Before the Independent Hearing Commissioner
At Ashburton District Council

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under: the Resource Management Act 1991

in the matter of: application LUC23/0109 to the Ashburton District Council relating to the proposed equestrian centre located on 279 Stranges Road, Ashburton

between: **Southern Parallel Equine Centre Limited**
Applicant

and: **Ashburton District Council**
Consent Authority

Statement of evidence of Roger Cudmore

Dated: 20 March 2024

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STATEMENT OF EVIDENCE OF ROGER CUDMORE

INTRODUCTION

1 My full name is Roger Steven Cudmore.

2 I am a Technical Director – Environment at WSP NZ Limited (*WSP*) and a certified air quality professional (CAQP) with the Clean Air Society of Australia & New Zealand (CASANZ). I graduated from the University of Canterbury with a degree in Chemical Engineering awarded with honours in 1986.

3 I have worked as a consultant in air quality management for over 30 years, working for industry, Regional Councils and the Ministry for the Environment (*MfE*). Over this time, I have had significant involvement in the development of national guideline documents for air quality management including the MfE ambient air quality guidelines (*AAQGs*) for New Zealand. This process commenced during the mid-1990s and led to our current Ministry for Environment AAQGs (MfE, May 2002). I took part in workshops run by MfE from 2000 to 2004 for developing various good practice guidelines and for establishing the Resource Management (National Environmental Standards for Air Quality) Regulations (*NESAQ*) (MfE, 2004). In 2008, I co-authored a review of the World Health Organisation (*WHO*) guideline for sulfur dioxide (SO_2) (Kelly & Cudmore, 2008) and co-authored reports (MfE, August 2002) that were the basis for the current MfE Odour Management Guideline (MfE, 2016).

4 I have significant involvement with air quality management in Canterbury and have previously provided expert evidence in resource consent and plan change processes.

5 I have been engaged by Southern Parallel Equine Centre Limited (*SPEC*) to provide expert evidence regarding potential odour effects in relation to its application for a resource consent (*Application*) to establish an equine centre in Lake Hood (the *Proposed Equine Centre*).

CODE OF CONDUCT

6 I note that in preparing my evidence I have reviewed the Code of Conduct for Expert Witnesses contained in Part 9 of the Environment Court Practice Note 2023. I have complied with it in preparing my evidence. I confirm that the issues addressed in this statement of evidence are within my area of expertise, except where relying on the opinion or evidence of other witnesses. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

SCOPE OF EVIDENCE

7 My evidence will deal with the following:

7.1 Potential for odour effects from the operation of the Wastewater Treatment Plant (*WTP*); and

7.2 Potential for odour effects from horse stables and sales at the SPEC site.

8 In preparing my evidence, I have reviewed:

8.1 The Application;

8.2 Submissions on the Application; and

8.3 The section 42A report.

SUMMARY OF EVIDENCE

9 The potential for odour effects from the operation of the WTP, horse stables and related activities at the SPEC site are likely to be less than minor given the employment of good management practices.

ODOUR ASSESSMENTS UNDERTAKEN BY WSP

10 I was responsible for preparing the "Assessment of Potential Odour Effects – Community Wastewater Treatment Plant" dated 4 November 2022 and attached at Appendix 11 of the Assessment of Environmental Effects (*AEE*) of the Application.

11 While that report was in the context of a different proposed land use, it focussed on the effects of the proposed new municipal WTP being a package activated sludge plant that employs a novel trickling filter type of technology, supplied by BiGill.

12 The BioGill WTP proposed for the Proposed Equine Centre, and therefore the conclusions in that report remain valid.

13 WSP also provided a further assessment in response to a request for further information on the Application which considered the odour effects from the horses and manure of the Proposed Equine Centre (the *WSP assessment*). This was prepared by my colleague Cathy Nieuwenhuijsen, but I have read this assessment and agree with her conclusions.

SITE FEATURES

14 The proposed SPEC site is located on Stranges Road, Huntingdon and situated adjacent to the western end of Lake Hood. The site is approximately six kilometres to the south of Ashburton. *Figure 1* below shows the SPEC property boundary and location of the

proposed WTP, within the site. This is located approximately 150 m from the site's eastern property boundary.

