Before an Independent Commissioner
appointed by the Selwyn District Council

Under	the Resource Management Act 1991
In the Matter of	of Proposed Private Plan Change 50 to the Selwyn District Plan

Statement of Evidence of Donovan Van Kekem on behalf of Charlie and Sue Buttle

22 March 2017

INTRODUCTION

1 My name is Donovan van Kekem. I am the managing director of NZ Air Limited an independent air quality consultancy. I have over 13 years' specialist air quality experience.

2 I was engaged in December 2016 by submitter Charlie Buttle to prepare air quality evidence to support his submission in opposition to the proposed private plan change application (PC50) made by Fonterra Limited (the applicant) for the proposed variation of rural zone rules specific to 131 hectares of rural land through the introduction of a diary processing management area (DPMA).

3 I am familiar with the area, and have conducted a site visit on 14 December 2016.

QUALIFICATIONS AND EXPERIENCE

4 I have the following qualifications:

(a) a Bachelor's Degree in Biochemistry from the University of Canterbury; and

(b) a Post Graduate Diploma in Forensic Science from the University of Auckland.

5 I am also a current member of the Clean Air Society of Australia and New Zealand.

6 Some of my work experience which is relevant to this application is as follows:

(a) I have conducted many assessments of environmental effects (AEE's) on coal fired boiler plants for industrial clients (including Air New Zealand, the New Zealand Defence Force, and Palmer Resources).

(b) I have conducted air quality monitoring and/or assessments at number of waste water treatment plants including:

(i) Watercare's Mangere WWTP.

(ii) Watercare's Rosedale WWTP.

(iii) Watercare's, Pond 2 bio-solid cells Auckland.

(iv) Keri Keri WWTP.

(v) Wacol WWTP (Queensland Australia)

(c) I have prepared and presented evidence in support of submitters at the Fonterra Waimate hearing in April 2016.

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 Consolidated Practice Note (2014). I have complied with it when preparing my written statement of evidence and I agree to comply with it when presenting evidence. I confirm that the evidence and the opinions I have expressed in my evidence are within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

Scope of Evidence

8 The scope of my evidence is limited to potential odour effects associated with the proposed plan change and scope for expansion of the existing factory under that plan change.

9 Although the potential for adverse air quality effects extends some distance from the factory, my evidence is focused on potential adverse effects on Mr Buttle's properties.

10 I have been instructed by Mr Buttle's legal representation (Ms Sarah Eveleigh of Anderson Lloyd), to prepare technical air quality evidence to assess the potential reduction in air quality amenity values that could occur should PC50 be granted. The premise for this evidence is to be based on the worst case potential or likely expansion of the Fonterra plant which would be allowed under the proposed development plan for PC50.

11 Ms Eveleigh and Ms Liz Stewart address the relevance of this assessment to consideration of PC50. I rely on their submissions and evidence in this respect. In addition, Mrs Foote states in paragraph 27 of the Section 42A report that in her opinion "odour as it relates to amenity effects requires consideration as part of this plan change".

12 My evidence will address the following matters:

(a) A review of the assessment of environmental effects (AEE) produced by Planz Consultants (Planz) for the proposed plan change (July 2016);

(b) The scope of potential expansion which would be allowed for under PC50;

(c) Existing air quality environment;

(d) Potential for discharges to air;

(e) Assessment for potential off-site effects and proposed mitigation measures;

(f) Comments on the Section 42A Reports;

(g) Comments on the applicant's expert evidence;

(h) Conclusion.

13 In preparing this evidence I have reviewed the following material:

(a) I have read and reviewed the AEE and associated documents produced by Planz Consultants in support of PC50.

(b) I have reviewed the submissions made on the notified PC50 application

(c) I have read the Section 42A report prepared by Ms Melanie Foote on behalf of the Selwyn District Council (SDC), including the technical Memorandum prepared by Mr Andrew Curtis.

(d) I took part in expert conferencing on 23 February 2017, and reviewed the summary of the meeting.

Review of the AEE produced by produced by Planz Consultants for the proposed plan change (July 2016)

14 Adverse effects of offensive or objectionable odour on the surrounding environment of the proposed plan change have not been assessed in the Planz AEE. Rather, Planz have argued that the potential for adverse effects on air quality will be dealt with during applications for resource consents at the time of specific upgrades to the existing Fonterra plant.

15 Although the potential for odour effects has been addressed in consent applications for the existing resource consents in place for the existing Fonterra factory, no consideration as to the potential for increased odour discharges and the potential resulting effects on the surrounding environment has been included in the Section 32 report prepared by Planz.

The scope of potential expansion which would be allowed for under PC50

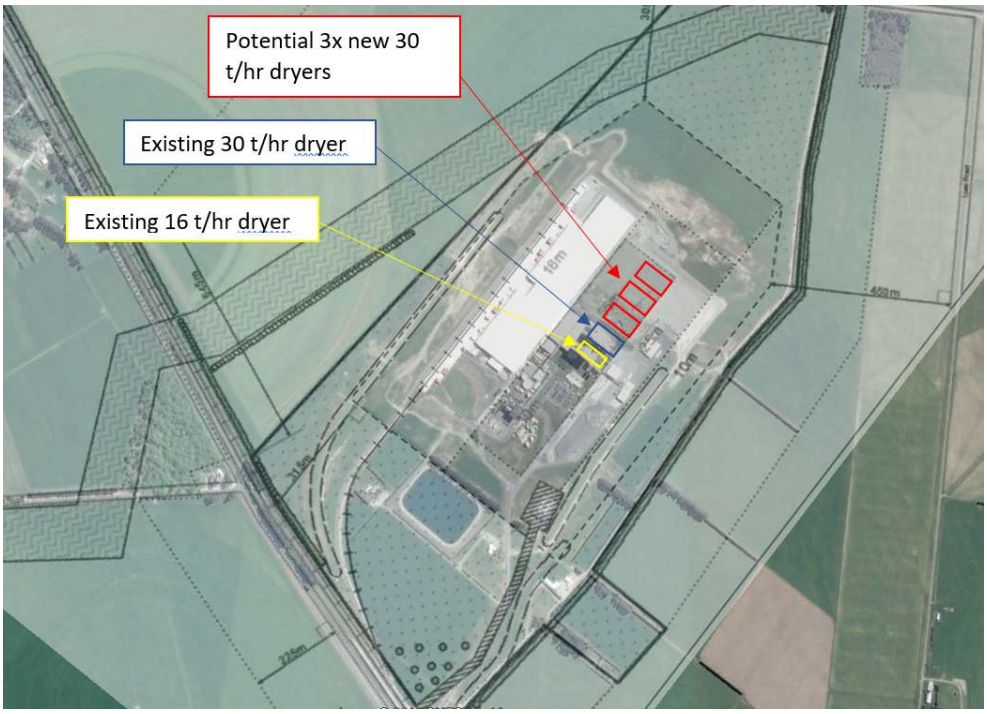
16 In Section 7.1 of the Planz Section 32 evaluation report, assumptions have been made as to maximum increase in plant size and capacity that might be anticipated or provided for under the proposed plan. This includes: "Up to 2 additional dryers (total 4 dryers) and 2 additional boilers (total 4 boilers) with associated reception, drystores, roading, infrastructure etc".

