Before the Independent Hearing Commissioners
Appointed by the Taranaki Regional Council

Under	the Resource Management Act 1991
In the matter of	a resource consent for air discharge relating to the poultry farm operation at 58 Airport Drive, New Plymouth (5262-3.0)

Evidence of Jason Savelio Karena Pene

28 January 2022

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Introduction

1 My full name is Jason Savelio Karena Pene.

2 I am a Principal Environmental Engineer at Tonkin & Taylor Ltd (**T+T**) and in this role I provide air quality and environmental engineering consultancy services to a range of private and public sector clients.

3 I hold a Bachelor of Engineering degree with honours in Chemical and Process Engineering from the University of Canterbury and I am a Certified Air Quality Professional of the Clean Air Society of Australia and New Zealand (**CASANZ**).

4 I have been involved in the assessment and management of environmental impacts, with a particular focus on discharges of contaminants to air, in various roles in consultancy, for regulatory authorities and in industry for over 20 years. Of specific relevance to this application, my experience has included:

(a) Preparation of assessments of odour and air quality impacts and provision of expert air quality evidence for consent applications for poultry farming operations in Taranaki, Waikato, Canterbury, Manawatu and Northland;

(b) Technical review of consent applications for poultry farms on behalf of Waikato Regional and Waikato District Councils; and

(c) Provision of advice and expert evidence to submitters on poultry farms in the Waikato region.

5 T+T was engaged by Airport Farm Trustee Limited (**AFTL**) in September 2020 to prepare an odour and dust assessment to accompany an application to the Taranaki Regional Council (**TRC**) to replace the existing resource consent for discharge to air from the poultry farming operation at 58 Airport Drive, New Plymouth. I oversaw the development of the Airport Drive Free Range Poultry Farm Odour Assessment dated June 2021 ("**Air Assessment**") submitted to the TRC in relation to the application.

6 In preparing this statement of evidence I have considered the following documents:

(a) The application to replace the resource consent to discharge to air from the site, including the Air Assessment;

(b) Section 42A report;

(c) Submissions of the application as they relate to air quality impacts;

(d) Statements of evidence on behalf of AFTL of:

(i) Mr. Ed Whiting;

(ii) Ms. Deborah Ryan; and

(iii) Mr. Christian McDean.

Code of conduct

7 While this is not a hearing before the Environment Court, I confirm that I have read the Code of Conduct for expert witnesses contained in the Environment Court Practice Note 2014 and that I agree to comply with it. I confirm that I have considered all the material facts that I am aware of that might alter or detract from the opinions I express. In particular, unless I state otherwise, this evidence is within my sphere of expertise, and I have not omitted to consider material facts known to me that might alter or detract from the opinions I express.

Scope of evidence

8 My statement of evidence addresses the following matters:

(a) description of activity;

(b) the nature of the discharges to air;

(c) receiving environment;

(d) air quality impacts of the existing operation;

(e) air quality impacts of the proposed (modified) operation;

(f) matters raised by submitters;

(g) matters raised in s42A Report; and

(h) conditions of consent.

Executive summary

9 AFTL proposes to convert its existing conventional (enclosed) four shed intensive chicken farming operation at Airport Drive, Bell Block to a free-range poultry operation.

10 I have assessed the potential effects on air quality of discharges to air from the operation on behalf of AFTL and my conclusions in relation to the air quality effects of the proposal are as follows:

(a) I agree with the s42A reporting officers that odour is the key air contaminant of interest in this case.

(b) The site is situated in a rural area with a number of rural dwellings located in the vicinity, the nearest of which is located within 55 m. As a result of the number and proximity of local rural dwellings, sensitivity to odour is higher in general than in other less populated rural environments.

(c) In the assessment of the impacts of odour and other contaminants from the proposed operation I have first reviewed the corresponding impacts of the existing operation to form a baseline for the assessment.

(d) A number of submitters have voiced concern in relation to the air quality impacts of the existing and historical operation at the site, including as a result of odour emissions.

(e) These concerns however are not reflected in the complaint recorded, with no complaints received by TRC in the preceding five years to lodgement of the application. Some complaints were lodged following notification of the Application, however, TRC's investigations have not confirmed any non-compliance (and have instead highlighted background odour sources in the area).

(f) TRC has undertaken an extensive programme of regular monitoring at the site over the course of a growing cycle looking at observed odour levels and measured ammonia concentrations. This has been supplemented with my own brief odour observations and those of a T+T colleague of mine.

(g) The investigations encompassed a wide range of operational and environmental conditions and have included observations from a range of different people. The results of the investigations did not highlight a potential for offensive or objectionable odour (which in my opinion would be unacceptable adverse effects) as a result of the existing operation.

(h) To assess how the effects of emissions from the existing operation are likely to change as a result of the application proposal, I have utilised a range of assessment techniques. This has included

reviewing the proposed regime of odour and dust management, estimating how odour emissions may change with the regime in place, using odour dispersion modelling to predict associated changes in ambient odour levels and reviewing similar operations.

(i) The odour management regime at the site is required to take account of the sensitivity of the receiving environment. I consider that a high standard of litter management is currently employed to minimise odour generation and further measures are proposed to provide additional control. Improved dispersion of odour emissions will be achieved through installation of roof mounted chimney vents.

(j) Importantly, the proposal will involve a reduction in the number and mass of birds housed on the site, which directly relates to odour generation. I have estimated this is likely to translate to a 35% reduction in odour emissions relative to the activities authorised by the existing consent, and up to 30% of a reduction relative to odour emissions currently occurring from the site.

(k) Dispersion modelling indicates that further reductions in ambient odour levels are likely to be achieved through installation of relatively tall chimney vents. Peak odour concentrations at local dwellings are predicted to be reduced with both the reduction in birds and chimney vents in place by up to 58%.

(l) My brief observations of odour at the applicant's operation at Midhirst where the proposed mitigation technology has already been employed supports the above conclusions in relation to the effectiveness of the proposed improvements.

