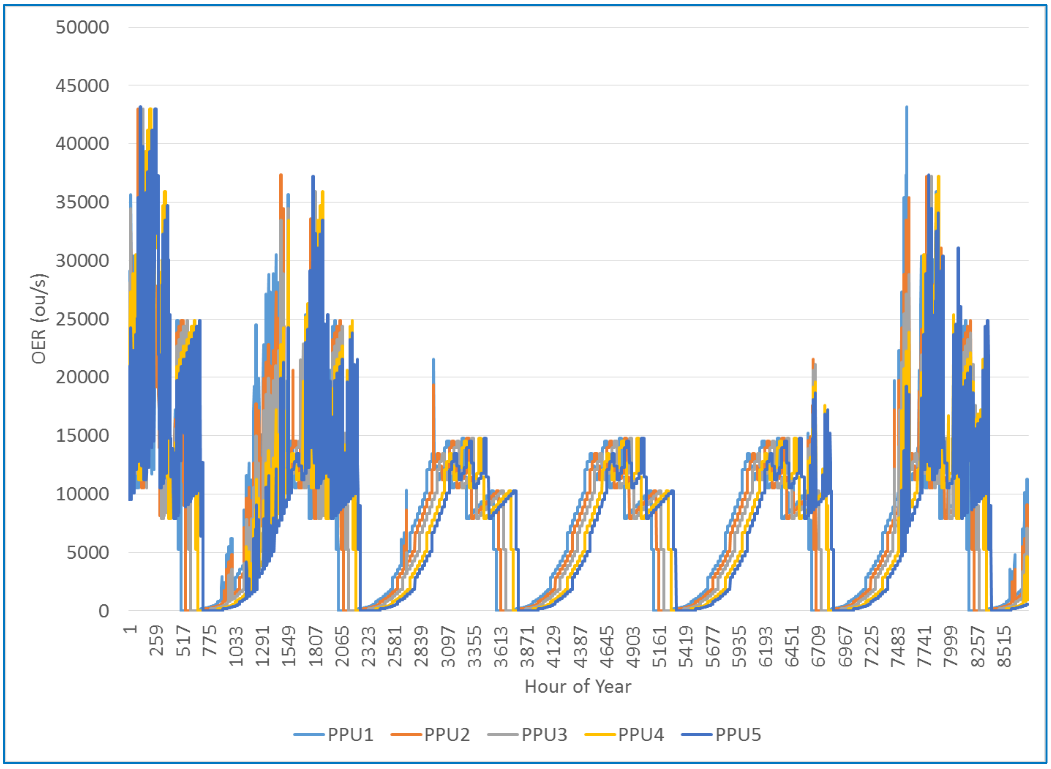

Figure 5: Emission Profile – Run 3

Rerunning the site for odour with gridded receptors for the three scenarios would take an extended period. To reduce model run time a selected number of discrete receptors were modelled. These are based on the original receptors shown in Figure 6 which shows the model results from the original modelling assessment. We selected the receptors as being both the closest to the site (Receptors 5-7) or representative of areas not covered by the aforementioned receptors (Receptors 8 and 11). Figure 7 shows the receptors modelled for this work.