17 Currently Fonterra have two dryers on-site, a 16 t/hr and a 30 t/hr drier. The noise assessment conducted by Marshall Day Acoustics (MDA), included as Appendix 6 to the Planz report, has assumed two additional 30 t/hr dryers for the purposes of their assessment. This assumption equates to a 230% increase in plant drying capacity.

18 Currently Fonterra have two boilers on-site, a 30 MW boiler and a 45 MW boiler. It has not been expressly indicated within the Planz report or associated technical reports the potential size of the proposed additional two boilers, however if two additional 30 t/hr dryers were added it is likely that another two 45 MW boilers would be required to meet the energy demands.

19 Notwithstanding the above, the building height envelopes illustrated in the proposed outline development plan (ODP) would allow for at least three additional 30 t/hr dryers (based on the current building foot prints). This is illustrated in **Figure 1** below where the ODP is overlaid over a current aerial image of the site. This would equate to a 295% increase in drying capacity.

Figure 1. Building Envelope – Potential Expansion Scenario



20 As there is no proposed cap on factory size of production capacity proposed with the plan change and associated ODP, in my opinion a production increase of up to 295% is not unrealistic as a potential or likely worst case expansion scenario.

21 Fonterra recently applied to expand their Studholme plant milk drying capacity from 10 t/hr to 70 t/hr via the addition of two new 30 t/hr dryers.

22 Within the application the assumption is an expansion of the current operation, furthermore, the building height envelopes appear to be consistent with expanding the current operation i.e. the generation of dried milk powder as the

primary product from the site. I note that Mr Craig has also assessed the landscape effects arising from the plan change on the basis that development will be "more of the same", to the maximum extent possible within the building envelopes prescribed by the ODP.

Existing environment

23 Although the existing Fonterra factory is located in a relatively remote rural environment with large separation distances between the factory and the nearest sensitive receptors (generally greater than 1,000 m) it appears that the current factory is contributing to significantly reduced amenity on the surrounding environment.

24 I have reviewed the Environment Canterbury record of complaints associated with the Fonterra Darfield factory. A copy of this record is included as **Attachment A**. While compliance of the existing plant is obviously a matter to be resolved by Environment Canterbury, it provides useful information regarding the potential effects that may arise from expansion of the plant.

25 On the 25th of October 2013 a complaint was logged through the pollution hotline and investigated on-site by an Environment Canterbury enforcement officer. During this investigation, the enforcement officer detected 'offensive/objectionable' odour beyond the boundary of the Fonterra factory, adjacent to Mr Buttle's stock yards (see notes in PE20134558 of **Attachment A**), which is a breach of the existing air discharge consent Condition 3.

26 In the officer's notes for this investigation it was noted that multiple complaints had been received by the caller whom had logged the complaint, however it does not appear that all the calls have been logged or provided in the records.

27 A number of other complaints were logged but not substantiated due to an enforcement officer not being available to visit the site or the wind conditions changing between the time the complaint was made and the enforcement officer contacting the complainant.

28 On 8th October 2014 a complaint regarding odour from the wastewater pivots was logged with Fonterra staff. Fonterra undertook remedial actions to address this complaint. They installed a chlorine dioxide dosing unit to the irrigator flushing system. However, this unit failed during the 2015-2016 season resulting in a further odour complaint.

29 My client, Mr Buttle, has made several complaints to Environment Canterbury relating to offensive or objectionable odour on his property. Unfortunately given the remoteness of Mr Buttle's property relative to the Environment Canterbury offices, often the wind conditions which result in adverse odour effects on his

property change between the time at which the complaint is lodged and the time when an enforcement officer can make it to site.

30 As a result, Mr Buttle was provided an odour diary template in August 2014 to record the frequency, duration, character, and intensity of odour events on his property. This odour diary is included as **Attachment B** of my evidence.

31 Mr Buttle recorded odour observations for approximately three months from early August to early November 2014. Over this three month period Mr Buttle observed odour events on 30 occasions. The odour events ranged in duration from a few hours to most of the day. The odour character was described mostly as “tangy or sickly milk”. The odour intensity ranged from ‘distinct’ to ‘very strong’. The hedonic tone was mostly characterised as ‘-3’ or very unpleasant.

32 Mr Buttle provided the results of this odour diary to Environment Canterbury at the completion of the survey. Mr Buttle received a response from Environment Canterbury stating that Environment Canterbury had consulted with Fonterra and that no plant malfunctions had occurred during the period Mr Buttle had made observations. Fonterra requested that locations for the observations were included in any further observations. Environment Canterbury’s enforcement officer, Eva Harris, stated that she had not detected any offensive or objectionable odour beyond the boundary of the site during any of her site visits. However, she did not state how many site visits/observations she had made.

33 After having made complaints both to Environment Canterbury, Fonterra, and having completed a comprehensive odour diary, all to little or no effect, Mr Buttle is experiencing complainant fatigue (as described in the Ministry for Environment Good Practise Guide for Assessing & Managing Odour (2016)). Complainant fatigue occurs when the complainant feels like making complaints is not making any difference to the situation.

34 Hence Mr Buttle has not made any complaints to the Environment Canterbury pollution hotline in recent years despite regular occurrences of nuisance odour occurring on his property.

35 Mr Buttle has also stated that he has on occasion been able to detect faint sickly sweet/tangy milk odour within his L2 zoned land, approximately 2,800 m to the south east of the factory.

36 During my site visit I conducted some odour surveys around the plant generally in accordance with the German Method VDI 3940 “Determination of odorants in ambient air by field inspections”. The results of this survey are included as **Attachment C**.

37 Although the wind conditions were variable during my assessment I was able to detect odours with a similar character and intensity to those described by Mr Buttle in his odour diaries and those observed and recorded by the enforcement officer on 25/10/13.

38 I detected odour off-site in two distinct locations under two different wind conditions. The odour character, a tangy/sickly sweet milk smell, is assumed to be coming from the dryer stacks due to the wind trajectories during my assessment and as the other site based odour sources (discussed below) do not produce an odour of this character.

39 I have spoken with a colleague whom works as a stack tester and has experience testing milk dryer stacks. This colleague has described the odour being emitted from milk dryer stacks as the same 'tangy/sickly sweet' odour detected by myself and described by Mr Buttle and the enforcement officer.

40 Mr Buttle advises that he has also experienced the odour at his residence. It is my opinion that should the character and intensity of odour which I detected during my site visit occur at a residential dwelling, then it could be described as offensive or objectionable.

41 In assessing nuisance odour against the 'offensive or objectionable' threshold, it is recommended good practise to undertake a frequency, intensity, duration, offensiveness, and location (FIDOL) assessment[1]. Taking this method, the character of the receiving environment, and all available information regarding existing odour discharge into account, in my opinion the existing odour discharges are at or about the offensive and objectionable threshold beyond the site boundary and potentially at Mr Buttle's residence on occasion. Therefore, there is little or no capacity in the surrounding environment for additional discharges of odour from any expansion of the Fonterra Darfield factory which might occur under PC50.