11 In summary, independent investigations of odour have not corroborated the presence of offensive and objectionable odour from the existing operation, as referred to in submissions. The application proposal incorporates further mitigation measures that will likely substantially reduce any existing impact of emissions from the site. With those additional measures in place I consider that a very high standard of emissions management will be in place, which I consider appropriately responds to the sensitivity of the local environment. Overall, with the proposed mitigation measures in place I do not anticipate offensive and objectionable odour and dust in the surrounding area as a result of the upgraded operation.

Description of activity and nature of discharges to air

12 The current and proposed poultry farming activities at the site are described in the evidence of Mr Whiting.

13 The existing farm is comprised of four conventional barn configuration broiler chicken sheds. In this configuration, the chickens are raised from 1-day old hatchlings entirely within the shed. The sheds are entirely enclosed with ventilation controlled through the use of side wall exhaust fans. The sheds also feature end wall fans, but these are currently used as ventilation inlets.

14 The proposal is to convert the existing sheds to free range configuration and install a range of measures to further improve odour and dust management. Of relevance to the discharge of contaminants to air, this will involve:

(a) A reduction in bird stocking density across the sheds. The proposed stocking density of the free-range operation will be no more than 15 birds/m^2 of floor area. The proposed stocking density based on bird numbers is not directly comparable with the stocking density limit of the existing consent of 38 kg/m^2. However, as I describe later in my evidence the proposed stocking density equates to an approximate 35% reduction in allowable stocking density in terms of mass. As the site is operated well within the consent limit, the proposed stocking density equates to an approximate 30% reduction in the current operational peak stocking density at the site of approximately 35 kg/m^2.

(b) Allowance for the birds to access range areas located to the side of the sheds once birds are old enough to regulate body temperature.

(c) Installation of a new ventilation and heating system including:

(i) A new programmable logic controller to provide automated control of climate conditions utilising feedback from sensors for temperature, humidity and internal concentrations of carbon dioxide and ammonia;

(ii) New natural gas fired boilers and heat exchangers that will be used to heat and dry inlet ventilation air and/or air within the shed;

(iii) New chimney exhaust vents and roof inlet vents to replace the existing side wall vents;

(d) Installation of a water misting system to control dust during shed cleanout, catching and from the sidewall vents (before they are replaced).

Nature of the discharges to air

Odour emissions

15 The intensive housing of chickens has the potential to generate odour. In my experience, odour is the main contaminant emitted to air from this type of operation with a potential to cause air quality impacts and I agree with the s42A report[1] that "*the only offsite environmental effect of significance resulting from broiler rearing is that caused by the release of offensive odour*".

16 Odour from poultry rearing is mainly caused by the anaerobic decomposition of manure (faeces and urine) deposited onto the litter. Uric acid present in the manure may also undergo aerobic degradation and hydrolysis to form ammonia (as well as being produced through anaerobic degradation). A critical component of both anaerobic and aerobic odour generation processes is water (moisture). Control of litter moisture content and associated shed humidity levels is the key component of odour management in litter-based poultry farming operations.

17 Odour may also be generated from the birds themselves (i.e. a bird or feather-type odour) or from the feed, particularly if it is allowed to degrade. The feed is stored in silos and fed to the chickens in small, regular quantities so spoilage of feed is unlikely. Odour from these latter sources (if it occurs at all) would be of a lower intensity and have a less offensive character than the odour from manure decomposition.

18 The odour generated within the sheds is discharged to air via active fan-driven ventilation. Under the current cross-flow ventilation configuration, exhaust is via horizontal vents along one side wall of each shed (and previously exhaust has also been via end wall fans, which are no longer used for exhaust). The ventilation configuration is to be changed to a system manufactured by DACS with exhaust via chimney roof vents to aid dispersion of emissions.

19 Odour will be emitted from the free-range operation at a lower rate than from conventional broiler (i.e. non free range) operations of an equivalent scale for the following reasons:

[1] At paragraph 134

(a) The maximum stocking density of birds in a free-range operation is lower than corresponding conventional broiler operations resulting in lower manure/excreta generation.

(b) Manure/excreta is deposited over wider area – in my experience the majority of manure generated by the birds is still deposited onto the litter in the sheds, as occurs in conventional configuration sheds, and a lesser amount will be deposited on the outside range areas. This will, however, reduce the potential for anaerobic degradation and the rate of odour emissions from the sheds.

Other emissions

20 Other emissions include:

(a) Dust comprised of airborne particles of wood litter, food, manure, skin and feathers disturbed within the sheds. The potential for dust emissions will be increased during the cleaning out of each shed. At the end of each growing cycle litter is removed and stockpiled at the end of the shed for removal off-site and the handling of litter can release dust. The main effects of dust emissions are associated with nuisance and property soiling associated with deposition of the dust.

(b) Combustion by-products derived from the combustion of natural gas to heat the sheds.

Receiving environment

Adjacent activities and sensitivity to air contaminants

21 The zoning of the site and surrounding area is described in the evidence of Mr McDean. In terms of the existing activities in the area, the site is located in a rural area that features a mix of rural production and rural residential activities. As a result, sensitivity to odour and other air contaminants in the local environment is variable.

22 Areas to the east and south of the site feature pasture and cropping activities. The presence of people in the areas occupied by these activities will be intermittent and will generally be related to particular tasks (feeding out, moving stock, crop harvest etc.) that are typically of a relatively short duration (of the order of hours). The wider area is likely to occasionally be subject to common rural odours such as the handling of silage and spreading of agricultural production waste (I note that recent TRC investigations have identified spreading of poultry litter as a background source of odour in the area). As a result of these factors in rural areas

amenity expectations are generally lower in relation to rural odours compared to urban areas.

23 The relevant Ministry for the Environment's (MfE) good practice guidance ("MfE Odour GPG") provides general guidance on the sensitivity of different types of land uses. The MfE Odour GPG describes the sensitivity of rural areas as "Low for rural activities; moderate or high for other activities" (page 20). The reasons given are that:

> "A low population density means there is a decreased risk of people being adversely affected.
>
> People living in and visiting rural areas generally have a high tolerance for rural activities and their associated effects. Although these people can be desensitised to rural activities, they may still be sensitive to other types of activities (e.g. industrial activities)."