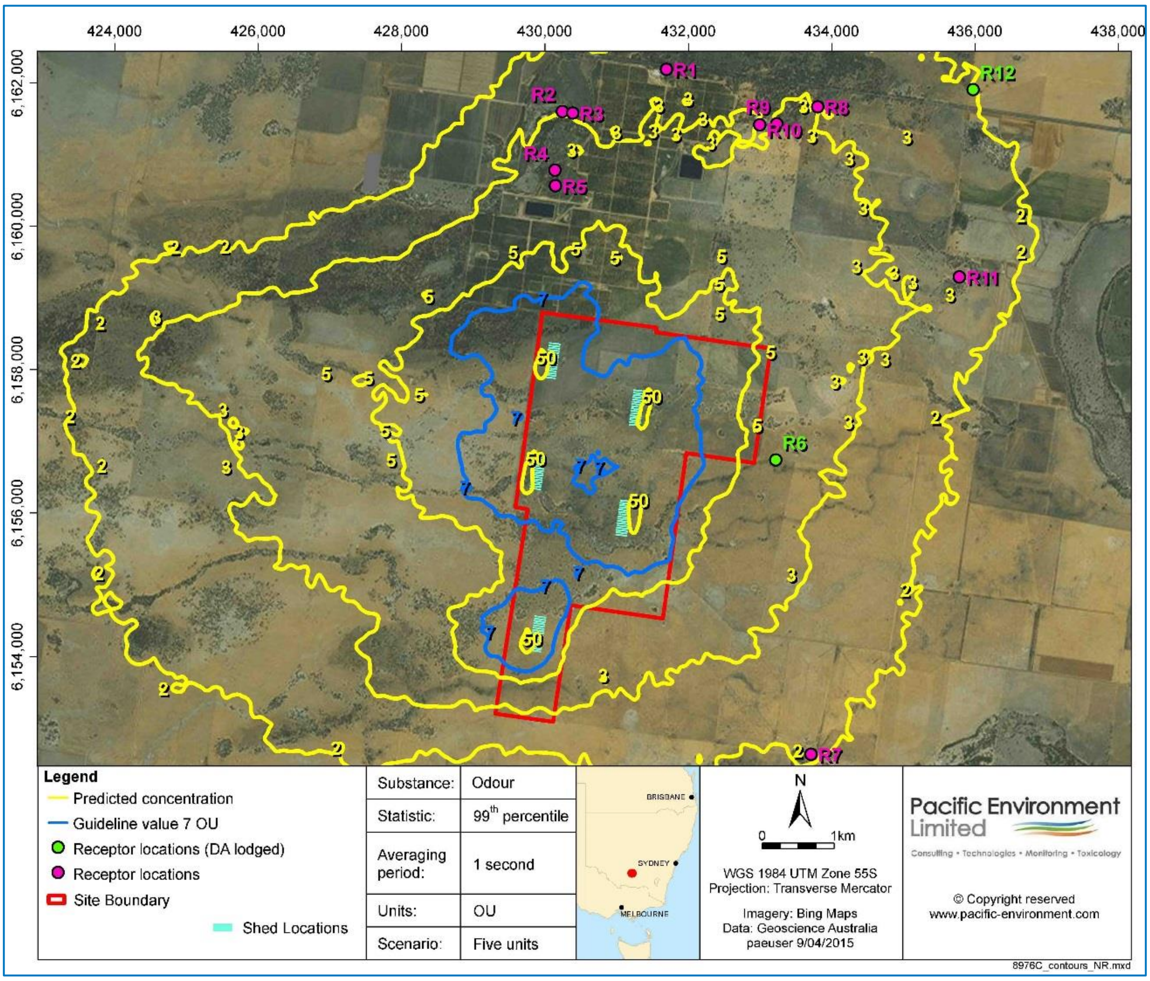

Figure 6: $C_{99\ 1\ sec}$ Contours - Original "All in" Model Results

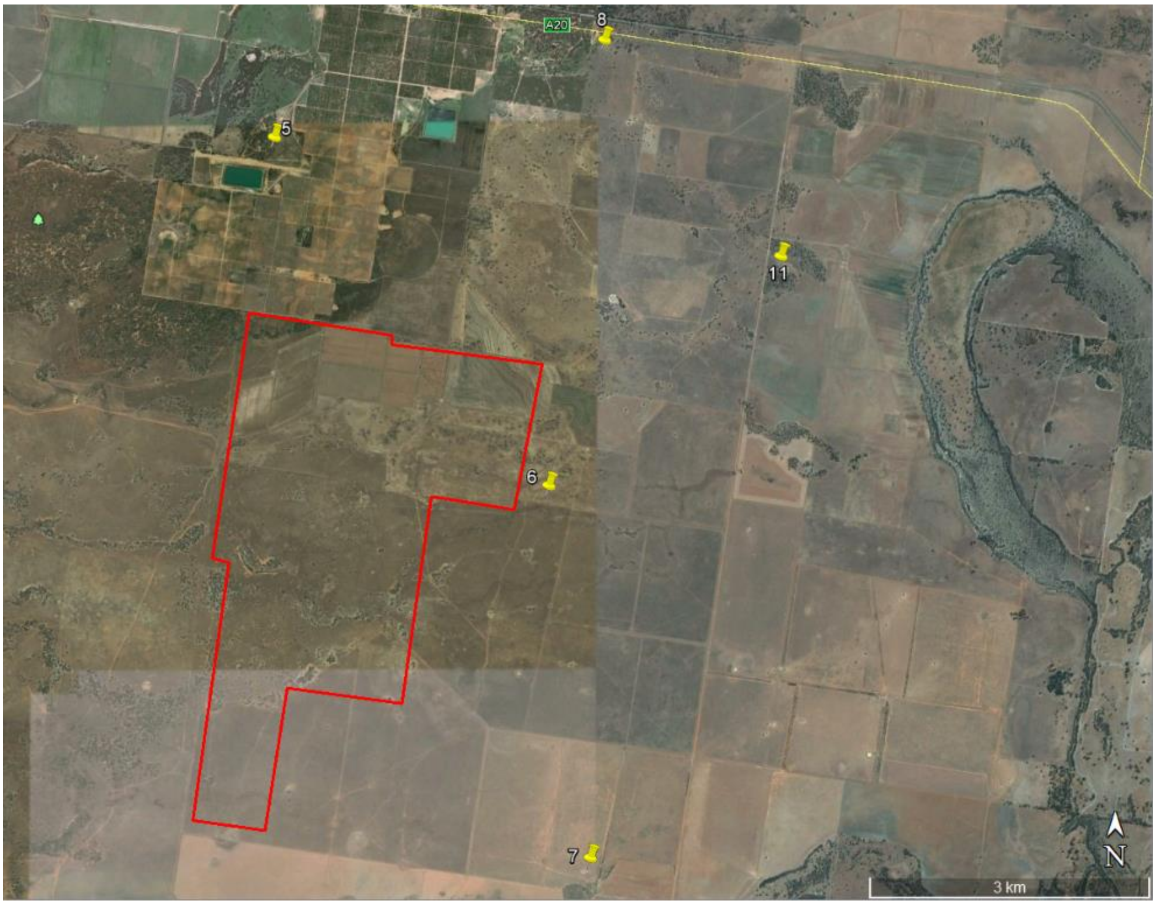

Figure 7: Modelled Receptors

The results are summarised by receptor below in Table 5 for the receptors identified above for the original modelled as well as Runs 1 to 3. As noted above, the previous modelling (Figure 6) showed that receptors 5 and 6 were most critical. The table clearly shows that when batch staging is included with a K factor of 2.2, the only receptors near to the odour criterion (but still complying) were receptors 5 and 6. We note that these receptors complied with the 5 ou criterion even with the K factor of 2.2. A lower K factor would see lower predicted odour concentrations. For example a K factor of 2 would see the maximum predicted concentrations being 4.1 ou at receptor 5 and 4.2 ou at receptor 6.