Potential for Odour Discharge to Air

42 Based on the information I have reviewed and my experience with similar operations I consider the main sources of odour discharge from the existing Fonterra plant are:

(a) The dryer exhaust stacks.

(b) The waste water treatment plant.

[1] Ministry for Environment Good Practise Guide for Assessing & Managing Odour (2016)

(c) The coal boiler stacks.

(d) The waste water irrigation system.

Milk Dryers

43 The potential odour discharges from the dryer stacks have been discussed above. The volume of air being discharged from these stacks is significant (Dryer 1 discharging ~83 Nm^3/s and Dryer 2 discharging approximately ~139 Nm^3/s).

44 The above ground level heights of the dryer stacks are elevated (47m and 56m), which will improve dispersion. This also means that in general the highest predicted off-site concentrations from these stacks will be at distance from the stacks.

45 To my knowledge there is no data available for odour discharge rates from milk dryers and therefore it is difficult to estimate potential ground level concentrations from the existing operation and extrapolate these to the potential plant expansion under PC50.

46 However, based on the odour observations discussed earlier, the height of the stacks, and the exit velocities, the concentrations would need to be significant to be detectable at the distances where detection has occurred (enforcement officer – cattle yards ~1,400 m, Mr Buttle, residence ~1,500 m, my observations ~900 m).

Waste Water Treatment

47 To date I have not found any information which would suggest that the waste water treatment plant (WWTP) is generating off-site odour nuisance in its current configuration.

48 However, I am aware that the treatment of wastewater at the Fonterra Studholme and Edendale plants has been the source of a number of off-site complaints in the past.

49 The Victoria Environmental Protection Agency (Vic EPA) has produced "Environmental Guidelines for the Dairy Processing Industry" (1997). Within this guideline, the suggested buffer distance between dairy processing operation WWTP's and residential receptors should be between 200 – 2,200 m dependant on the flow rate and strength of the treated water. Mr Buttle's residence is approximately 1,200 m from the existing WWTP.

50 Historical odour complaints from dairy factory WWTPs have related to upset conditions within the treatment system, resulting in anaerobic decomposition of the nutrients in the waste water. This anaerobic decomposition results in the

release of hydrogen sulphide which has a distinct ‘rotten egg’ smell at low concentrations.

Boilers

51 Odour emissions from coal boiler emissions are generally related to the sulfur content in the coal. The resulting combustion emissions can have a sulphurous smell due to the release of SO_2 gas.

52 Currently Mr Buttle has described occasional instances where he has detected odours of this nature on his property.

53 Fonterra currently burn a relatively low grade of coal (calorific value 18-19 MJ/kg) with an average sulfur content of approximately 0.5%.

Waste Water Irrigation

54 Odour from the waste water irrigation system has caused off-site complaints in the past, this has been due to waste water remaining in the pipes for a period of time and turning anaerobic. When the stagnant wastewater is subsequently irrigated over a large area the resulting odour release can be intense and wide spread.

55 Fonterra have put in place mitigation measures to reduce this potential, however these mitigation measures have failed at least once in the current plant’s history.

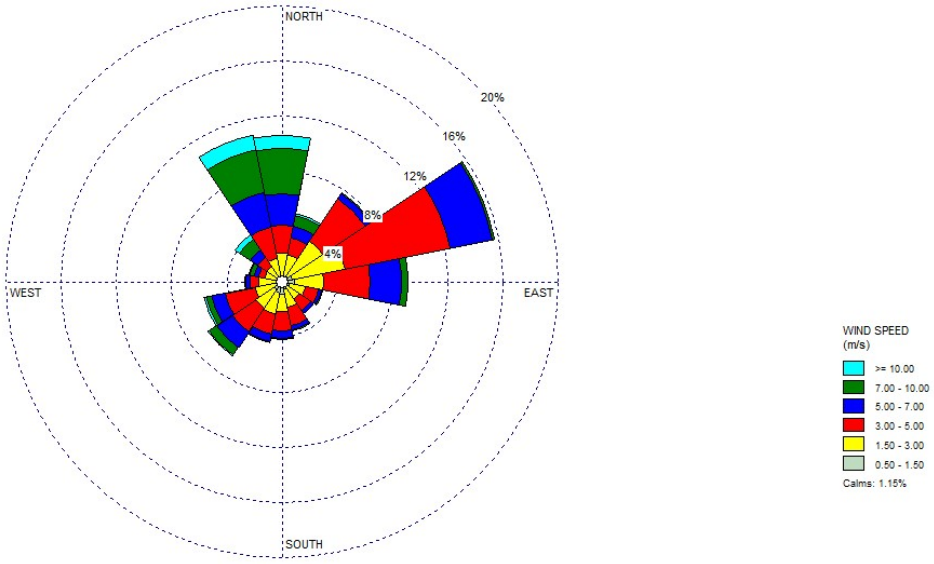
Potential for adverse odour effect under PC50

56 As discussed earlier the odour emissions from the current plant have resulted in off-site nuisance complaints and at least one breach of the existing consent Condition 3 (no offensive or objectionable odour to be detected beyond the boundary of the site in the opinion of an enforcement officer).

57 Mr Buttle states in his evidence that he can detect odour from the dryer stacks on his property during most north westerly wind conditions when the dryers are operational. North westerly winds are more prominent in Darfield than in other areas of Canterbury. A wind rose from the Darfield Forest Plains weather station is presented in **Figure 2**.