24 Within the rural environment, sensitivity to odours will be highest at rural dwellings. This is because people may be at home at any time of day or night, and for extended periods of time. People have a higher expectation of amenity when at home, undertaking activities such as eating, relaxing and entertaining, compared to when they may be working or passing through the wider rural environment.

25 While the majority of the rural environment occupied by agricultural/horticultural activities is of low sensitivity, as noted in the Air Assessment, 16 rural residential dwellings lie within 300 m of the sheds. The s42A report notes that the nearest of these dwellings (at 66 Airport Drive) lies within 55 m of the nearest shed. As a result of the proximity of dwellings, the sensitivity of the receiving environment overall is higher than less populated rural environments. It is therefore important that the regime of odour and dust management at Airport Farm reflects the degree of sensitivity in the local environment, which I discuss further below.

Meteorological conditions

26 Weather conditions, in particular wind speed and direction and atmospheric stability, can influence the dispersion of contaminant emissions and their potential to impact on air quality.

27 Weather conditions are measured nearby at the New Plymouth AWS weather station at New Plymouth Airport, 1.9 km to the north-northeast of the site. Given the proximity of this weather station, it should provide a reasonable indication of overlying wind flows in the wider area (including the site and surrounding area). It should be noted, however, that local

topography is likely to alter surface wind flows at the site and surrounding properties to some degree. Shelter belts and other mature vegetation in the area will also alter wind flows and reduce the speed of surface wind flows.

28 Wind rose analyses of wind speeds and directions observed at the airport weather station and predicted to occur at the site in my odour dispersion modelling investigation are provided in Appendix A.

29 There is a strong prevalence for wind from the south-southeast and southeast directions, as well as from the west and west-southwest in both the observed and predicted data. There is, however, a higher frequency of wind predicted from the northwest quadrant and a lower predicted frequency of northerly winds in the modelled data than observed at the airport.

30 An important feature of the observed and predicted weather conditions in the area is the low frequency of calm and low wind speed conditions and the relatively high average wind speeds. This is important as atmospheric dispersion is typically poor in calm and low wind speed conditions. The low frequency of these conditions illustrated in Appendix A indicates that conditions for poor dispersion are likely to occur infrequently at the site.

Methodology for assessing air quality effects

31 The methodology used in the Air Assessment to assess the potential effects of the proposed discharges to air from the modified operation is described in section 5.1 of the Assessment.

32 The development of the assessment method considered the recommendations of the Ministry for the Environment (MfE) guidance on odour assessment[2] and preparing or evaluating resource consents for modifications to existing activities[3]. In my opinion the assessment methodology employed is consistent with those recommendations.

33 Submitters have queried the omission from the assessment method of consultation with themselves and other neighbours in relation to the proposal. Direct consultation with neighbours can provide feedback in relation to historical adverse effects of air contaminants such as odour or dust in the area. This feedback can be useful in the assessment of effects

[2] MfE. 2016 “Good practice guide for assessing and managing odour”.

[3] It should be noted that section 5.1 of the Air Assessment incorrectly refers to the MfE recommendations for existing operations – the comparison provided in Table 5.1 of the Air Assessment is against the recommendations for modifications to existing operations.

of odour or dust emissions from the existing operation (to provide context for the assessment of the proposed discharges to air from the modified operation).

34 In developing the assessment methodology for this application, the TRC's complaint record for the site did not highlight any concerns in the community relating to emissions from the existing operation in at least the preceding five years. Given the assessment related to proposed improvements of the existing operation in terms of odour emissions, I did not consider that direct consultation with neighbours was necessary at the time.

35 Subsequent to the preparation of the Air Assessment, the application was notified to neighbours, and I have taken into account feedback on air quality impacts noted in submissions in this statement of evidence.

36 Submissions have noted concerns in relation to the assessment method and excessive reliance on the complaint record. However, a multi-pronged assessment approach has been utilised in order that reliance on one assessment technique is not required and to provide a well-rounded and robust assessment of effects.

37 To provide context to assessment of the proposed discharges to air I have first reviewed the impacts of the existing operation. In doing so I have not presumed that the existing operation is part of the existing environment, rather that this review can provide a baseline to inform understanding of the potential effects of the proposed modified activity.

38 To better understand the effects of the existing operation I have taken into consideration the following additional assessment information:

(a) Additional complaints received since notification of the application and the TRC's investigations of the complaints;

(b) TRC's investigations of air quality impacts conducted over the course of a growing cycle in 2021;

(c) Observations of odour at the site conducted by T+T staff.

39 To provide further assessment of the improvements in odour emissions and reduction in potential for adverse odour effects likely to be achieved with the proposed modifications, I have undertaken the following additional assessments:

(a) Comparative quantification (estimation) of odour emissions from the existing and proposed (modified) operations;

(b) Atmospheric dispersion modelling of the quantified odour emissions to determine the relative change in ambient odour levels in the surrounding environment associated with the proposed modifications; and

(c) Review of odour impacts associated with a poultry farming operation where similar odour control techniques has been implemented.

Air quality impacts of existing operation

Complaints and compliance records

40 Odour and dust complaints are not a conclusive indicator of the presence or absence of offensive or objectionable effects associated with these contaminants but can provide a broad indication of adverse effects experienced in the vicinity of the existing operation. This indication can then be used to provide context to the assessment of potential for similar effects from the proposed modified operation.

41 Section 5.2 of the Air Assessment describes the record of complaints received by the TRC at the time of publication regarding odour or other air contaminants from the site.

42 Figure 1 illustrates the frequency of complaints recorded by the TRC in relation to discharges to air from the site since 2008.