Table 5: Receptor Concentrations ($C_{99\ 1\ sec}$)

Original Receptor Number	Original Run	Run 1	Run 2	Run 3	Maximum of Run 1 to 3	Average	Compliance
5	4.7	4.5	3.6	3.9	4.5	4.0	Yes
6	4.4	4.1	3.8	4.6	4.6	4.1	Yes
7	2.1	2.4	2.3	2.3	2.4	2.3	Yes
8	3.8	2.4	2.0	3.2	3.2	2.5	Yes
11	2.8	2.2	2.2	2.8	2.8	2.4	Yes

3. Modelled PM_{10} Emission Rate

The modelled PM_{10} emissions rates on a per shed basis are shown below in Figure 8. Dust emissions from modern farms are typically low as shown in the latest measurement at existing farms. By adopting a conservative dust emission profile it has been found, provided the odour buffer is suitable (which it is in this case), that dust impacts will not occur even with the conservative emissions. Therefore we do not scale the dust emissions based on farm management.

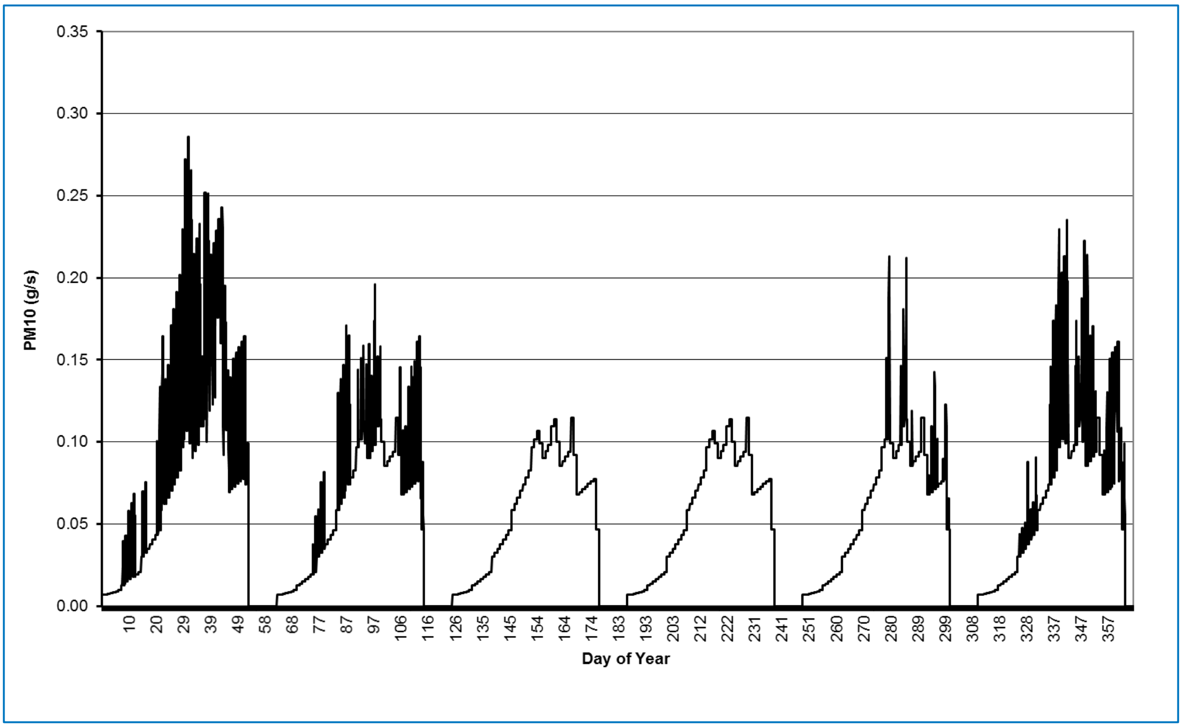

Figure 8: Modelled PM_{10} Emissions

4. Sources of particulate matter were excluded from the assessment

While we did consider the potential for wheel generated dust from the internal roads in the air quality study it was concluded that the potential for emissions will be low given the constructed nature of the roads and subsequent lower silt loading (compared to using unformed tracks). The internal roads will be 7 metres wide and will be constructed with a compacted clay base to 98 percent and 200 mm of road base (120 mm of 80 mm "Jawbone" rock and 80 mm of 40 mm "DGS" gravel on top).

We have assessed multiple poultry operations over time and have found internal roadways are not a significant source of dust emissions. This is because the roads can be constructed in a way to minimise dust and can also be managed to minimise emissions. Such management may include limiting vehicle speeds and using water trucks to reduce dust during dusty periods. The emissions from roads will be managed by the CEMP and OEMP. Moreover the distance from the roads to nearby sensitive location is suitably significant that dust impacts from the internal roads would be unlikely to occur.

Should the concern be related to the site entrance, the proposed access road will be bitumen sealed for a distance of 50 metres from the carriageway of the Sturt Highway.

Therefore modelling of dust emissions from the roads is not warranted and was not performed.

5. The representativeness of the year 2010 was not demonstrated

The year 2010 was evaluated prior to modelling by Dr Li Fitzmaurice[1] a meteorologist in our Sydney office. To evaluate the data we compared the long term averages up to 2015 (based on available data) against a number of years. By doing so we found that 2010 correlated well with the long term averages with regard to minimum and maximum temperatures, 9am wind speed and humidity. A check of the weather data for the area also confirmed that the average wind speed for 2010 of 3.4 m/s was consistent with other recent years, and that the frequency of calm winds, which are critical with regard to odour, at 12.7% was consistent with other years, albeit slightly higher (~1%) than 2007-2009. Higher occurrence of calms would lead to poorer dispersion and potentially higher odour impacts. The year also had a marginally higher percentage of winds from the south-west than other years, which would have seen the plume extending more towards the nearest receptors to the north-east.