15 To the immediate south, east, and west of the site is rural farmland. To the north of the site are recreational and residential areas. I understand that the Ashburton District Council District Plan allows for medium to low density residential plots to the north of the site boundary, as shown in *Figure 1*.

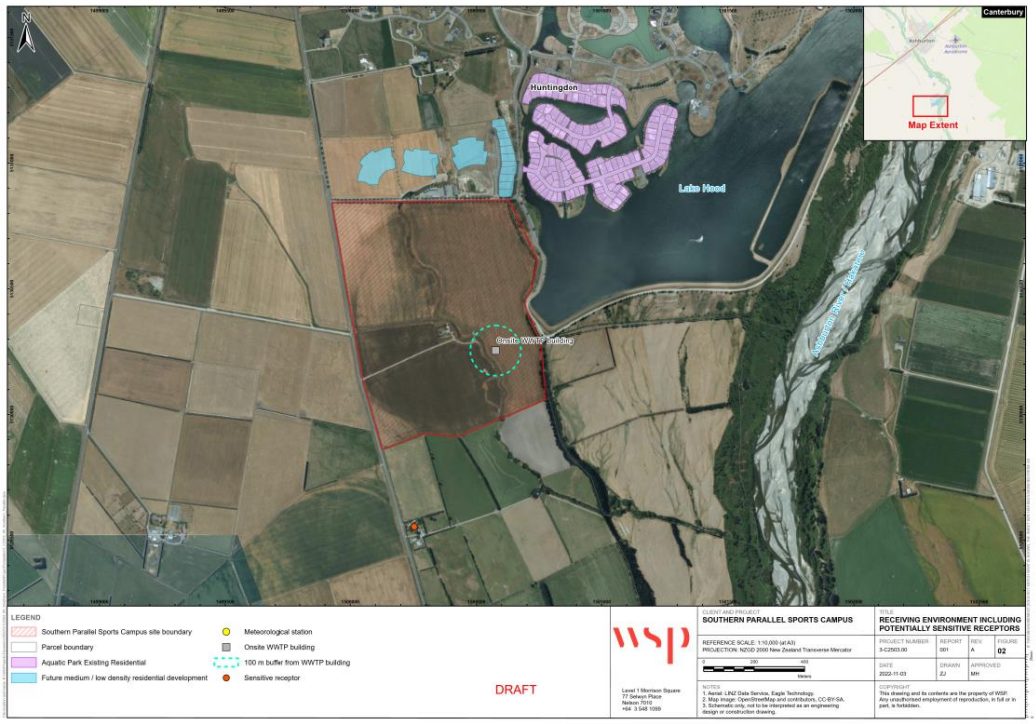

***Figure 1*: Map of the SPEC site and surrounding environment.**

16 The nearest existing and future residential dwellings to the north, northeast and southwest of the site would be classified as highly sensitive receptors by MfE (2016). However, the actual sensitivity of any off-site receptor also needs to account for separation distance, activity type and scale, and site wind patterns. When allowing for these factors, I consider residential and recreational areas opposite Lake Hood would have a low sensitivity to odour emissions associated with the proposal. This is because the existing and future residential dwellings are in the order of 500-600 m, or further away from the proposed WTP and horse stables.

17 Furthermore, the prevalent wind patterns (as measured 4 kms to the east of the site) would disperse site emissions away from the main residential areas to the north and northeast of the site. This feature can be seen in the wind rose in *Figure 2*, which shows a dominance of winds coming from northerly directions.

18 Later in this evidence, I discuss the nearest residential dwelling located to the south of the property boundary (shown as a red dot

in *Figure 1*). This receptor would have moderate sensitivity to odour emissions from the proposal due to this location being downwind of the horse stables and to a lesser extent the WTP during early morning and evening periods when the air drifts towards the ocean. Nevertheless, I later conclude that this receptor would have a less than minor potential for odour effects from these activities.