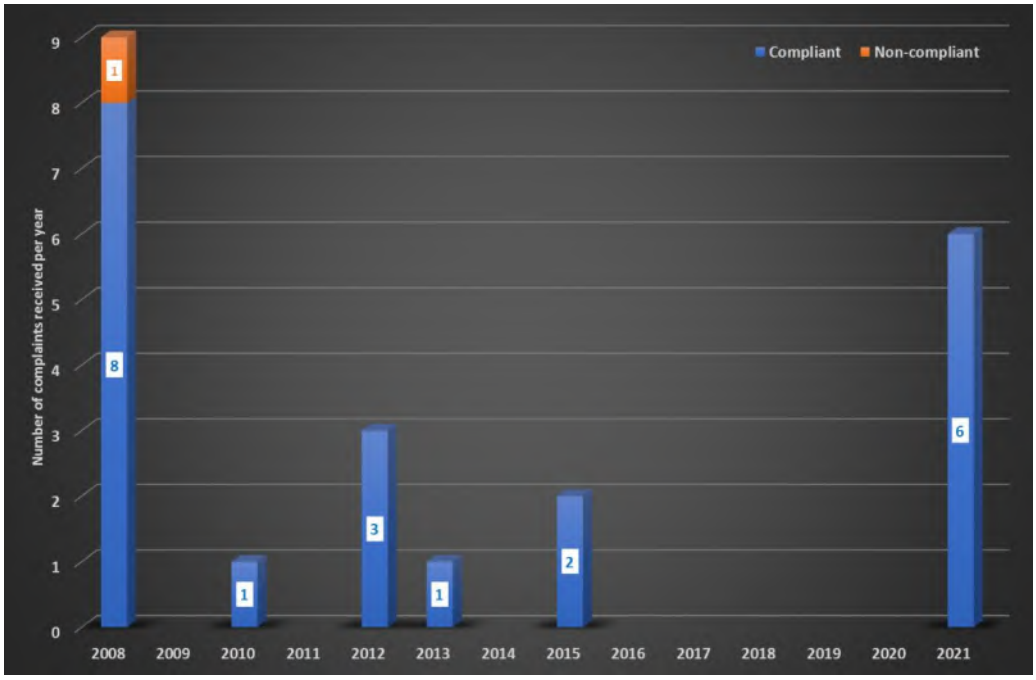

Figure 1: Frequency of complaints recorded by TRC in regard to discharges to air from the site

43 All of the complaints related to odour, although one complaint (in 2008) related to both odour and dust. TRC investigations of the complaints identified non-compliance on one occasion in 2008.

44 14 complaints were recorded in relation to odour from the site prior to AFTL talking ownership in August 2013, the majority of which were recorded in 2008. The complaints highlight concerns that neighbours held in relation to odour from the site as it was previously operated.

45 Between AFTL taking ownership of the site in 2013 and completion of the Air Assessment, only two complaints were received relating to odour, in 2015. As I note above, neither of the complaints resulted in the TRC confirming offensive or objectionable effects of odour or that a condition of consent had been breached.

46 There were no complaints recorded between 2015 and notification of the application in August 2021, which coincided with improvements to odour management that AFTL implemented at the site.

47 Following notification of the application, a series complaints were received between August and November 2021. Beneficially the complaints coincided with a period of regular TRC investigations at the site in relation to this application, which allowed the complaints to be thoroughly investigated. The investigations confirmed that odour from the sheds was not in breach of conditions of the existing consent (including that there was no offensive or objectionable odour).

48 The investigations also indicated that a number of complaints made over this period coincided with periods when there were no birds housed on-site (i.e. between growing cycles).

49 Furthermore, odour investigations in response to a complaint about odour from the site in October 2021 identified that offensive and objectionable odour was in fact the result of spreading of chicken manure on a neighbouring property. This highlights a potential for odour from background sources in the area to be misconstrued by neighbours as odour from the site.

50 Overall, although a string of complaints was received following notification of the application, TRC's ongoing investigations at the time did not identify any breaches of consent.

51 Since neighbours were reminded by the TRC, following the receipt of submissions, of the ability to make complaints and the benefit of doing in allowing TRC to investigate compliance, a string of complaints was lodged

but as I have said above did not result in confirmation of consent breaches during TRC's investigations.

52 The current growing cycle (commenced 31 December 2021) has occurred over a fine, warm summer period. The frequency of odour complaints received by regional councils could be expected to increase over this period due to people being outside more often, making the most of warm weather. Despite this AFTL has not been notified of any complaints to the TRC since November 2021.

Observations and measurements

53 Observations of odour levels in and around the site have been made by officers of the TRC, me and a T+T colleague of mine. Odour observations can be used to understand ambient odour levels in a range of operating and environmental conditions to provide a foundation to understand odour levels that may result from the proposed modified operation.

54 The TRC's extensive programme of investigation of odour at the site in 2021 is described in the s42A report. Compliance officers of the TRC conducted observations of odour levels and measurements of ambient ammonia concentrations in and around the site from August to October 2021 over the course of a growing cycle.

55 Ammonia is only one of the odorants derived from poultry litter and can be formed by both aerobic and anaerobic mechanisms (whereas most poultry farming odorants are formed by anaerobic processes). Notwithstanding this the ambient measurement of ammonia levels can provide a broad indication of odour levels associated with the activity.

56 Notes from eight TRC investigations were provided to AFTL, which were conducted at varying stages of the growing cycle, including when bird mass was highest and during loadout and catching activities. During only one of the eight TRC investigations (conducted during the first cut removal of birds), was odour detected at the site boundary, described as "light" and "slightly detectable" odour of an intensity of one out of six. On each of the other seven occasions, no odour was detected at the boundary.

57 No ammonia (recorded as 0 parts per million) was detected at the site boundary during the investigations. This means ammonia was below the lower limit of detection of the instrument. The lower limit of detection was not specified in the investigation notes provided to AFTL.

58 I have conducted observations of odour at the site over two days on 23 and 24 January 2020 during which:

(a) the existing horizontal cross flow ventilation was in operation (the DACS process control system was in use and some chimney vents had been installed but were not in use);

(b) the birds in all sheds were 23 and 24 days old, approaching peak bird mass in the cycle (within a week the stocking density had reached 32 kg/m^3);

(c) there were clear overhead conditions and wind conditions ranged from light northwesterly and very light southerly winds as well as calm conditions – these conditions are generally associated with relatively poor dispersion; and

(d) was during hot summer conditions which combined with the bird age meant that ventilation rates were high at the time.

59 The outcomes of my observations may be summarised as follows:

(a) Poultry odour observed at the boundary downwind of vents during warm, fine afternoon conditions in light northwest winds was generally either of very weak intensity or not present with the occasional occurrence of weak intensity odour (depending on instantaneous wind conditions).