A summary of the data for the year 2010 against long term averages is shown graphically below in Figure 9 to Figure 13. In the figures, the red line is the data for the year 2010.

[1] Dr Fitzmaurice is a Meteorologist with over 10 years' experience and holds a Bachelors, Masters and PhD all of which have focussed on Atmospheric Physics and Meteorology.

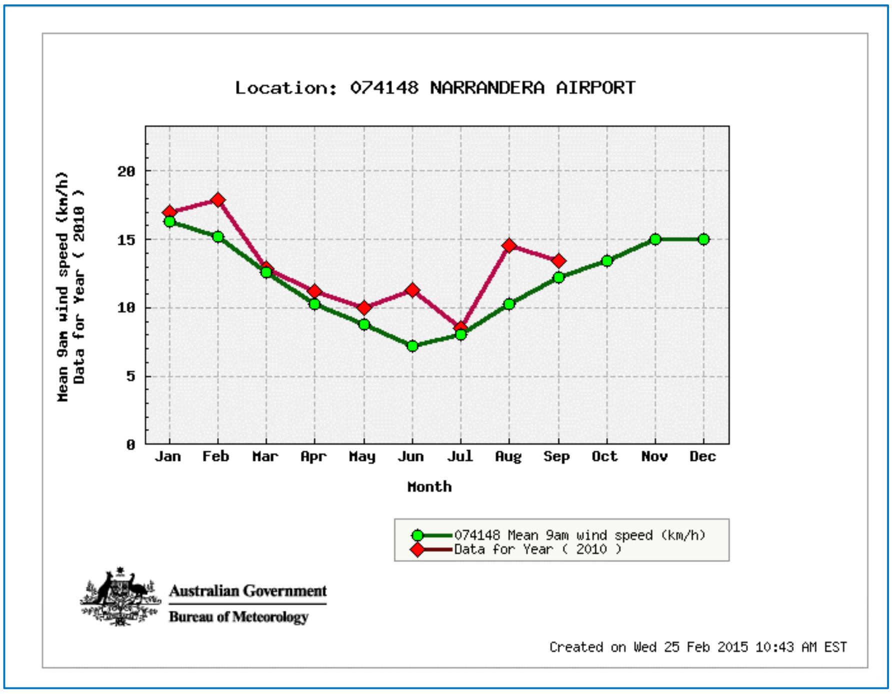

Figure 9: 2010 – 9am Wind Speed

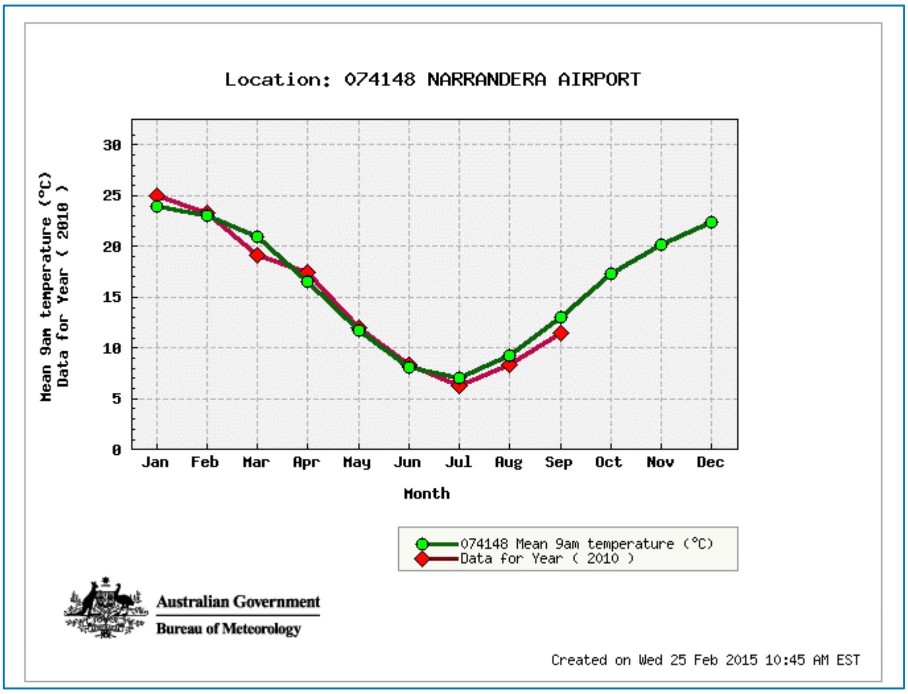

Figure 10: 2010 – 9am Temperature

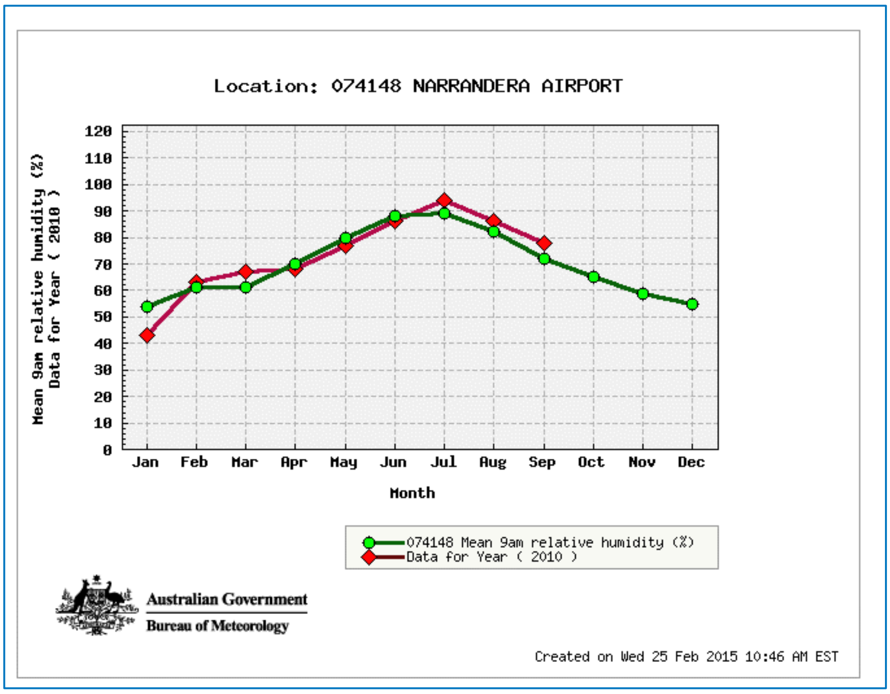

Figure 11: 2010 – 9am relative humidity

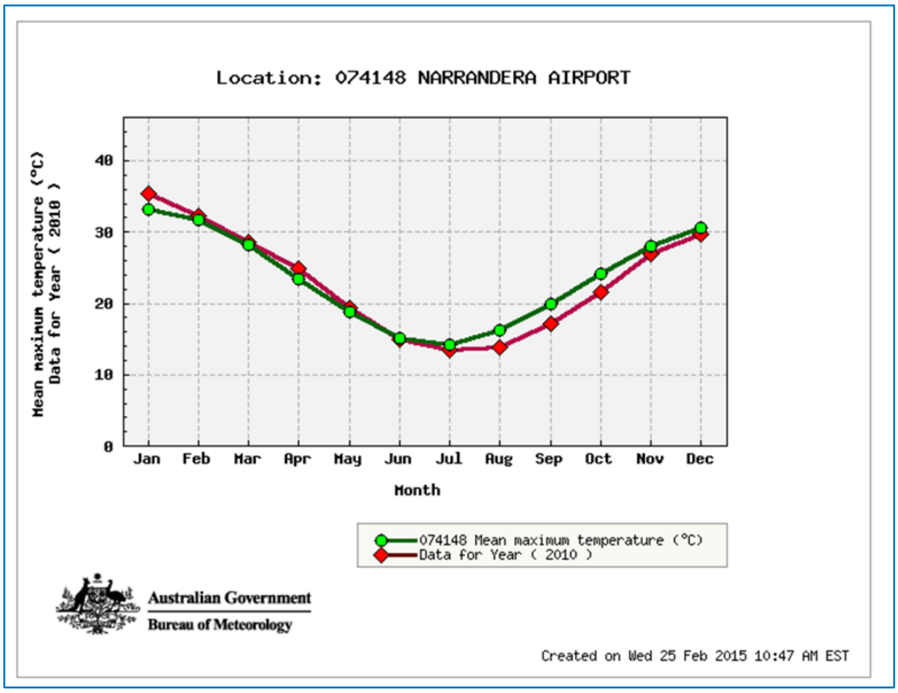

Figure 12: 2010 – Mean Maximum Temperature

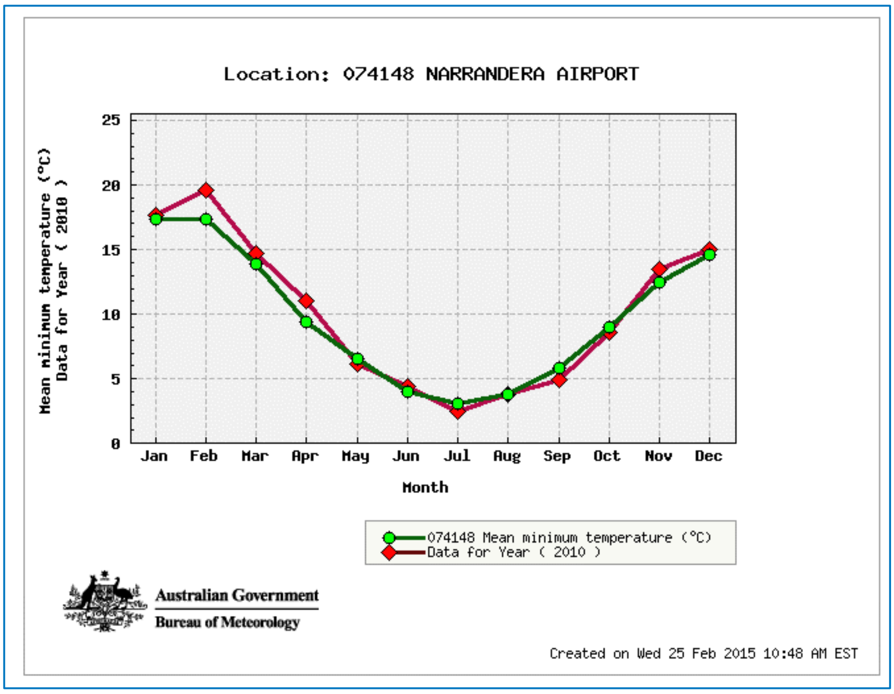

Figure 13: 2010 – Mean Minimum temperature

6. Modelled meteorological data is not evaluated

After selecting a representative year, prior to performing the modelling we examined and compared the Yanco and Narrandera observations with TAPM generated data. This was shown in the report and is also shown below in Figure 14. As shown in the figures, the data did not compare well between TAPM and observed with TAPM predicting less south-easterly and easterly winds. Noticeably TAPM predicted similar wind fields for both sites, further indicating that the area is flat. Overall the Yanco and Narrandera sites were similar with the exception of some terrain blocking at Yanco, which resulted in a high proportion of winds from the north.