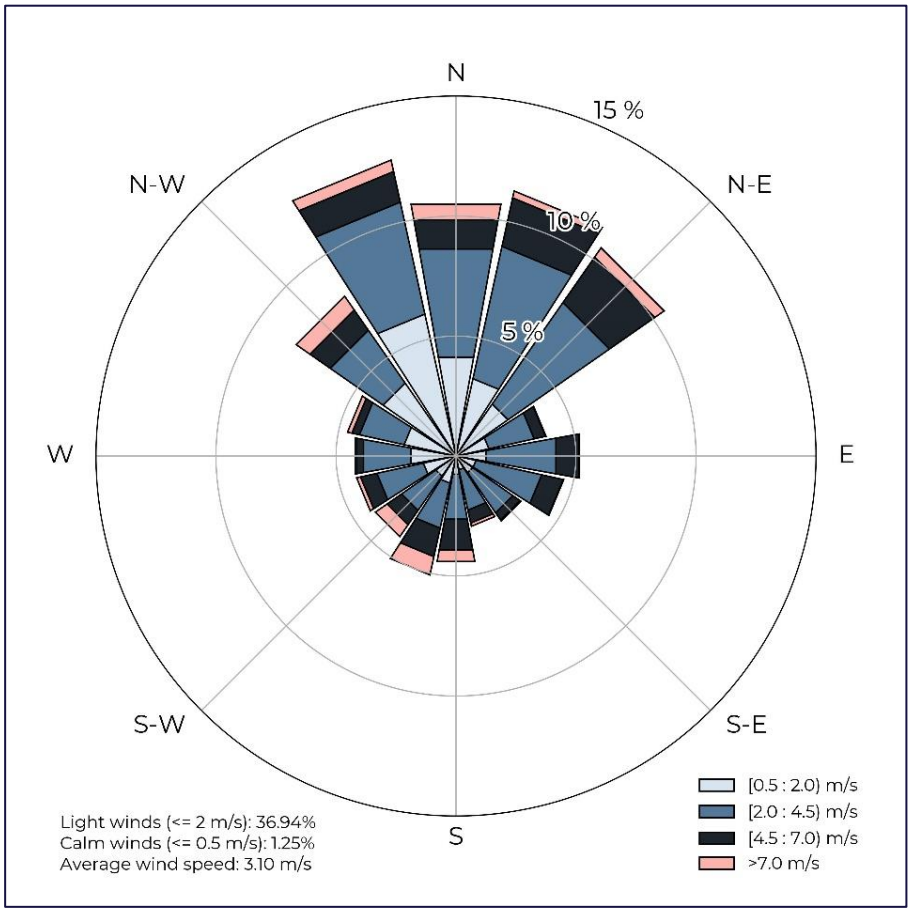

***Figure 2*: Wind rose for the period 2019 to 2021 derived from meteorological site at Wakanui operated by NIWA.**

ASSESSMENT METHODOLOGY

19 The significance of odour exposure effects is related to the FIDOL factors (MfE 2016) – the combination of the five factors (frequency, intensity, duration, offensiveness, and location). These factors are important considerations where there is an expectation of some level of ongoing odour exposure resulting from a proposed activity. However, in practical terms, for the assessment of relatively small WTPs it is more appropriate and pragmatic to assess the ability of the design and mitigation features to simply avoid recognisable WTP odour occurring beyond the site boundary on any occasion. This is an important outcome for a privately operated WTP in my view. This is because any potential occurrences of noticeable odour would only be associated with the WTP operating outside of normal design parameters and/or wastewater conditions becoming septic.

20 With respect to the horse stables and related equine activities at the site, there is likely to be occasional horse type odour, which is recognisable beyond the property boundary of SPEC. Therefore, an assessment approach, which assesses the FIDOL factors is appropriate. The WSP assessment provided such an assessment by considering various separation distance guidelines from various Australia EPAs for horse and other animal activities. I agree with the approach and general conclusions of this assessment. This is based on my own consideration of these guidelines along with the site wind patterns and the context of horse related odours in a rural environment.

POTENTIAL ODOUR EFFECTS FROM THE WTP

Overview of the WTP design

21 The BioGill WTP is an enclosed package activated sludge type of treatment process, which is preceded by a sewage reticulation pipe network, main sump and sewage screening stages. A diagram of system is shown in *Figure 3*.