(b) No odour was detected on both days along SH3 320 m to 340 m to the south and southeast of the site (downwind of the site at the time).

(c) In calm conditions around dusk and dawn, poultry odour observed at boundaries downwind of sheds was generally associated with fan operation – odour was consistently of very weak intensity when fans were in operation and absent when fans were off.

(d) In similar calm conditions at dusk, no odour was detected at the nearest boundary to 66 Airport Drive. In very light southerly to southeasterly wind conditions after dawn at this location odour of very weak intensity was intermittently detected at this location.

(e) In very light southerly to southeasterly wind conditions after dawn no odour was detected along the eastern road berm of Airport Drive from the entrance to 82 Airport Drive to opposite the entrance to 65 Airport Drive.

60 Observations were also undertaken by my colleague, Michele Dyer, a senior environmental engineer at T+T on 21 and 22 September 2021, as described in Appendix B. Her observations included downwind

observations of odour along SH3 (320 m from the shed) prior to and during the first catch of the cycle.

(a) Occasional very weak (5%) and weak (2%) intensity odour of a “sour” character was observed prior to the catch (during normal operation at the peak of the cycle) during the day in moderate to fresh breeze wind conditions, otherwise odour was absent (93%).

(b) Slightly more frequent very weak (7%) and weak (4%) odour of a “manure”, “grain” and “chicken shed” character notes odour was observed during two observation periods during the catch in the early hours of the morning in light to gentle breeze wind conditions, otherwise odour was absent (89%).

(c) Given the occasional nature of odour detection both prior to and during the catch, the difference in odour levels was considered minimal.

61 In summary, observations at the site boundary were conducted by TRC officers and me indicate that in close proximity to the existing vents (generally within 10 m to 20 m). A reasonably low intensity of odour (or no odour) was detected during these observations.

62 In terms of off-site observations, at a distance of 320 m to 340 m downwind from the nearest shed on SH3 I did not detect odour in light and very light wind speed conditions. However, Michele Dyer occasionally detected odour of weak and very weak intensities and of varying character including chicken shed odour. During the one period of downwind observations that I was able to conduct along Airport Drive, in light southerly winds, I did not detect odour from the site.

Air quality impacts of the proposed (modified) operation

Review of proposed improvements to odour management

63 The measures implemented and proposed to manage odour and dust emissions from the site at the time the Air Assessment was completed were reviewed in section 5.4 of the report.

64 In addition to the change to free range configuration that I have discussed above, important existing measures discussed in the Air Assessment include:

(a) Continuous monitoring of temperature and humidity within the sheds with automated control of internal shed climate based on feedback from monitoring;

(b) Insulation of sheds to make it easier to control internal shed conditions;

(c) Procedures to minimise odour and dust associated with shed clean out. Sheds are cleaned out by a specialist contractor Osflow. Sheds are cleaned out sequentially with litter removed from the site on the day of cleaning, without storage or processing on-site.

65 Since the Air Assessment was completed, AFTL has proposed further modifications to the operation to improve odour and dust management, including:

(a) Installation of a DACS balanced pressure ventilation system. The ventilation system is controlled using feedback from continuous monitoring of ammonia and carbon dioxide concentrations as well as the temperature and humidity parameters that are typically used. The system will provide for improved control of internal climate conditions in the sheds (including humidity) to inhibit odour generation.

(b) Installation of a DACS indirect heating system. “Add-Air” heat exchangers (with heat provided by natural gas-fired hot-water boilers) will be used to heat either ventilation air introduced to the sheds or air circulating within the shed (depending on internal and external climate conditions). The change to indirect heating will cease the direct introduction of combustion gas (which includes moisture), thereby reducing shed humidity and associated litter moisture content. An important additional benefit of the proposed heating system compared to other indirect heating systems is that it also provides direct control of the humidity of inlet ventilation air to provide further control of internal shed humidity.

(c) Installation of roof-mounted chimney exhaust vents in place of the existing cross-flow side wall vents. Currently, when ventilation rates are high, the existing horizontal vents tend to push odour towards the adjacent boundaries – towards the east from sheds 3 and 4 (towards the boundary with adjoining pasture), towards the south (currently bounded by maize cropping) from shed 2 and towards the north from shed 1 (towards rural residential properties). The new vents will instead direct flow vertically and the increased discharge height (7 m above ground level) will minimise downwash eddy effects of the chicken sheds that can reduce dispersion. Dispersion model predictions that I describe below indicate that this modification should substantially improve dispersion and dilution of odour emitted from the sheds compared to the existing horizontal discharge.

(d) A system of water misting sprays was installed in November 2021. Misting sprays are spaced along the outside of each side wall where exhaust vents are currently located and end walls where litter is collected during cleanout. The sprays are activated manually by staff to provide a fine water mist. Contact of emitted dust particles with misted water droplets will result in agglomeration and deposition of dust, typically in close proximity to the source. The misting system will improve control of dust emissions from stockpiled litter during shed clean out. The misting system has also likely reduced dust emitted from the existing side wall vents during the growing cycle. I understand that in-stack misting systems are being trialled for the chimney stacks to provide similar control of dust from the new vents.

66 Overall, AFTL has implemented a range of measures to improve odour and dust management at the site since it has taken ownership in 2013. Further changes are proposed at the site, which in my opinion will result in a very high standard of odour and dust management being employed at the site, appropriate for the sensitivity of the receiving environment (with rural residential activities on adjoining properties).

Change in odour emissions

67 As I have noted above a number of factors of the proposed operation will reduce the odour emissions from those that are authorised by the existing consent. An important influence on odour emissions is the mass of housed birds (which increases as the birds grow over the cycle and is reduced when birds are removed from the sheds).

68 To quantify the impact of the proposed reduction in housed birds, I have estimated using a method developed for EPA Victoria[4] based on housed bird mass.

69 As I have noted above, the mass-based stocking density limit of the existing consent (38 kg/m^2) is not directly comparable with the stocking density limit proposed in the s42A report (15 birds/m^2). The latter limit allows a total of 60,120 birds to be housed at the site.

