14 November 2018

Ms Susan Shay
ACS Engineers
susan@acsengineers.com.au

Dear Susan

Re: AP2018/006 - SDA application for a material change of use for intensive animal industry (poultry farm) – New Sheds

I refer to your question regarding the Material Change of Use (MCU) application to the Coordinator General for the changes to the meat chicken sheds on the existing farm located at 265 Amiens Road at Beaudesert.

We understand that the changes at the site will be reducing the number of sheds to five, while keeping the same maximum bird numbers at 150,000. The existing farm layout and sheds is shown in Figure 1. The existing sheds have been numbered 1 to 6.

The proposed reconfiguration is shown in Figure 2 and Figure 3.

Based on Figure 3 we understand that:

- Existing shed 1 will be demolished;
- Existing sheds 2 and 3 will be replaced with larger modern sheds with dimensions of 134m long and 15m wide;
- A new shed will be built in between existing sheds 3 and 4;
- Existing sheds 4 and 5 will be replaced with new sheds with dimensions of 134m long and 15m wide;
- Existing shed 6 will be decommissioned and used as a machinery and storage shed.

Based on 150,000 birds, the existing sheds have a maximum stocking rate of 25,000 birds a shed, and the five upgraded sheds would have a stocking rate of 30,000 birds a shed.

In their letter dated 34 October 2018, The Office of the Coordinator-General (OUT18/7175) requested additional information including (Paraphrased):

- How odour associated with differences in batch lengths between 2010 and present; and
- To provide a copy of the 2016 Pacific Environment Limited odour study.

Figure 1: Existing Site – QLDGlobe

Figure 2: Site Layout (ACS Engineers)

Figure 3: Proposed Shed Layout (ACS Engineers)

Batch Length

With regard to batch lengths, as noted in the letter from the Office of the Coordinator-General, the 2010 Site Based Environmental Management farm (SBEMP) refers to a maximum of 53 day batch, and the proposed operation would have a 50 day batch length. Assuming a 10 day cleanout, Figure 1 was prepared. The x axis is day of year, and the y axis is the day of batch (growth period plus cleanout). Based on a standard cleanout, a 50 day batch length would have approximately 5.8 batches per year, and a 53 day batch would have 5.1 batches a year. Given that batch lengths have always varied over time for the industry (as a function of market demands) as have cleanout lengths, this difference is not considered significant given recent improvements in farm management. These improvements have led to overall lower emissions compared to farms in 2010.