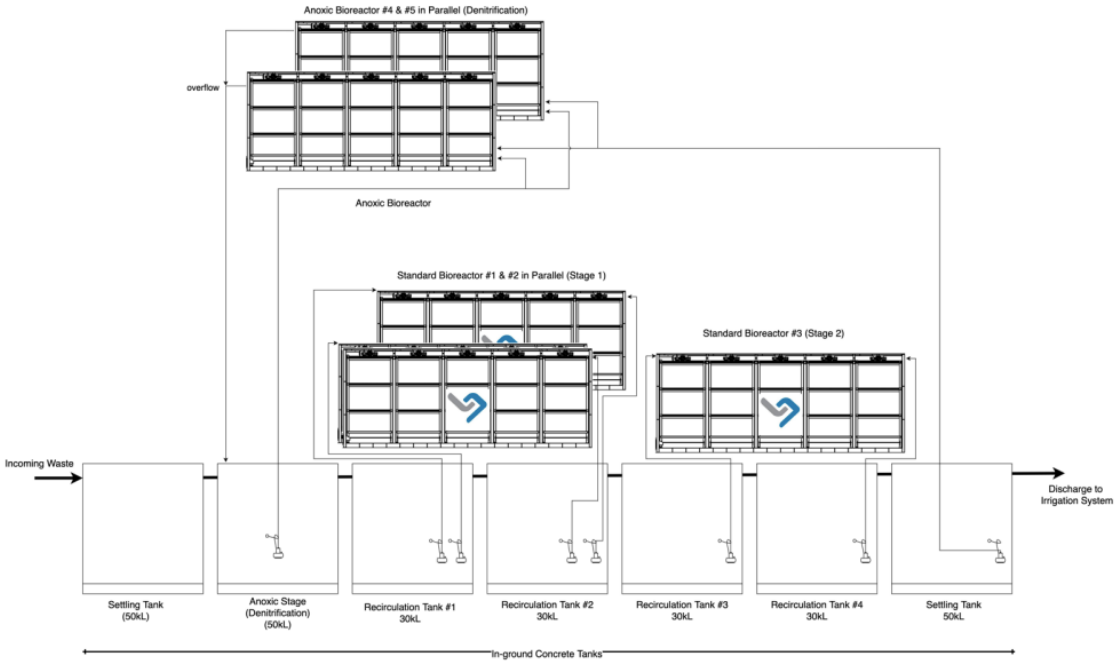

***Figure 3*: Diagram biological treatment system layout (Source: BioGill).**

22 From the inlet sump, wastewater is pumped over screen which discharges solids to a skip. The screened sewage flows to the first stage of the BioGill system (i.e., the 50 m^3 settling tank). I note the term WTP includes the inlet sump, screening plant, solids skip and the downstream biological treatment process (i.e., the BioGill system).

23 The BioGill system consists of five enclosed trickling filter modules (each consisting of a fine ceramic fin structure). These modules would be housed in a WTP building (example of the filter units are shown in *Figure 4*). The ceramic fins have recirculating wastewater trickled down over their surfaces – this results in biological growths being established. The recirculated wastewater overflows and transfers to successive underground tanks. Apart from the initial buffer tank, flow is pumped from these to the top of various BioGill filter units located above at floor level.

24 Therefore, as the wastewater progressively overflows from one tank to the next, it is recirculated to and from each trickling filter unit (first anoxic units, then two aerobic units operating in series). This allows for conventional anoxic (non-aerated) and aerobic (naturally aerated) biological wastewater treatment stages. The treated wastewater flow is partially recycled back to the first treatment stage at the head of the plant.

***Figure 4*: Picture of two trickling filter units (Source: BioGill).**

25 The treatment process allows for denitrification of the incoming screened wastewater, followed by aerobic consumption of dissolved organics (converting these to biosolids), the settling of spent biofilm, followed by filtration, and UV disinfection of the treated effluent. This process would result in tertiary treated wastewater quality, which is expected to be of sufficient quality for it to be discharged to an onsite wetland/pond system and to be used for irrigation of vegetated areas within the SPEC site.

26 The wastewater screening plant, the five enclosed trickling filter modules and underground tanks would be housed within a WTP

building which would ventilate building air to atmosphere via carbon filters.

27 The sewerage pipework at the site would result in wastewater being transferred within several hundred metres from source to the WTP. As such the potential for sewerage type odour discharges would be minimal.

28 The wastewater sump which supplies raw sewage to the screening plant and then to the BioGill treatment system, has the potential to result in sewage becoming septic (therefore more odorous) during periods of low flow in summer (i.e., well below the design maximum of 150 m^3/day inlet flow). This scenario can be readily avoided via automatic sump level control and/or sump sizing, so that the wastewater retention time within the sump is 8 hours, or less.