70 However, based on an expected growth curve for broiler chickens provided by Tegel and an assumption of the first catch of birds occurring at day 28

[4] EPA Victoria. 2012. “Broiler farm odour environmental risk assessment-Background to technical guidance”

of the cycle[5], the existing stocking density limit would equate to a total population at the site of approximately 94,570 birds.

71 The site is typically stocked at a rate well within the consent limit and the stocking density for the current operation is generally maintained below 35 kg/m^2. Via the same method of derivation I have used above, this stocking density equates to a total site population of approximately 87,100 birds.

72 Figure 2 compares individual shed odour emission rates that I have estimated in the following scenarios:

(a) the proposed free-range configuration (with a stocking density of 15 birds/m^2);

(b) the existing broiler configuration operating at the currently consented stocking density limit (38 kg/m^2); and

(c) the existing broiler configuration stocked at the operational peak stocking density (35 kg/m^2).

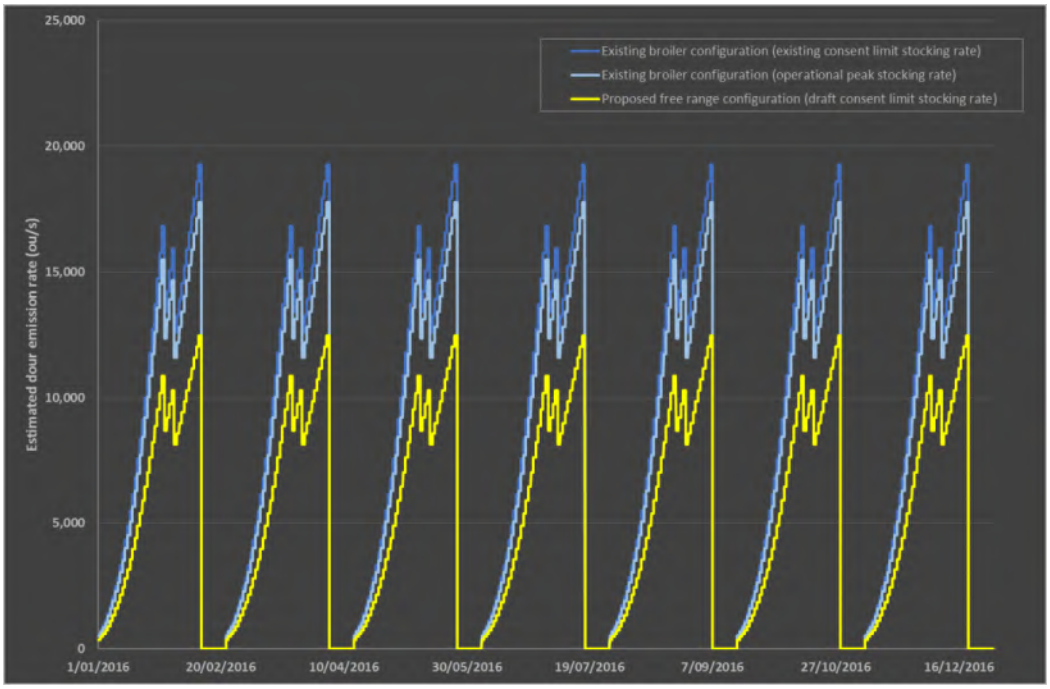

Figure 2: Comparison of odour emission rates from an indivdual shed estimated for the existing broiler configuration (dark and light blue) and proposed free range configuration (yellow)

73 Figure 2 highlights the reduction in the odour emission rates associated with the proposed reduction in stocking density for the free range operation.

[5] The first catch typically occurs no earlier than Day 28

74 The reduction in odour emissions is in proportion to the reduction in the mass of birds housed at the site, which I have estimated to equate to 35% compared to the existing consent limit, and 30% compared to the current operational peak stocking density.

75 Other modifications at the site that are likely to further reduce odour emission rates are not reflected in the relative emission estimates shown in Figure 2. These modifications include the introduction of indirect heating, improved control of shed humidity as well as the likely reduction in exhaust ventilation requirements with the balanced pressure system, which collectively should make substantial further reductions in odour emissions.

76 Submissions have raised concerns in relation to a focus on odour emissions from the sheds in the proposed free-range configuration, without inclusion of odour emissions from range areas.

77 Research conducted Rural Industries Research and Development Corporation (RIRDC) of the Australian Federal Government [6] has found the following based on odour emission measurements at Australian free-range farms:

> "Odour emissions from the range surface were seen to be negligible when compared to emissions from the sheds, contributing about 1% of total odour emission rate."

78 This finding is consistent with my own experience of odour emissions from free range operations in New Zealand where observable odour from range areas has been negligible compared to that observed from active shed ventilation. A focus on emissions from the shed vents in this emission quantification exercise and in the dispersion modelling as I describe below is therefore appropriate in my opinion.

Dispersion modelling

79 Since the Air Assessment was completed, I have used the CALPUFF atmospheric dispersion modelling suite of software to predict potential change in odour levels associated with the proposed modifications. The details and results of the dispersion modelling investigation are provided in Appendix C.

[6] Brown, G, Gallagher, E. 2015. "Free Range Chickens –Odour Emissions and Nutrient Management". RIRDC Publication No 15/017.

80 The dispersion modelling investigation has included assessment of the following of the proposed modifications:

(a) Reduction in bird stocking density; and

(b) Modifications to ventilation exhaust flows (installation of vertical roof stack vents in place of horizontal wall vents).

81 The reduction in stocking density has been represented in the emission calculations illustrated in Figure 2.

82 The modifications to ventilation exhaust flows were represented in the model investigation as follows:

(a) Side wall exhaust vents of each shed were represented by three point emission sources located. The vertical momentum of each modelled vents was set to zero to reflect to the horizontal nature of the side vent discharges. The location of each modelled vent was set at a distance of 2 m from the shed wall to reflect the initial horizontal momentum of the discharge. This method was used in preference to the alternative use of volume emission sources to represent the horizontal vents to incorporate the effect of thermal buoyancy of the shed exhaust discharge in accordance with recommendations of research conducted by the Australian RIRDC[7].

(b) The proposed chimney exhausts were represented by three point emission sources located on the roof with full vertical momentum to reflect the vertical orientation of the vents. The height of the vents has been assumed to be 5 m [to be updated to 7 m].