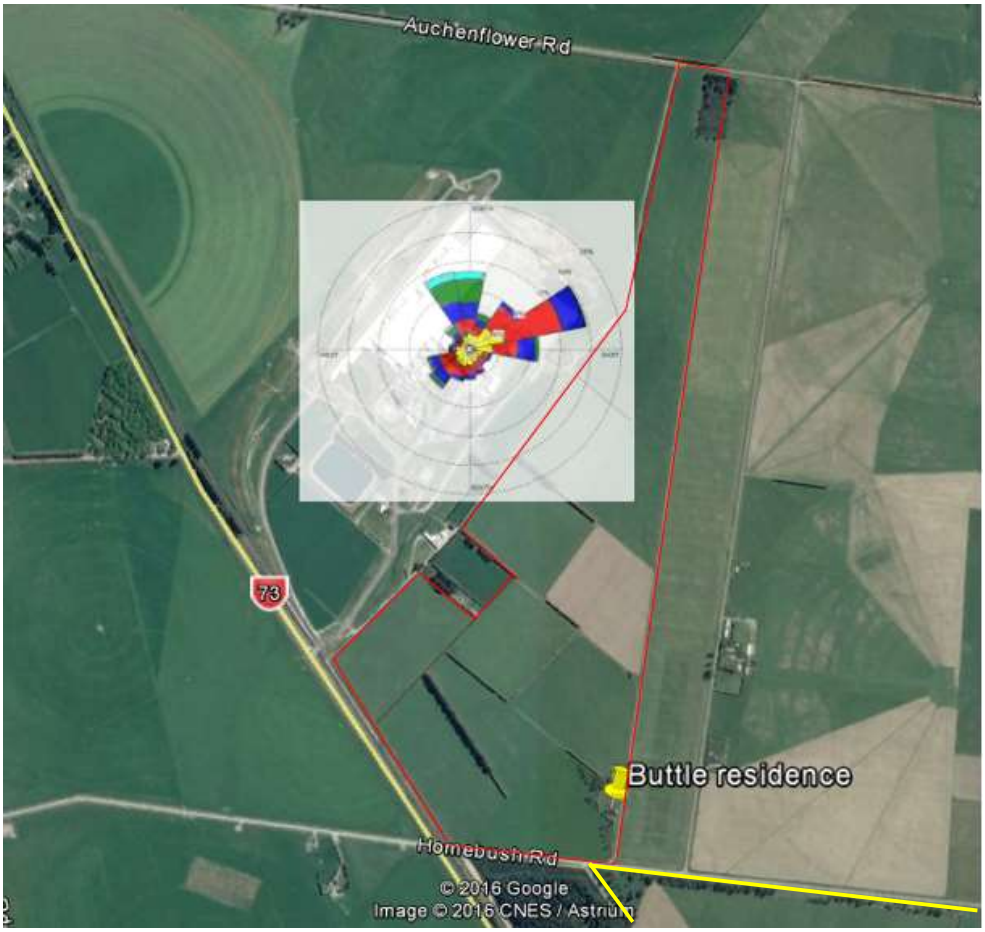
58 The Darfield Forest Plains weather station is located approximately 2.6 km south of the site and demonstrates that approximately 20% of the wind comes from the north and north northwest. The windrose also demonstrates that the majority of the strong winds (greater than 7 m/s) come from these directions.

Figure 2. Darfield Forest Plains wind rose 2013 – mid 2015



59 To demonstrate what this means for Mr Buttle's property I have overlaid this windrose over the existing dryer stacks on an aerial image in **Figure 3** below. This image clearly demonstrates that a large portion of winds (especially stronger winds) blow towards Mr Buttle's property (outlined in red). Mr Buttle owns much of the land to the south and east of the existing Fonterra factory. In addition, Mr Buttle also owns some L2A zoned land to the south east (outlined in yellow) which is consented to be developed into residential dwellings with a minimum lot size of 10,000 m^2.

Figure 3. Windrose overlay



60 Aspects of Mr Buttle's property are downwind from the factory when winds blowing from the south west all the way through to north northeast (or 214 – 34 degrees of the 360 degree compass). This equates to approximately 48% of the winds as measured at the Darfield Forest Plains weather station.

61 As I have discussed earlier the odour that is most frequently detected on Mr Buttle's property is being generated from the dryer stacks. The odour being discharged from these elevated sources will be dispersed variably depending on a number of factors including the mixing height, the presence and height of any inversion layers, the stability class of the air, building downwash effects, etc.

62 It is likely that elevated odour concentrations occur on Mr Buttle's property during a variety of meteorological conditions given the expanse of land owned by My Buttle. For example, peak concentrations at Mr Buttle's residence may occur during unstable daytime conditions (Pasquill class A and B) where convective cells drag plumes closer to ground level at distance from the emission point.

63 Given the complexities of the likely dispersion of odours generated from these sources, it is not possible to estimate the actual locations of peak odour concentrations or frequency of those occurrences without undertaking atmospheric air dispersion modelling. However, on my site visit it was clear to me that there was a distinct area downwind of the plant where odour was observable. During the warm daytime unstable meteorological conditions when I was on-site, odour was not stronger the closer you get to the plant, but was detectable within a defined area some distance from the emission sources.

64 In order to quantify the anticipated odour effects arsing from expansion of the plant, in my professional opinion it would be necessary to conduct conservative atmospheric air dispersion modelling to demonstrate the existing odour levels generated from the operation of the Fonterra site, followed by further modelling to demonstrate the potential increase in off-site odour concentrations associated with the maximum allowable increase in plant size under PC50. The applicant is best placed to undertake this modelling, as it has the necessary input information.

65 This would clearly demonstrate the potential increase in effects on the amenity values of neighbouring property owners. Should the increase in adverse effects be unacceptable, Fonterra should demonstrate the mitigation measures they propose to implement to ensure odour levels remain below the offensive or objectionable threshold beyond the boundary of their site.

66 Fonterra's existing operation and its associated mitigation measures and controls are not containing odour emissions within the existing site boundary. I agree with Mr Curtis that the current consent condition and legislation in New Zealand does not require 'no odour' beyond the boundary of an industrial or trade premises. However, as discussed earlier the information I have gathered suggests that Fonterra are at or over the offensive or objectionable threshold. Therefore, the surrounding environment is already experiencing reduced amenity values than what would be expected within a rural zone. It is my opinion that there is little or no 'room' in the receiving environment for additional odour discharges/emissions.

67 Should Fonterra construct two to three more dryers within the proposed 55m building height restriction zone applied for under PC50, it is likely that odour emission rates from the dryers could increase by a factor of 230% (2 more 30 t/hr dryers) or maybe even by 295% (3 more 30 t/hr dryers).

68 These odour emission rates are likely to result in ground level odour concentration increases of a similar scale. These increased ground level odour concentrations are likely to greatly increase; the area at which odour from the dryers can be detected, the intensity at which these odours are experienced off-site, and the frequency of those detections.

69 It is my opinion that should the scale of plant increase allowed for under PC50 occur without the addition of alternate more effective mitigation measures, that there will be significant increases to the frequency, intensity and duration of offensive odours detected beyond the boundary (as relevant under a FIDOL assessment).

70 I am unable to quantify the actual increases in these without undertaking a dispersion modelling exercise. However, from the evidence of the existing level of effect and the potential increase in scale/discharge rates, it is clear to me that the potential for further adverse effect is significant and likely to be widespread.

71 In terms of the offensiveness and location aspects of a FIDOL assessment, as discussed earlier, Mr Buttle owns L2 and L2A zoned land to south east of the Fonterra factory. Mr Buttle intends to extend his existing subdivision within this land to the boundary of Homebush road. The level of amenity value that is expected in L2 and L2A zoned land is higher than that of rurally zoned land. This is discussed in further depth in Ms Stewart's evidence.

72 If odour nuisance effects where to extend to within this L2A zoned land (only 200 m beyond Mr Buttle's residence) the location of potential effects would be important. The sensitivity to odour nuisance for a variety of receiving environments is listed in Table 4 of the Ministry for Environment Good Practise Guide for Assessing & Managing Odour (2016). Residential land is listed as being highly sensitive, whereas rural land is rated as "Low for rural activities; moderate or high for other activities".

73 Therefore, the L2 and L2A zoned land would be considered more sensitive to odour discharges from the Fonterra factory and the potential for offensive or objectionable effects within this land is increased.