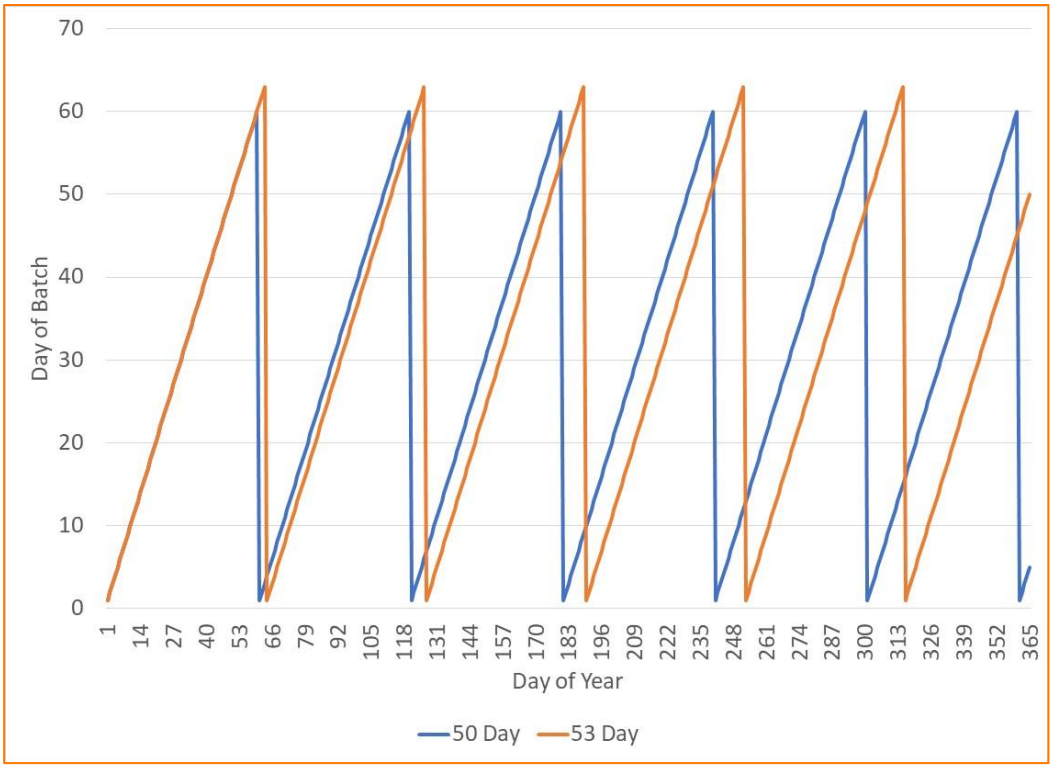

Figure 4: Batch Profiles 53 day(orange) and 50 day (blue)

The improvements over time for the chicken industry has included better designed sheds, which enable a farmer to optimise shed ventilation (which in turn ensures the litter remains dry). More recent changes have included the adoption by many integrators of the RSPCA management methods. Whilst put in place for bird health, the RSPCA methods (RSPCA, 2013; RSPCA, 2014; RSPCA, 2017) have led to drier litter and lower odour emissions. The primary management method for this is, tilling (rotary hoeing) of litter. This is done to aerate the litter, which reduces the risk of footpad dermatitis which occurs due to wet litter in broilers (Greene, et al., 1985). As shown in Clarkson and Misselbrook (1991) drier litter has less emission potential compared to wet litter.

The improvements and how odour emissions have changed over time is discussed further below.

Pacific Environment 2016 Study and Odour from Proposal

While at Pacific Environment, I worked on the 2016 study. I can confirm that the focus of the study was to examine the potential of the site to expand, rather than the proposal here which is to stock the existing bird numbers in five sheds instead of six.

Odour emissions in chicken sheds are a function of many factors, however the two primary odour sources are the litter and the birds themselves. With regard to emissions, the K Factor method of Ormerod and Holmes (2005) is the standard method used to estimate how much odour is emitted from a farm over time. The method was originally based on extensive odour sampling at a number of farms.

Using the method, at a point in time, the odour emission rate (OER in ou/s) is a function of the Ventilation Rate (V in m^3/s), the floor area (A in m^2), the bird Density (kg/m^2) and the K factor. The OER equation from Ormerod and Holmes (2005) is shown below as Equation 1.

$$OER = 0.025 \times K \times A \times D \times V^{0.5}$$ **Equation 1**

If Equation 1 is distilled down as a function of the units for the inputs, the OER at a point in time (when all other inputs are the same) is a function of the kilograms of birds present ($A \times D = m^2 \times \frac{kg}{m^2} = kg$). This method doesn't take into account decreasing bird density over time (down from around 18.5 birds/m^2 for the current farm approval down to 14.9 birds/m^2 for this application), which has been demonstrated to lead to drier litter and therefore less emissions. The reason for this is that the moisture generated by manure from the birds is the same, but in a larger shed which reduces the risk of wet spots forming.

The farm is currently approved to operate with six sheds holding 150,000 bids total with a density of 18.5 birds/m^2. Therefore, using the equation above, the total odour emission rate for the farm at a point in time would be a function of the total kilograms of birds present. This means that beyond a slight change in footprint due to changing the shed layout, the emission from the farm would not be expected to rise, nor would impacts with the farm change, in reality they would likely be better due to the lower stocking density and better shed operation. As the new sheds would better manage airflow the emissions would be expected to be better for the new sheds. Test data collected at a number of farms over time has shown this. The K in Equation 1 is a scaling factor which is used to scale the emissions from a farm. A farm with a K factor of 2 would have twice the emissions of a farm with a K factor of 1. Whilst a K factor of 2.2 is recommended (PAEHolmes, 2011) as an upper value for odour modelling, recent data shows that modern farms can achieve lower K factors. Test data from a number of farms (with a maximum stocking density of 17 birds/m^2) in New South Wales and Queensland collected for our recent project work is summarised below (as K factors) in Figure 5.