83 Other modifications such as the change to indirect heating and installation of the DACS ventilation system are likely to reduce odour emissions but have not been able to be accounted for in the model.

84 As set out in MfE guidance on odour assessment, odour concentration predictions are typically evaluated through analysis of the predicted frequency of occurrence of 1-hour average odour concentrations, in particular the 99.5th and 99.5th percentile of predictions. The predicted change in these percentiles of odour concentrations at the submitter locations is described in the following table.

[7] Dunlop M.et. al. 2010, “Separation Distances for Broiler Farms. Verifying methods and investigation the effects of thermal buoyancy”. RIRDC Publication No. 10/073.

Table 1: Percentage change in peak 1-hour average odour concentrations at submitter dwellings predicted to result from the proposed change to free range configuration and installation of roof vents (compared to the presently authorised broiler configuration with side exhaust vents)

Submitter location	Predicted change in 99.5th percentile 1-hour average odour concentrations, relative to corresponding prediction at:	
	Existing consent limit	Current operational peak
62 Airport Drive	-54%	-50%
76 Airport Drive	-47%	-42%
47 Airport Drive	-47%	-43%
40 Airport Drive	-42%	-37%
35 Airport Drive	-50%	-46%

85 The reduction in 99.5th percentile odour concentrations in the local environment predicted to be achieved from the proposed change to free range configuration and installation of roof is illustrated in Figure 3.

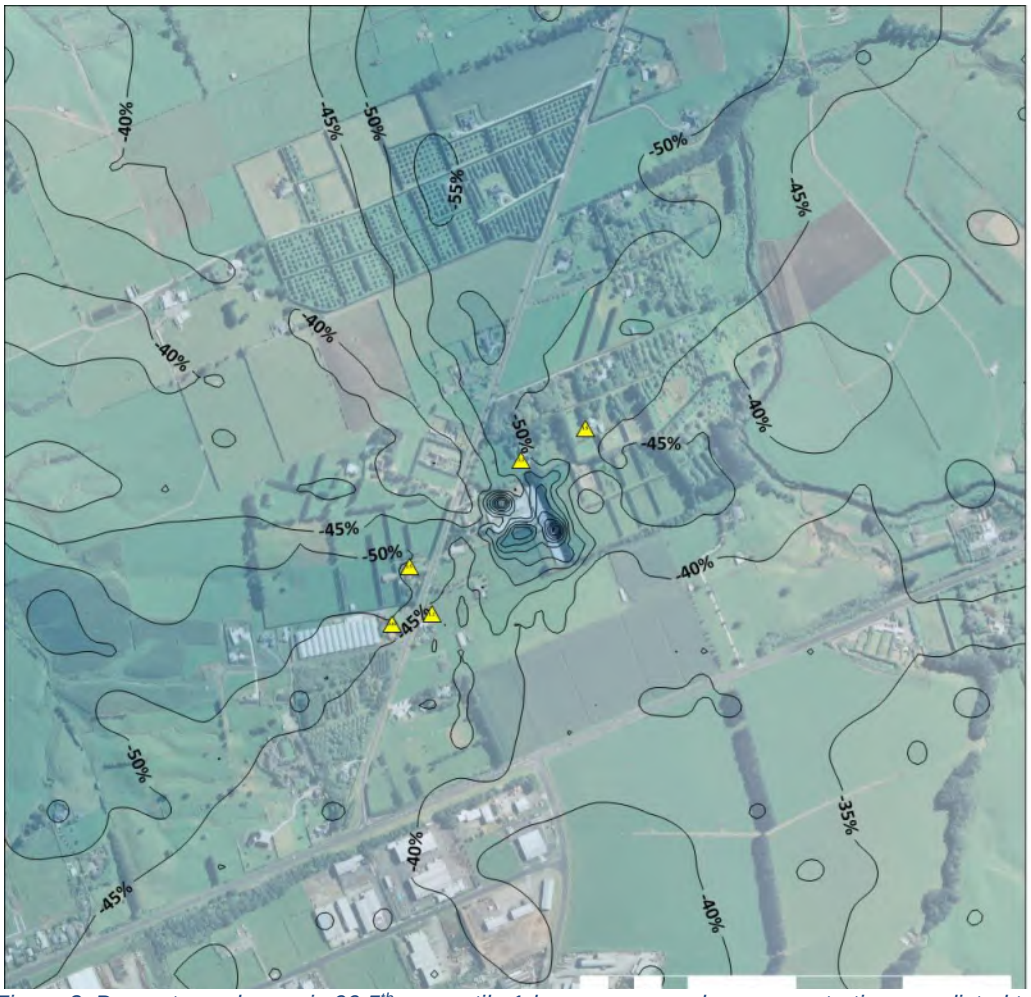

Figure 3: Percentage change in 99.5th percentile 1-hour average odour concentrations predicted to result in the local environment from the proposed change to free range configuration and installation of roof vents (compared to the existing broiler configuration stocked at the current consent limit, with side exhaust vents)

86 99.5th percentile odour concentrations are predicted to be reduced by over 50% to the north of the site and to the southwest. Reductions are at least 40% over much of the remainder of the modelled area. At the nearest of

the submitter's dwellings[8] at 62 Airport Drive (K and G McDonald) to the north, the 99.5th odour concentrations is predicted to be reduced by 54%. Corresponding concentrations at other submitter dwellings are predicted to be reduced by at least 42%. At other dwellings in the area, the largest reduction in 99.5th percentile odour concentrations is 58%.

87 The degree of predicted improvement in 99.5th percentile odour concentrations highlights the incremental improvements in odour levels that are to be achieved by the proposed modifications to exhaust discharges (in addition to the improvements associated with the reduction in bird numbers).

88 Overall the dispersion modelling predictions highlight the substantial reductions in odour concentrations likely to be achieved by both the proposed change to free range configuration and the proposed improvements to the exhaust of emissions from the sheds.

89 Further reductions, beyond those quantified, are likely to result from other proposed modifications including improvements to heating and control of shed humidity and have not been represented in the model predictions.