74 Much of the discussion above is centred on potential effects from odours discharged from the dryers. However, should the scale of plant increase discussed earlier occur, there will need to be a corresponding increase in wastewater treatment and disposal, and energy plant capacity. All of these have the potential to emit odour.

75 Of particular concern is the waste water treatment and disposal. Is it Fonterra's intention to increase the current water application to land? If so where would this occur? Would it occur closer to Mr Buttle's L2 or L2A zoned land? What controls are proposed to prevent historic odour releases from this process? Are these controls adequate given the proposed location of the discharges and the sensitivity of the receiving environment?

76 With substantial increases in the WWTP it is likely that the recommended separation distances discussed earlier (paragraph 49) would increase.

Furthermore, the requirement for higher levels of mitigation is warranted as the potential or risk of effect increases with scale.

Comments on the Section 42A Reports

77 I agree with Ms Foote that odour is a relevant consideration before the commissioner for this proposed plan change.

78 Ms Foote relies on Mr Curtis's review of the air quality aspects of PC50. Mr Curtis's review is primarily focused on planning aspects of PC50, focussing on the regional council requirements and controls. Mr Curtis' evidence does not contain any discussion about potential for adverse or nuisance odour effects under the potential expansion of the plant allowed for under PC50.

79 Ms Stewart disagrees with Mr Curtis (see paragraph 172 of her evidence) and considers that the District Plan rules and matters of control/discretion are wider than those considered by the Regional Council when addressing potential for odour effects. And therefore, potential for odour effects need to be established to assess these effects against the relevant District plan provisions.

80 Mr Curtis also comments in Section 6 of his memorandum *"Concerns were also raised about odours from the milk dryers, as far as I can see there have been no complaints made that might be associated with the odour."* As presented earlier in my evidence I have discussed this record and odour potential at length.

81 Mr Curtis also states *"there is no control that I am aware that might be included in the proposed Plan change, over and above the controls already in the resource consents which could have prevented the odours from occurring, or resulted in a different outcome. i.e. Fonterra implementing process changes to prevent the odours occurring again."*

82 I disagree with Mr Curtis in this respect. In respect of land use planning controls, an appropriate separation distance between the existing or proposed sources of odour and neighbouring residences could be established (i.e. applying waste water to land further from neighbouring residences or sensitive activities, or positioning any new on-site facilities/building height envelopes further from the neighbouring properties, etc), or a limit on potential for expansion could be imposed to achieve effects within an acceptable range.

Comments on the applicant's expert evidence

83 Whilst I agree with much of Mr Richard Chilton's evidence, Mr Chilton has neglected to include aspects of the MfE Good Practice Guide in his paragraphs 16 – 18. Ms Stewart has included these omitted aspects of the Guide in her evidence paragraph 72. Territorial authorities have the main responsibility for land

use with respect to potential odour effects, which includes the location of activities. Are the proposed building height envelopes (assuming a worst case likely emission scenario within these envelopes) positioned sufficiently far away from surrounding sensitive land uses to mitigate potential adverse effects?

84 Mr Chilton states that he has been extensively involved in undertaking assessments for the existing plant, but upon review of these assessments I find that potential odour emissions from the dryers were not considered. In fact, the assessment of potential odour emissions from the plant as a whole was relatively light in my opinion and a lot of reliance is placed on the "no offensive or objectionable odour beyond the boundary in the opinion of an Environment Canterbury enforcement officer" condition.

85 As discussed earlier this condition has practical limitations in that an enforcement officer cannot be on-site at all times during production. Therefore, it is common for industrial activities whom have significant odour discharge potentials to have a number of other conditions stipulating mitigation measures and operational procedures to limit potential for odour discharge.

Conclusion

86 The proposed introduction of PC50 increases the capacity for Fonterra to expand their existing milk processing plant substantially. The application has not included an assessment against the territorial authorities' responsibility to maintain amenity values and avoid reverse sensitivity effects of potential odour discharges from land use activities.

87 Mr Buttle is concerned that PC50 allows for extensive expansion of the existing milk processing plant, which will likely increase the potential for odour emissions from the process.

88 I have proceeded on the basis of advice from Ms Stewart and Ms Eveleigh that odour and its potential effect on surrounding amenity values is a relevant consideration in determining a plan change (also agreed by Ms Foote). I have also been advised that the assessment of effects for a plan change should proceed on the basis of the full extent of development enabled by the change.

89 Although the ODP does not contain any specific expansion plans, assumptions have been made in the application of a maximum expansion of in excess of double the current milk drying capacity. The building height envelopes appear to allow for approximately three times the milk drying capacity. In my opinion either of these development scenarios would result in a significant reduction in amenity value on Mr Buttle's land due to the potential increase in odour emissions and hence off-site odour concentrations.

90 Increased odour emissions are likely to occur from the operation of more milk dryers, and may also arise from an increased energy plant, a larger WWTP, and increased waste water application to land.

91 The existing environment surrounding the existing Fonterra plant appears to be 'saturated' in terms of odour effects as supported by the record of complaints, Mr Buttle's odour diary observations, an Environment Canterbury enforcement officer observation, and my own on-site assessment. Any additional odour discharge from the plant is likely to push the off-site odour effects over the tipping point of the 'offensive or objectionable' threshold.

92 Under the scenario of doubling or tripling the plant capacity, potential odour effects are likely to extend into the L2A zoned land owned by Mr Buttle.

93 No controls of potential odour emissions are proposed as part of PC50, rather reliance on the Regional Council air discharge consenting approach is favoured by the applicant. I consider there are other land use control methods which could be implemented at this district planning stage, which will be largely precluded at the subsequent regional consenting stage.

94 In my opinion the potential for adverse effects on amenity values of surrounding land users as a result of potential additional odour discharges from the site are significant and wide ranging. The applicant has failed to adequately identify and assess these at the resource consenting phase of the current plant, and have not adequately assessed those potentially allowed for under PC50. No controls or alternatives are presented which would mitigate potential adverse effects from potential odour discharges associated with PC50.

Donovan Van Kekem

14 March 2017

Exhibit A – ECAN complaint record

This report uses the Complaint Received Date field to select records using the date range entered. The Description of Incident and Responsibility fields are searched to find the text entered in Responsiblity 1 and Responsibility 2.