29 Having the screen and associated solids skip housed within the WTP services building (which has pre-treatment of building air via carbon filters) is likely to ensure that odour generated from screening the sewage is not recognisable at, or beyond the SPEC site boundary.

30 The 50 m^3 in-ground settling tank (first settling tank in Figure 3) also has the potential to cause septic sewage conditions during low flow periods. One option to avoid this would be gentle aeration of this tank. For example, an air bubble type system installed within this tank, so to maintain a positive dissolved oxygen (DO) within the screened raw sewage.

31 The 50 m^3 anoxic tank, four 30 m^3 inground tanks (shown in *Figure 3*) and the final 50 m^3 settling tanks would have all have sufficiently large recirculation and inlet flows to ensure that partially treated wastewater would not have an opportunity to become septic and therefore odorous.

32 The two anoxic stage BioGill filter units would receive oxygenated wastewater from the final settling tank at a large flow of 40 m^3/hr. Therefore, these units are likely to operate with relatively fresh anoxic wastewater with positive residual levels of nitrate. Therefore, the anoxic tank (which has a high degree recirculating flow) is also likely to only ever operate under anoxic conditions and therefore wastewater in a relatively fresh state low odour state.

33 The removal of sludge from the WTP is another potential source of odour. Spent biosolids will end up within the final settling tank. The first settling tank will also settle out any primary solids within the incoming wastewater flow, which were not removed by the screening plant. The resultant sludge layers would exist in various states of mineralisation. These solids would need to be sucked out to a truck/tanker and removed from the site (typically on a 3-6 monthly cycle). These sludge pump-out operations may possibly produce a localised sewage odour within 50 metres, or less of the WTP services building. This is likely to result as much from air

displacement from the truck's tanker than the removed sludge itself. Irrespectively, this odour would be temporary (e.g., ≤30 mins), occur during working hours, and be unlikely to be noticeable beyond the site boundary.

34 The WTP building's ventilation air would be extracted and treated via the carbon filter system before discharging to atmosphere. This system provides a second layer of protection against the discharge of WTP odour that may be recognisable beyond the SPEC property boundary, especially if there was a process failure and the sewage become septic within some part of the treatment system.

35 I consider that the BioGill WTP system, as proposed, is an efficient and relatively novel type of activated sludge process design, which appears to be ideally suited to the reliable treatment of the SPEC site's wastewater, with minimal odour generation when appropriate mitigation and management is in place (these measures including appropriate contingencies should be in an odour management plan for the Biogill WTP).

Assessment of effects of the WTP

36 Given the SPEC site scale, the proposed WTP design and operational features and avoidance of septic wastewater conditions within the WTP, I conclude that it would very unlikely that recognisable sewage type odours would occur at or beyond the property boundary during normal operating conditions. Therefore, the potential for any significant chronic odour effects would be negligible.

37 The prospect for adverse odour events (acute odour) to occur beyond the property boundary because of abnormally high levels of odour discharge from the WTP, can be effectively avoided by operating the system within its design parameters, avoiding septic conditions occurring within the WTP and by treating ventilated WTP building air before it is discharged to atmosphere. The compliance with these conditions can be readily achieved via an odour management plan and contingencies. Given effective WTP management and avoidance of septic wastewater conditions, I consider the potential for causing objectionable or offensive odour events due to the WTP operation is less than minor.

POTENTIAL ODOUR EFFECTS FROM THE EQUESTRIAN ACTIVITY

Overview of the activity

38 SPEC proposes to operate six horse stable blocks with 100 stables per block. Each stable could house one horse and foal. I understand that normally the site would have approximately 100 resident horses (but this could range from 50-200 horses) and that for 25 days per year there could be up to 600 horses onsite for sales and training purposes (although I understand the 600 horses is the upper limit, only expected for the annual sales event held for 2-3 days of the year). I assume these animals would mostly reside in

the site stables, whilst on site, while a minority would be located elsewhere on site.

39 SPEC will also operate a veterinary clinic and breeding centre with 58 stables.

40 Additionally, a stud selling centre will be used for annual sales event and other small events. During the annual sales event, a maximum of 50 horses will be present in the selling centre.