After discussions with Dr Li Fitzmaurice and Mr Robin Ormerod[2] (both meteorologists), in line with good practice, Narrandera data was used to drive the model, however as some data gaps were present, these were infilled with data from Yanco. TAPM data was not used as both meteorologists considered that it was not representative of the area, particularly as it had zero calms, which are critical for odour impacts. Mr Ormerod noted at the time that his experience in the area around Narrandera led him to conclude that the lack of large terrain elements in the area led to the "observation only" approach being suitable for the project.

[2] Mr Ormerod has over 30 years experience as a meteorologist and is a Certified Consulting Meteorologist as awarded by the American Meteorological Society.

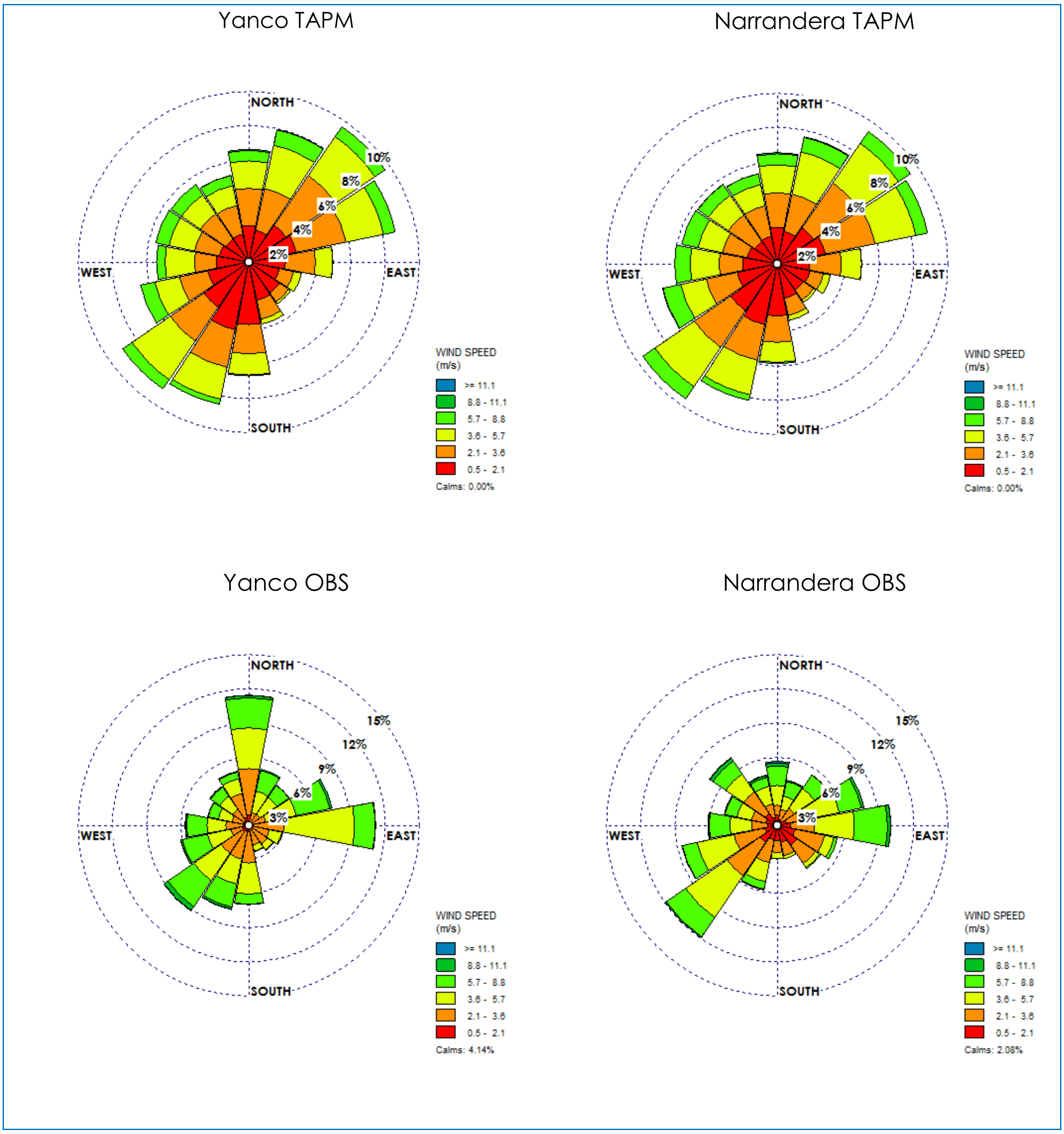

Figure 14: 2010 – Comparison of TAPM and Observed data (2010)

The seven parameters requested by EPA used for the modelling (as selected by our meteorologists) are as follows:

- RMAX1 = 0.1
- RMAX2 = 0.1
- R1 = 0.1
- R2 = 0.1
- TERRAD = 2
- IEXTRP = -4
- BIAS = -1 , -.75 , -.5 , 0 , 1 , 1 , 1 , 1 , 1

With regard to the above we note:

- IEXTRP is the extrapolation of surface wind to the upper layers. We used the default of -4 which allows extrapolation through similarity theory
- RMAX is the maximum radius of influence the surface station will exert on the final guess field. As is required, we use our professional judgement to select this value on the basis of the geography of the region. We ran CALMET with both RMAX at 0.1 as the method is observation only (see discussion below)
- R1 is the radius that yields equal weighting to the first guess and surface station winds. This is usually the same as RMAX as there is only the single meteorological station (see discussion below).
- RMAX2 and R2 for upper air. In this case the domain was small and we allowed the upper air station "observations" to influence the domain (See discussion below)
- TERRAD is a radius of influence of terrain features. As there are no significant terrain features in the area, a value of 2 kilometres was selected.