PE Number	Status	Complaint Received Date	Incident Start Date	Incident Start Time	Received After Hours?	Overall Assessment of Event	Event Outcome	Description of Incident	Responsibility	No. Complaints	General Location Description	Territorial Authority	Actions
PE20144176	Event Closed	08/10/2014	08/10/2014	08:00	Yes	Event not Substantiated	Noted	0800 - This email is to notify you, as required under Condition 40(f) of CRC103594, that a complaint was received in relation to odour coming from the Fonterra Farm waste water pivots. A neighbour of the Fonterra Farms rung on the 09 October 2014 to inform of offensive smells coming from the Fonterra waste water pivots on the 8 October 2014 at approx. 8am. Remedial actions have been taken to reduce the odour. If you would like any further information please contact myself.	FONTERRA FARM DARFIELD	1	RACECOURSE HILL, DARFIELD	Selwyn District Council	AE: 10/10/14 - received via the Environmental Team Lead at Fonterra Farms. Remedial actions have been taken to reduce the odour. AE: 10/10/14 - Email added to TRIM C14C/188010 EH: noted for record on consent
PE20134558	Event Closed	25/10/2013	25/10/2013	08:45		Event Substantiated	Noted	The complainant phoned to say that strong smells emitting from the Fonterra Factory. This occurs everytime there is a NW wind. This is very bad, strong sickly milk smells.	FONTERRA DARFIELD	1	3792 WEST COAST ROAD, DARFIELD	Selwyn District Council	MJS - this complainant is a regular and this is the second complaint this week. MS: Called back at 9:20am to see if he had the odour at the moment. Caller was back at the house and couldn't smell anything. Caller thinks that the wiind has shifted around to a more North Easterly direction but will keep an eye out throughout the day to see if the Nor West returns. I said to call me directly if he finds that the odour is getting stronger/is persistant through today and I would come out. I also asked if caller can recal what the smell was like last time I had come out, and how it compared to that. Caller said it was pretty similar but it can be a lot worse now that they have two driers up and running. 25/10/2013 - Another call at 12pm said that the smell was back. Left at 12:15 to visit property. Arrived at callers property at 1pm. Met with caller and went down Loes Road and stopped in a coupple of places where caller thought the odour was strong enough for the assessment. Ended up doing it next to the cattle yards and sheds. Noticed a distinct odour for the first half of the assessment and then the wind changed direction. I consider that should that strenght of odour be detected on a regular basis that the smell could be considered as offensive/objectionable. The smell was sickly,sweet milky smell like strong lambs milk powder but also a bit latex glovey. I found the smell to be -1 on the hedonic scale and 2-3 in strength. Discussed the use of odour diaries with caller and how often he is getting smells etc. Said I would give my opinion over to team leader about what I smelt today for follow up. Also said I would recommend giving odour diaries to other surrounding properties. As I was leaving the area drove along to see if I could smell in various places and it was of similar intensity and tone whereever was directly down wind (NW to W winds but alternated between those directions). I consider that the smell is offensive/objectionable beyond the site boundary from my site visit today. Team leader to follow up with Fonterra next week. Note: team leader has spoken to Fiona at Fonterra 29/10/2013 Odour survey C13C/158157
PE20123974	Event Closed	17/12/2012	17/12/2012	08:30		Event not Substantiated	Noted	Odour This morning at 8:30 am in the mdiddle of the paddcok behind Fonterra Plant. Smell was very strong this mroning and it was continuous. Strong NW wind.	FONTERRA DARFIELD	1	DERFIELD	Selwyn District Council	AB 17/12/12 contacted complianant at 11:30. complainant stated that the smell was not present anylonger. Also mentioned that the smell was present around the house on Sun in the afternoon. AB 17/12/12 AB reported the smell to Fonterra. Operating as normal until 9:30 when they started doing maintenance.
PE20130993	Event Closed	25/03/2013				Event Forwarded to another Agency	Noted	Customer has called to complain about sickly milk smell coming from the Fonterra Factory in Darfield - says its at about 6 on the scale and he has noticed it all weekend but particularly bad this morning	FONTERRA DARFIELD	1	DARFIELD	Selwyn District Council	
PE20134434	Event Closed	17/10/2013				Event not Substantiated	Noted	Odour coming from Fonterra Plant - 8:30 in the paddock close to the plant 9:00 around the house	FONTERRA DARFIELD	1	3792 WEST COAST ROAD, DARFIELD	Selwyn District Council	AB 17/10/2013 Contacted complianant. They stated that the smell is around the house. I advsied that I could not go to visit the site today, but will try tomorrow. I have sent him a copy of the odur diary in order to keep track of odour to plot trends.

Total Rows 10

Exhibit B – Buttle Odour Diary

Odour Diary **Name/Location:** Buttle, Horsebush Road.

Date	Time	Wind Direction	Wind Strength	Odour Character	Odour Intensity	Odour Tone	Odour Duration	Alleged Source/Further Notes
7·8·14	8:00 AM	NW	Light	Tangy Milk	3	-3		Fonterra, Dairfell.
6·8·14	"	"	"	" "	3	-3		"
7·8·14	2:00 AM	NW	Light	" "	3	-3	morning.	"
8·8·14	7:30 AM	NW	Light	Barrel Fuel, Sulphur	3	-1	morning	" Baker.
7·8·14	8:00 AM	NW	Light	Tangy Milk	3	-3	800 - 1000 AM	Dryer Drf.
9·9·14	6:45 AM	NW	Light	" "	"	"	3 hrs.	Dryer Drf.
9·9·14	7:00 AM	NW	Light	" "	3	-3	7:00 AM - 11:00 AM	" "
9·9·14	7:00 AM	NW	Light	" "	3	-3	AM - PM	" "
9·9·14	7:30 AM	NW	med	" "	3	-3		" "
9·9·14	7:30 AM	NW	med	" "	3	-3	AM PM	" "
9·9·14	5:00 PM	NW	med	" "	3	-3		" "
8·9·14	6:46 AM	NW	Light	" "	3	-3		" "
9·9·14	7:00 AM	NW	med	" "	3.5	-3		" "
9·9·14	8:00 AM	NW	Light	" "	3	-3	AM	" "
9·9·14	2:00 PM	NW	Light	" "	3	-3	AM-PM	" "
9·9·14	8:00 AM	NW	Light	" "	3	-3	AM.	" "

Scale of Intensity

6	Extremely strong
5	Very strong
4	Strong
3	Distinct
2	Weak
1	Very weak
0	No odour

General Hedonic Tone

-4	Extremely Unpleasant
-3	
-2	
-1	
0	Neutral
1	
2	
3	
4	Extremely Pleasant

Site Sketch (if applicable)

Odour Diary **Name/Location:** Buttle, Horsebush Road.

Date	Time	Wind Direction	Wind Strength	Odour Character	Odour Intensity	Odour Tone	Odour Duration	Alleged Source/Further Notes
25·9·14	2:00pm	NW	Light	Sickly milk	4	-3	PM	Drf Dryer Fonterra
26·9·14	8:00AM	NW	Light	" "	4	-3	AM/PM	" " "
27·9·14	2:30AM	NW	Light	Sickly Milk	4	-3	AM	Drf Dryer "
2·10·14	8:00 AM	NW	Light	" "	4	-3	AM PM	" "
5·10·14	4:15pm	NW	med	" "	4	-3	PM	" "
5·10·14	5:30PM	NW	med	" "	4	-3	20 mins	" "
2·10·14	10:00 AM	NW	Light	" "	4	-2	1 hr.	" "
3·10·14	8:00 AM	NW	Light	" "	3.5	-2	2 hrs.	" "
4·10·14	7:00 AM	NW	med	" "	4	-3	AM	" "
7·10·14	8:00 AM	NW	med	" "	4	-3	AM.	" "
1·10·14	8:30 AM	NW	med	" "	4-5	-3	AM	" "
11·11·14	8:00 AM	NW	med	" "	4	-3	AM/PM	" "
11·11·14	9:00 AM	NW	Strong	" "	5	-3	AM/PM	" "
11·11·14	8:00 AM	NW	Strong	" "	4-5	-3	AM/PM	" "

Scale of Intensity

6	Extremely strong
5	Very strong
4	Strong
3	Distinct
2	Weak
1	Very weak
0	No odour

General Hedonic Tone

-4	Extremely Unpleasant
-3	
-2	
-1	
0	Neutral
1	
2	
3	
4	Extremely Pleasant

Site Sketch (if applicable)

Exhibit C – NZ Air odour investigation

Darfield Odour Investigation

14 DECEMBER 2016

Table of Contents

Introduction

NZ Air Limited (NZ Air) has been engaged by Mr Buttle to provide air quality technical advice and write independent expert evidence for the upcoming Fonterra Darfield plan change application hearing.