41 Finally, it is important to note that SPEC propose to remove all horse manure from the stables, and the site, on a daily basis.

Odour management and mitigation

42 The WSP assessment listed the key odour management and mitigation procedures as follows:

42.1 The floor of the stables will be an impervious concrete surface to help maintain the bedding material/manure dry.

42.2 All horse manure and soiled bedding will be cleaned out from the stable area/saleyards and disposed offsite daily.

42.3 No manure will be stored outside the stables.

42.4 Ventilation within the stables will be maintained via roof shafts, opening doors and windows.

43 I consider these measures would be effective at minimising odour generation from horse manure to a low level such that it would not be noticeable beyond a few hundred metres or more from the SPEC stables. This is acceptable given that noticeable horse manure type odour could occur on uninhabited rural land adjacent to the SPEC boundary, but not extending to residential dwellings, which are 500 m or further from the site's stables. The main source of remaining odour is likely to be that generated from the horses themselves.

Assessment of odour effects of equestrian activity

44 The WSP assessment considered the potential odour effects from various sources including:

44.1 the day-to-day activities (in the range of 50-200 horses onsite);

44.2 the 25 days a year when there would be in the range of 200 to 600 horses onsite for sales and training events; and

44.3 The maximum of 600 horses on site would occur for only 2-3 days per annum.

45 I consider the odour potential associated with the cumulative emissions from the normal day to activities listed above to be relatively minor. The WSP assessment utilised published separation distance guidelines from various Australian Environmental Protection Agencies and also found the potential for odour effects from sales and veterinary activities to be very minor – which I fully agree with.

46 The potential for odour effects from holding significantly more than 200 horses on site and up to a maximum of 600 horses is of more significance in my view and as such I have further considered the WSP assessment of this source.

47 I also consider it appropriate to utilise published buffer/separation criteria that is most applicable to an equine stud's operation and potential odour effects on sensitive receptor locations. These include the following:

47.1 Western Australia EPA (*WA EPA*): Draft environmental assessment guideline for Separation distances between industrial and sensitive land use. September 2015 (WA EPA 2015).

47.2 South Australia EPA (*SA EPA*): Evaluation distances for effective air quality and noise management, January 2023. (SA EPA 2023).

47.3 Victoria EPA (*Vic EPA*). Separation distance guideline. December 2022 (Victorian EPA Publication 1949, December 2022).

48 These separation guidelines are invariably set to specify the minimum distance between an odour source and residential dwellings, for which odour effects are expected to be acceptable. However, where the separation distance for a proposal is less than the specified minimum distance, then this always informs the need for a more detailed site-specific assessment to confirm the likely level of odour impact. It does not mean that there will necessarily be adverse odour effects - a common misunderstanding in my experience.

49 Only the WA EPA has specified separation criteria specifically for horse stables. It specifies 100 m to 500 m depending on size. By inference, the larger-scale horse stables are recommended to have a 500 m separation from residential dwellings. I have checked typical sizes of horse breeding studs in Western Australia in terms of land area. These appear to be typically in the range of 100 to 400 acres, which is consistent with the SPEC land area of about 150 acres.

50 All of the nearest residential dwellings are beyond 500 m from the SPEC horse stables. Therefore, the only horse stable specific criterion from Australia does support a conclusion of minor or less

potential for adverse odour effects from the Proposed Equine Centre.

51 While the SA EPA and Vic EPA separation criteria are for sale yard activities (which generally applies to pigs, sheep, and cattle), they can still be used as a further cross check on the potential for odour effects from the SPEC proposal. Applying these to equivalent stock units of 600 horses will be conservative for two main reasons:

51.1 Firstly, sale yard related odour is generated from manure build up on the ground, which is not removed until the sale process is complete. The manure from the 600 horses would be removed daily and taken offsite.

51.2 Secondly, from my experience, horses and cattle have a much lower odour potential than for sheep, chickens and pigs for the same number of stock units. For the latter two, this is because of the much higher protein diets of omnivores compared to grass eating ruminants. Furthermore, while sheep are also ruminants, they have (in my experience) a much higher inherent odour than horses with an equivalent number of stock units (e.g., compare one horse to a small flock of 12 ewes).

52 With the above considerations in mind, I have reconsidered the application of the SA EPA and Vic EPA separation criteria to the SPEC proposal.