With regard to the RMAX and R values above, two scenarios were run. The scenarios are summarised below in Table 6. As there was only one observation station in the domain, and the domain is flat, CALMET produced exactly the same wind field for Run 1 and Run 2 with small and large RMAX values. The model run produced (as shown above and in our report) wind fields which were the same as the data measured at Narrandera. This is consistent with the TAPM modelling above which showed that TAPM also produced nearly identical windfields for spatially separated sites.

Table 6: Model Sensitivity Assessment Settings

Setting	Run 1	Run 2
RMAX1	0.1	6
RMAX2	0.1	6
R1	0.1	3
R2	0.1	3
TERRAD	2	2
IEXTRP	-4	-4
LVARY	False	False
BIAS	BIAS = -1 , -.75 , -.5 , 0 , 1 , 1 , 1 , 1 , 1	BIAS = -1 , -.75 , -.5 , 0 , 1 , 1 , 1 , 1 , 1

7. Modelled meteorological data is not evaluated

As noted above we performed two runs to test the sensitivity of the model. Given that the terrain is flat and driven by observation data at Narrandera the model has produced a similar windfield at the subject site as at Narrandera, which is as expected given the lack of terrain in the area which was also confirmed by the TAPM outputs.

The wind rose in the modelling report can be compared to the observed data provided above for Narrandera for the modelled year.

8. Project odour criterion

The project odour criterion was $C_{99\ 1\ sec}$ = 7 ou based on discussions between ProTen and the EPA's Griffith office. We note that the modelling showed compliance with the 5 ou criterion at receptors.

The Census data for 2011[3] for rural communities in New South Wales gave an average population per house of 2.4 people, which is consistent with EPA's 2.8 people per house value.

The population density around the subject site is variable and on a per square kilometre basis quite low (~29 people over and area of around 110 square kilometres). With regard to the subject site, there are three single receptors, one to the south-east, one to the east (proposed) and one to the east-north-east. These are discrete dwellings rather than forming part of a cluster of dwellings.

There is a cluster of dwellings to the north, over an area of approximately 8 square kilometres. Whilst we accept that the population over the area (>100 km^2) equates to an odour impact criterion of 5 ou, when the distances between the receptors are considered, a higher criterion of 6 ou is likely to be sufficient to protect against amenity impacts at the single rural residences.

On this basis, in addressing the EPA's request for a lower odour performance criterion, it is considered that a criterion of 6 ou is appropriate however as shown above, all receptors comply with 5 ou.

9. Assessment of cumulative particulate impacts not in accordance with the Approved Methods

Monte Carlo simulation has been applied in numerous significant extractive industry dust assessments in the Hunter valley and elsewhere, as an alternative to the Level 2 approach in the Approved Methods. Both the Level 1 and Level 2 assessments require continuous background ambient monitoring data. The Level 2 assessment works well when there are ambient monitoring data available for each day that coincide with the period of time of predicted impacts, and the data are representative of the site being assessed. However if there is no data for the local area it is difficult to perform an assessment which includes background dust concentrations.

The Monte Carlo method has previously been presented to and accepted by the NSW Government as an alternative to the use of site specific dust monitoring data for significant extractive industry (i.e. mining) dust assessments.

The Monte Carlo simulation is a statistical approach that combines the frequency distribution of one data set (in this case, measured 24-hour average PM_{10} concentrations representative of the site) with the frequency distribution of another data set (modelled concentrations at a given receptor). This is achieved by randomly and repeatedly sampling and combining values within the two data sets to create a third, 'cumulative' data set and associated frequency distribution.

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3 http://www.censusdata.abs.gov.au/census_services/getproduct/census/2011/communityprofile/1RNSW?opendocument&navpos=100

To generate greater confidence in the statistical robustness of the results, the Monte Carlo simulation was repeated 250,000 times for each of the chosen receptors.

Moreover, as noted above, it is our experience that our dust emissions method for the farms over predicts the dust emissions by a factor (depending on bird numbers etc.) anywhere between a factor of two and four. Therefore, based on the modelling to date, the maximum PM_{10} concentration which could actually occur at the most exposed receptors is in the order of 5 ug/m^3. That is, the impact from the farm, at the nearest receptors is very low. Moreover we have assumed that all farms peak at the same time, which would lead to further conservatism.

Based on the information above, and considering that the dust impacts from the farms in isolation will be low, we consider the use of the Monte Carlo method appropriate for the assessment of cumulative impacts associated with the proposed poultry development and that dust impacts from the proposed development are unlikely to occur..

10. No feasible mitigation measures that could be implemented should odour impacts occur once operational have been provided

As noted above, emissions for the poultry industry have been decreased for at least three years. This is likely a function of improved feed conversion and better overall shed management.

Therefore the use of a K factor of 2.2, when the average K factor at present is well below this represents a conservative assessment. Moreover as noted above, by complying with DPI (2012b) the risk of elevated emissions would be low due to the high standard of management required.

With the industry trend of including RSPCA type management including rotary hoeing of litter, the range of emissions is expected to reduce further. One thing that is not addressed when assessing farms purely in terms of odour units is the odour character. It is our experience that emissions from a farm with poor litter management has not only high emissions, but the odour is more offensive. Therefore the emissions from modern farms are also potentially less offensive.

As noted by the EPA, the industry literature does not support the use of windbreak walls or stacks. Whilst windbreak walls are beneficial in terms of localised impact reduction of odour and reducing dust levels, we agree that they do not achieve a high enough vertical velocity to enhance dispersion.