Mr Buttle claims that there has been extensive offensive/objectionable odours on his property as a result of the Fonterra Darfield factory's emissions. Mr Buttle states that every time there is a north westerly wind and the milk dryers are operational, he can detect a tangy sickly sweet milk odour on his property. Mr Buttle owns much of the property adjacent to the Fonterra factory to the south and east of the site.

As part of my site visit I undertook an assessment of the odour at four locations around the plant. I also made observations at a further three locations. These locations are indicated in **Figure 1**.

Figure 1 Monitoring locations

Methodology

I attended the site between 1:30pm and 3:15pm. I have had my nose calibrated in accordance with AS/NZ 4323.3:2001 and it is within the acceptable range for making odour assessments.

The odour investigation was conducted loosely in accordance with the German Method VDI 3940 "Determination of odorants in ambient air by field inspections" and the guidance in the MFE "Good practice guide for assessing and managing odour in New Zealand" 2016.

On the date that I attended site there was a light breeze prevailing from the north (however there was some variations in wind direction during the course of the investigation which ranged from northly to easterlies). It was warm (approximately 25 deg C) and overcast with brief patches of sunshine.

I conducted a 360 degree observation of the site, stopping to make formal observations at a number of locations. Observations were made at three downwind locations and one upwind location (locations 1-4 see **Figure 1**). Each observation consisted of 60 records of odour intensity and character (one record every 10 seconds over 10 minutes). Odour intensity and character were recorded utilizing the descriptors in **Table 1** and **Table 2**.

Table 1 Odour intensity scale

Odour Intensity Scale	
Intensity Level	Odour intensity
1	Very Weak
2	Weak
3	Distinct
4	Strong
5	Very strong
6	Extremely Strong

Table 2 Odour character descriptors

Odour Character Descriptors			
1	Fragrant	21	Like blood, raw meat
2	Perfumy	22	Rubbish
3	Sweet	23	Compost
4	Fruity	24	Silage
5	Bakery (fresh bread)	25	Sickening
6	Coffee-like	26	Musty, earthy, mouldy
7	Spicy	27	Sharp, pungent, acid
8	Meaty (cooked, good)	28	Metallic
9	Sea/marine	29	Tar-like
10	Herbal, green, cut grass	30	Oily, fatty
11	Bark-like, birch bark	31	Like gasoline, solvent
12	Woody, resinous	32	Fishy
13	Medicinal	33	Putrid, foul, decayed
14	Burnt, smoky	34	Paint-like
15	Soapy	35	Rancid
16	Garlic, onion	36	Sulphidic
17	Cooked vegetables	37	Dead animal
18	Chemical	38	Faecal (like manure)
19	Etherish, anaesthetic	39	Sewer odour
20	Sour, acrid, vinegar	40	Other (record description)

The field sheets are included in **Appendix A**. In addition to these formal observations, three informal observations were made at locations A, B and C in **Figure 1**.

Results

During the sampling period the milk dryers appeared to be operational as the roof flaps were open.

Location 1

This location is approximately 900 m south-southwest of the milk dryer stacks. At the time observations were made at this location a moderate breeze was blowing mostly from the north. Odour was detected in bursts. The maximum intensity was 4 (strong) on the intensity scale, the remainder of the odour detected in each ‘burst’ was intensity 2-3 (weak to distinct). The majority of the character was described as ‘sweet, tangy’ and was consistent with the characteristic odour of from milk dryers.

Location 2

Location 2 was approximately 800 m south of the dryers. Minimal odour was detected at this location primarily as winds were blowing mostly from the north east during this observation.

Location 3

This location was approximately 900 m west-southwest of the dryer stacks. The wind had shifted to coming from the east – northeast. Similar odours and intensities and characters were detected at this location to those detected at Location 1. Odour intensities of 4 (strong) were detected at this location again with bursts containing intensities of 2-3 (weak to distinct). The odour character was mostly “sweet, tangy, sickening”.

Location 4

This location was selected to be representative of an upwind monitoring location for the survey to ascertain if there were any other odour sources in the vicinity of the plant which may have been contributing to the downwind odours detected. Two 10 second periods contained weak sweet odours. There were some paddocks of clover in flower which produced a mild sweet odour.

Location A

Brief observations were made at this location for a period of approximately 3 minutes. This was the closest downwind boundary to the dryer stacks. No discernible odour was detected at this location. This is likely to be due to the height of the discharge stacks (approx. 55 m above ground level).

Location B

Brief observations were made at this location for a period of approximately 3 minutes. This site was downwind from the waste water treatment ponds and was selected to observe potential odours associated with this process. No discernible odour was detected at this location.

Location C

Brief observations were made at this location for a period of approximately 2 minutes. This site was downwind from a large clover paddock which was emitting intermittent mild sweet odours. Therefore some of the sweet character of the odours detected in the downwind observations may have been associated with the clover odours.

Discussion

It is generally accepted that odour with a character that could be considered offensive with an intensity greater than 3 can be considered offensive and objectionable, dependent on the frequency and duration of the odour emissions in conjunction with the location in which they occur.

Odours consistent in character to those described by Mr Buttle were detected during my site visit. The odour is unique and difficult to describe. When it is mild in intensity it can be described as a sickly sweet tangy milk smell. But as the intensity increases the odour is less sweet and more sour/tangy and can be similar to the smell of vomit.

The odour appeared to be confined to a relatively small area downwind from the dryers. This is likely to be due to the atmospheric dispersion conditions during the site visit. The likely turbulent convective currents in conjunction with elevated stacks and building downwash effects would have been producing variable ground level concentrations at distance from the source.

In my opinion the odour character observed does not resemble any rural type odours common to the rural environment. This is especially true when odours are above an intensity of approximately 3 on the intensity scale. The odour could be described as offensive at or above an intensity of 3. Should odours of the intensity and character detected at locations 1 and 3 of this assessment occur at a residential dwelling they would most definitely be considered as offensive and objectionable despite being intermittent or infrequent.

Should these odours be above intensity 4, they could be considered offensive even in a regular working environment (i.e. a working farm where brief exposures to the odour occur).

Conclusion

Odours associated with the milk drying process at the Fonterra Darfield factory were detected at two different downwind off-site locations. These observations were made under two differing wind conditions.