Review of impacts of similar operations

90 Experience of odour effects (or absence thereof) associated with similar poultry operations featuring similar technology can provide an indication of potential adverse odour effects that may result from the proposed operation. In making this type of comparison, differences between the operations and local receiving environments need to be taken into account.

91 As noted in the evidence of Mr Whiting, AFTL has operated similar DACS heating and ventilation systems at its Midhirst farm for the last three years. The features employed include add-air heat exchangers and chimney exhaust stacks.

92 The Midhirst farm is a much larger free-range operation, featuring eight larger scale sheds and is capable of housing more than five times as many chickens as the application site.

93 I visited the Midhirst site on 23 January 2022, in light northerly wind conditions. Downwind of the northernmost group of four sheds (all of which were occupied at the time), within 20 m of the nearest shed, I observed intermittent poultry odour of up to a weak intensity.

[8] Also the nearest dwelling not owned by the applicant

94 The observations provided only a brief snapshot of odour generated at the site. However, the relatively low levels of odour downwind in reasonably close proximity to a much larger operation than at the site highlight the benefits of the heating and ventilation system proposed

Conclusions in relation to air quality effects

95 I have drawn the following conclusions from my updated assessment of air quality effects:

(a) Odour is the main contaminant of interest in relation to the existing and proposed discharge to air activities at the site, though both dust and combustion by-products will also be emitted.

(b) In order to assess the impacts of the proposed operation I have first reviewed the impacts of the existing operation. Feedback from submitters has indicated concern in relation to odour associated with the existing and historical operation at the site. However, this is not reflected in the record of complaints, investigations undertaken by the TRC or the observations of odour at the site undertaken by T+T.

(c) Although investigations are not able to be undertaken at all times when neighbours may be exposed, collectively the investigations have encompassed a wide range of operational and environmental conditions and have included observations from a range of different people. The results of the investigations indicate that unacceptable effects associated with offensive or objectionable odour from the existing operation are unlikely to have occurred in the local area from the current operations at Airport Farm.

(d) The proposal includes additional improvements to reduce odour emissions from the site and therefore the potential effects on air quality in the local environment. Additional measures include a reduction in bird numbers at the site, installation of a new heating and ventilation to better control internal shed climate conditions and inhibit odour generation and new chimney vents to improve dispersion of emitted odour.

(e) My review of the proposed improvements and brief observations of odour at the applicant's operation at Midhirst, where the technology has been used for three years, points to the likely effectiveness of the further improvements.

(f) With these improvements in place I consider that a very high standard of odour and dust management will be employed at the site. In my

opinion, the design and operation provide a level of control of emissions that is appropriate for the sensitivity of the receiving environment (which includes rural residential activities on adjoining properties).

(g) Dispersion modelling predictions indicate that peak odour concentrations at submitter dwellings will be reduced by up to 54% by the change to free range and exhaust vent improvements. Further reductions are likely to result from other proposed improvements.

96 Overall, for the reasons described above, it is my opinion that the proposed discharges to air will be well managed, potential effects of odour, dust and combustion by-products are likely to be minimal and that unacceptable effects in the receiving environment associated with offensive and objectionable odour and dust as a result of the improved operation is unlikely.

Matters raised by submitters

Odour causing disruption of outdoor entertainment

97 Sensitivity at neighbouring dwellings can be heightened during outdoor entertainment events such as birthday parties or barbeques when visitors are welcomed onto the property. The potential scale of odour propagation towards neighbouring dwellings is likely to have reduced over time as AFTL has implemented improvements to odour management at the site. The assessment of odour impacts of the proposed operation I describe above (as supported by dispersion modelling predictions), indicates that the further modifications to the site operation should further substantially reduce any historical potential for odour impacts.

Odour occurring during the removal of birds/or cleaning out of sheds.

98 Litter is disturbed at the end of the shed cycle when litter is removed and carted offsite to enable shed cleaning. Emissions of dust (in particular) and odour can potentially increase during this period. However, the potential increases in emissions can be mitigated through careful management of this process and rapid removal from site.

99 The recently installed misting system will provide additional control of dust during this process (and any odour associated with manure particles) to reduce odour from this activity.

100 In my experience removal of birds does not typically result in significant increases in odour emissions from those that occur from the sheds during

normal operation (at that stage of the cycle). Bird catching and removal can involve disturbance of litter, feather and skin particles but the scale of this disturbance is fairly low relative to the disturbance of litter during shed cleanouts

101 The odour observations of Michele Dyer before and during the initial catch of a growing cycle indicated there was a small increase in the frequency of low intensity odour but that the differences were minimal.

Odour tainting laundry:

102 Deposition of sufficient odorant compounds on clothing or other drying laundry items to result in residual odour release from the items would typically require persistent exposure to reasonably high odorant concentrations. While it's possible that this has occurred at neighbouring properties historically, the potential for this to occur in the future is likely to be reduced substantially by the measures implemented and proposed in the application.

Matters raised in s42A Report

103 Matters raised in the s42A report in relation to air quality impact have been discussed in this statement evidence above. Overall, I agree with the findings of the report, in particular the following two excerpts:

> The observations of Council officers during the latter stages of a rearing cycle indicate that the character of the shed emissions appears less unpleasant than those experienced at other poultry farms around Taranaki.

104 The observations concur with my own and confirm that a high standard of management of litter is employed at the site, in excess of that employed at many poultry operations in New Zealand. The odour management regime will be further enhanced with the range of improvements proposed.

105 In particular, I agree with the s42A report's conclusion that:

> it is reasonable to expect that neighbours would not be exposed to offensive and objectionable odours as a matter of course from the farm in question.

Conditions of consent

106 I consider the conditions recommended in the s42A Report to be broadly appropriate and support their adoption in general.

107 The only suggestions I have for modifications to the conditions relate to Condition 10, which prohibits offensive or objectionable dust discharges. In relation to the dust monitoring thresholds specified in the condition. An averaging period is specified for dust deposition rate (1 day) but not for suspended dust concentrations. For clarity and certainty, an averaging period (e.g. a 10-minute or 1-hour average.) should be added to clause ii).

Dated this 28th day of January 2022

Jason Savelio Karena Pene