Whilst there are other options with regard to odour control, it is accepted that these are outweighed by issues associated with cost and management.

Research has shown that vegetative buffers can reduce the impact of odour and dust emissions from agricultural operations (Laird, 1997; Thernelius, 1997). Other more recent publications have reported that vegetation can assist in odour management from livestock buildings by increasing dilution and acting as a sink for the chemical compounds responsible for odour (Patterson & Adrizal, 2005; Tyndall & Colletti, 2000; Tyndall & Colletti, 2007) . This was reinforced by Parker *et. al* (2012) who showed that vegetation trapped odorous particulate matter on leafy vegetation. However, they were uncertain with regard to whether odour concentration reduces as a function of dispersion associated with the trees or by interacting with the trees.

Other publications such as Karmaker *et. al.* (2006) have highlighted how in other areas, such as Canada, vegetative buffers are a primary consideration for odour control on intensive livestock operations.

We are of the opinion that a combination of a suitable buffer and vegetation represents the current best practice for site management.

11. Odour Risk

EPA states that the odour risk of the project has not been assessed. It has been requested that the odour risk be evaluated beyond the modelling as the compliance with the criterion is "marginal". Moreover EPA noted that:

- the project did not use site-specific meteorology and emissions, and only used average emission rate data.
- there was a higher risk of unacceptable odour impacts if there were small changes in the assumptions
- further statistical analysis was required which could include maximum, minimum, 99.9th, 95th percentile values
- unreliable and poorly performing mitigation measures presented a higher risk
- the facility posed an additional risk if there were no feasible mitigation measures that could be implemented if the facility emitted more odour that assumed

Firstly, the odour risk of the poultry development has been assessed in our air quality impact assessment (2015). We note that an air quality impact assessment, by its very nature, is an odour risk assessment. Based on the air quality impact assessment, which is considered conservative, our experience in the field, and the additional information in this submission, we are of the opinion that the modelling has produced a representative summary of potential impacts. In summary, our conclusions are:

- Odour levels at all surrounding receptors are predicted to be at or below $C_{99\ 1sec}$ = 5 ou even with batch staging included; and
- PM_{10} concentrations at all surrounding receptors when background levels are included are predicted to be below the adopted assessment criteria.

The assessment has been undertaken in accordance with accepted methodologies and considering local land use, terrain and meteorology.

With regard to the first point, indeed the project did not use site-specific meteorology or emissions. This is because there is no such data. It is considered good practice and standard practice to use the methodology adopted for this project when site-specific data is not available. If significant terrain was present in the region reliance on prognostic model output data including that from TAPM would be appropriate, however as shown above, given that the area is flat, and that TAPM does not compare well with the observed data at Griffith, the meteorology used is likely to be consistent with that expected on the site.

The emissions estimation method was not based on test data from the site, as there are currently no sheds on site, but is based on over 10 years of experience with poultry farms including the data collected over the last few years as shown above. The data makes use of local temperatures over a full year, which is used to first predict the ventilation rate for the sheds, which is then used to predict an odour emission rate. As noted above, the K factor of 2.2 as adopted, is conservative and is not expected to be exceeded. The data collected at the ProTen farm near Tamworth, along with the data shown in Figure 2, clearly shows that the K factor of 2.2 is likely to be about 50% higher than what is typical of similar farms elsewhere.

With regard to the second point, it is true that the assumptions can be critical, however as shown above, even with batch placement included, and the recommended K factor for new farms, which is higher than what is measured at operational farms over the last four years compliance has been shown. The assessment has been made based on a number of assumptions, which, through our experience, we have found to be appropriate and conservative for poultry odour assessments. For example, we have recently modelled two existing farms with a history of operation in Queensland with a K factor of 2.2, neither of which complied with the odour criterion. However, neither had ever had a single odour complaint. This gives weight to the notion that the assessment method is conservative and appropriate for siting new farms.

It is critical to note that farm management and profitability goes hand in hand. That is, the grower is paid less if the farm performs poorly. Therefore the better managed the farm, the lower the emissions, and the lower risk of odour impacts. We note that throughout its history in the Australian poultry industry, ProTen has proven its commitment to best management practice at its numerous poultry production operations.

The third point relates to additional statistical analysis. The NSW Approved Methods uses the 99th percentile nose response. It is unclear as to why EPA wishes further percentiles to be examined, or what to compare these against. Experience has shown that different percentiles can be used but there needs to be careful consideration of odour criteria and averaging times associated with them: the odour concentration criterion must vary with the percentile and averaging time. The use of maximum values will give a higher concentration. However, odour criteria are based on the relationship between percentiles, averaging times and concentrations – if one changes, the others also need to very in order to maintain an equivalent statistical outcome. Suitable adjustments to criteria have not been developed, and the current use of a single percentile-concentration-averaging time combination is a widely accepted approach. It is an indicator of the critical upper part of the predicted odour concentration distribution.

The fourth point relates to what would occur if odour impact occurred and mitigation measures were put in place. It notes that poorly performing measures would not mitigate against impacts. As noted above, farm management and profitability go hand-in-hand therefore we do not expect that farm management standards will reduce over time and the base emissions used are not expected to be exceeded. Changes to the industry, including the RSPCA requirements for rotary hoeing litter will only further reduce the risk of elevated odour emissions.

This follows on into the fifth point, which notes that the facility posed an additional risk if there were no feasible mitigation measures that could be implemented if the facility emitted more odour that assumed. Based on our air quality impact assessment, which is considered conservative, our experience in the field and the additional information provided in this submission, we do not expect the emissions to be higher than what was modelled.

Yours Sincerely,

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