In my opinion based on the odour character detected (its offensiveness) and the intensity of odour detected at two separate downwind locations the odour was approaching the offensive or objectionable threshold.

Should odours of this character and intensity occur, even infrequently, at a residence or alternate sensitive receptor they would meet the offensive and objectionable threshold as described in Chapter 3 of the Natural Resources Regional Plan and the proposed Canterbury Air Regional Plan.

Appendix A – Field sheets

Odour Diary Record Sheet

Sunny / some cloud

Name: Duk

Sample site: Paddock (2)

Date (dd/mm/yy): 14/12/16

Sample Start Time (hh:mm): 14:09

Rain (Circle one): None / Misty / Drizzle / Steady / Torrential

Wind direction (coming from)[3]: NE

Wind Strength[4]: 2

Sample number	Odour Intensity Level (1-6)[2]	Odour descriptor (1-40)[1]	Sample number	Odour Intensity Level (1-6)[2]	Odour descriptor (1-40)[1]	Sample number	Odour Intensity Level (1-6)[2]	Odour descriptor (1-40)[1]
1	2	3, 20	21	0	–	41	1	–
2	2	3, 20	22	0	–	42	0	–
3	0	–	23	0	–	43	0	–
4	0	–	24	0	–	44	0	–
5	1	–	25	0	–	45	0	–
6	0	–	26	0	–	46	0	–
7	0	–	27	0	–	47	0	–
8	0	–	28	0	–	48	0	–
9	1	–	29	0	–	49	0	–
10	0	–	30	0	–	50	0	–
11	0	–	31	0	–	51	0	–
12	0	–	32	0	–	52	0	–
13	0	–	33	0	–	53	0	–
14	0	–	34	0	–	54	0	–
15	0	–	35	0	–	55	0	–
16	0	–	36	0	–	56	0	–
17	0	–	37	0	–	57	0	–
18	0	–	38	0	–	58	0	–
19	0	–	39	0	–	59	0	–
20	0	–	40	0	–	60	0	–

If odour descriptor is 40 then please describe:

Odour Diary Record Sheet

overcast

Name: DUK

Sample site: "the Oaks" (3)

Date (dd/mm/yy): 14/12/16

Sample Start Time (hh:mm): 14:47

Rain (Circle one): None / Misty / Drizzle / Steady / Torrential

Wind direction (coming from)[3]: NE/E

Wind Strength[4]: 3

Sample number	Odour Intensity Level (1-6)[2]	Odour descriptor (1-40)[1]	Sample number	Odour Intensity Level (1-6)[2]	Odour descriptor (1-40)[1]	Sample number	Odour Intensity Level (1-6)[2]	Odour descriptor (1-40)[1]
1	3	25, 40	21	3	25, 40	41	0	–
2	4	25, 40	22	2	3, 40	42	0	–
3	0	–	23	2	3, 40	43	0	–
4	0	–	24	2	3, 40	44	0	–
5	3	25, 40	25	3	" "	45	0	–
6	2	3, 40	26	1	–	46	0	–
7	2	3, 40	27	1	–	47	0	–
8	3	" "	28	1	–	48	0	–
9	1	–	29	0	–	49	0	–
10	2	3, 40	30	0	–	50	0	–
11	1	–	31	0	–	51	0	–
12	1	–	32	0	–	52	0	–
13	2	3, 40	33	0	–	53	0	–
14	3	25, 40	34	0	–	54	0	–
15	2	3, 40	35	0	–	55	0	–
16	1	–	36	0	–	56	0	–
17	2	3, 40	37	1	–	57	0	–
18	0	–	38	0	–	58	0	–
19	0	–	39	0	–	59	0	–
20	2	3, 40	40	0	–	60	1	–

If odour descriptor is 40 then please describe: Tangy

Odour Diary Record Sheet

Name: DVk
Sample site: Laves Rd (4)
Date (dd/mm/yy): 14/12/16
Sample Start Time (hh:mm): 15:07
Rain (Circle one): None / Misty / Drizzle / Steady / Torrential
Wind direction (coming from)[3]: NE
Wind Strength[4]: 3

Sample number	Odour Intensity Level (1-6)[2]	Odour descriptor (1-40)[1]	Sample number	Odour Intensity Level (1-6)[2]	Odour descriptor (1-40)[1]	Sample number	Odour Intensity Level (1-6)[2]	Odour descriptor (1-40)[1]
1	0	–	21	0	–	41	2	3
2	0	–	22	0	–	42	1	–
3	0	–	23	0	–	43	2	3
4	0	–	24	0	–	44	0	–
5	1	–	25	0	–	45	0	–
6	0	–	26	0	–	46	0	–
7	0	–	27	0	–	47	0	–
8	0	–	28	0	–	48	0	–
9	1	–	29	0	–	49	0	–
10	0	–	30	0	–	50	0	–
11	0	–	31	1	–	51	1	–
12	0	–	32	0	–	52	0	–
13	0	–	33	0	–	53	0	–
14	0	–	34	0	–	54	0	–
15	0	–	35	1	–	55	0	–
16	0	–	36	0	–	56	1	–
17	0	–	37	0	–	57	0	–
18	0	–	38	0	–	58	0	–
19	0	–	39	0	–	59	1	–
20	0	–	40	0	–	60	0	

If odour descriptor is 40 then please describe:

variable

Odour Diary Record Sheet

overcast ~25°C

Name: Donovan
Sample site: Paddock (1)
Date (dd/mm/yy): 14
Sample Start Time (hh:mm): 13:45
Rain (Circle one): None / Misty / Drizzle / Steady / Torrential
Wind direction (coming from)[3]: North
Wind Strength[4]: 4

Sample number	Odour Intensity Level (1-6)[2]	Odour descriptor (1-40)[1]	Sample number	Odour Intensity Level (1-6)[2]	Odour descriptor (1-40)[1]	Sample number	Odour Intensity Level (1-6)[2]	Odour descriptor (1-40)[1]
1	1	–	21	1	–	41	0	–
2	1	–	22	0	–	42	0	–
3	1	–	23	0	–	43	0	–
4	2	3,20	24	2	3,40	44	0	–
5	1	–	25	0	–	45	1	–
6	1	–	26	0	–	46	1	–
7	1	–	27	2	3,40	47	0	–
8	1	–	28	3	3, 40	48	2	3, 40
9	3	3, 40	29	3	" "	49	0	
10	2	" "	30	1	–	50	0	
11	2	" "	31	0	–	51	3	
12	1	–	32	0	–	52	4	20, 25
13	1	–	33	1	–	53	3	" "
14	3	3, 40	34	0	–	54	3	" "
15	2	" "	35	0	–	55	4	" "
16	2	" "	36	0	–	56	3	" "
17	1	–	37	0	–	57	2	3, 40
18	0	–	38	0	–	58	1	–
19	0	–	39	3	3, 40	59	2	3, 40
20	0	–	40	2	" "	60	2	3, 40

If odour descriptor is 40 then please describe: Tangy / sweet