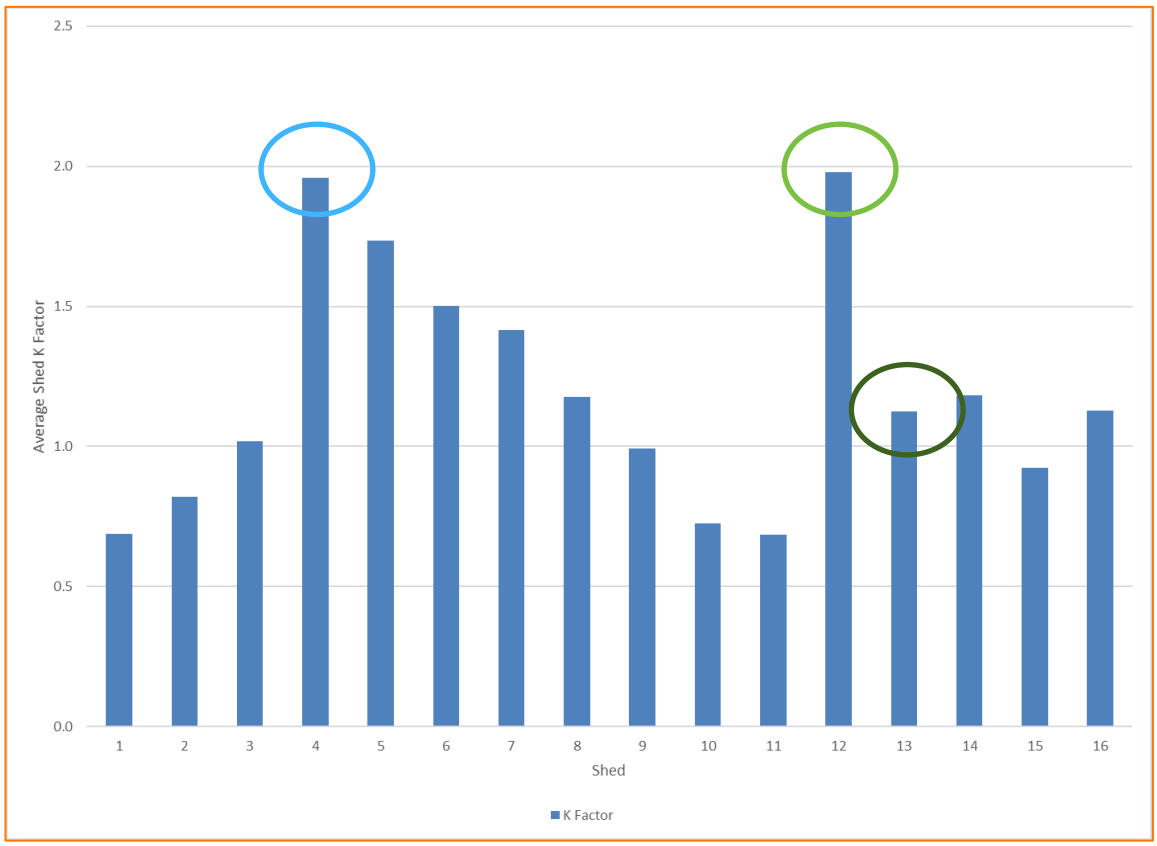

Figure 5: K Factors 2017/2018 (Average K=1.2)

The test data was collected in late 2017 and through 2018. The figure shows the average shed K factor for 16 sheds on 11 farms (includes separate farm units on larger farms in New South Wales). Eight of the sheds tested were in Queensland and eight were in New South Wales. With the exception of two farms, all sheds were less than five years old, and of the other two farms, one had sheds were constructed around seven years ago, and the other had older sheds which were over 10 years old.

Overall the test data shows an average K factor of 1.2. With regard to the two higher values (both still below K=2), the blue circle is for a shed which is more than 10 years old, the light green circle is a shed on a farm complex (sheds constructed approximately 7 years ago) west of Brisbane, and the dark green circle is another shed on the same farm. It is noted that the shed marked by the light green circle had water leakage issues (we understand due to pipework failure) during that batch. Even with these issues, the K factor for that shed was below 2.

Based on the above, odour impacts beyond what currently occur from the existing approved operation are not expected. Moreover, with improved shed design on site, the odour footprint of the farm would be expected to be better rather than worse that what currently occurs (which has not led to any complaints).

Sincerely

Geordie Galvin
B.Eng (Env Eng) M.Eng (Env) MIEAust A.AirQual
Principal Environmental Engineer

References

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