53 Firstly, the SA EPA sales yard criteria of 200 m is for <50,000 sheep equivalents (about 4,200 horses) per year. Therefore, for 25 days of horse numbers being significantly more than 200 at the SPEC site (up to a maximum of 600), and for 25 days , this criterion at face value indicates a larger buffer than 200 m maybe necessary - if we assume an equal odour inherent odour. I consider the best inference from this criterion is that 200 m may possibly be an insufficient separation distance. However, the adequacy, or otherwise of the >500 m separation distance available in this instance cannot be reliably informed from the SA EPA criterion for saleyard activities.

54 The SA EPA also have separation criterion for chicken sheds, so I have further utilised these for a very a conservative application to the temporary presence of 600 horses at the SPEC facility. In summary, when allowing for the number of chickens equating to 600 horses (around 160,000), then a setback of approximately 500 m is calculated for an isolated rural dwelling and 750 m for more built-up residential areas. This outcome provides further strong support, in my opinion, that the available separation distance at the SPEC site when containing 600 horses for a sales/training event would ensure only a very small (i.e., less than minor) potential for adverse odour effects occurring at nearby residential dwellings.

55 The Vict EPA sales yard criterion is somewhat more informative than the SA EPA criterion. It specifies setback distances for:

55.1 a 500 m setback to the saleyards where >500 head/week of pigs, cattle or other stock are temporarily confined for sale.

55.2 a 1,000 m setback to the saleyards where >10,000/week head/week of pigs, cattle or other stock are temporarily confined for sale.

56 Given my evidence regarding inherent horse odour compared to other species and saleyard manure management compared to the SPEC proposal, then I consider these criteria provide another strong indication of the proposal causing a less than minor potential for adverse odour effects given the available separation distances of 500 m or more to nearby residential dwellings.

57 I consider it useful to provide a specific qualitative FIDOL assessment of potential odour effects at the nearest isolated residential dwelling located to the south of the proposal site. This is the red dot to the south of the site as shown in *Figure 1* above (approximately 500 m south of the proposed horse stables).

58 This is the only location that is likely to be downwind of very light cold air drainage winds in early morning and evening periods. These conditions could allow horse type odour to be recognised at this dwelling when there are significantly more horses on site than normally occurs for day-to-day activities (i.e., 200 horses). Given these occasions of relatively high horse numbers (up to 600) for up to 25 days a year and drainage flow towards the residential dwelling my occurring for 5% to 10% of the time (F x D), the maximum odour exposure time is estimated to be 0.3 to 0.6% of all hours in a year.

59 The odour would be a very weak to weak intensity (I) at this distance if it was noticeable and specific events may last for several hours during evening to early morning periods.

60 The inherent odour character (O) would occur within an appropriate context (i.e., a horse odour character occurring in a rural environment).

61 Therefore, I conclude that the location with the highest potential for odour impact, would most likely be exposed to FIDOL factors that infer a less than minor odour effect. The frequency of very weak to weak intensity odour being observed combined with the duration of such events would be very low (< 1%) of the time. This combined with the odour having a relatively neutral character when occurring in a rural environment, allows me to conclude the high likelihood of *a less than minor* potential for an adverse effect at the most potentially impacted residential dwelling.

RESPONSE TO SUBMISSIONS

62 The submission of John Skevington and Jo Ruane raises concern about the odour effects of the proposed BioGill System and horse manure. I have covered this in my evidence above and consider the odour effects from the Proposed Equine Centre is very likely to less than minor beyond the site boundary.

RESPONSE TO SECTION 42A REPORT

63 The section 42A report does not raise any concern about the odour effects of the proposed BioGill WTP and operation of the Proposed Equine Centre, although notes that there was no comment by WSP on the adequacy of the odour mitigation of the Proposed Equine Centre. I confirm as set out in paragraph 42 that I consider the proposed mitigation is expected to effective at minimising odour from the Proposed Equine centre.

64 With the recommended and proposed mitigation for both the WTP and Proposed Equine Centre, I agree with the conclusions in the section 42A report that adverse odour effects are not expected beyond the boundary of the site.

CONCLUSIONS

65 The potential for odour effects from the operation of the WTP, horse stables and related activities at the SPEC site are likely to be less than minor given the employment of good management practices.

Dated: 20 March 2024

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Roger Cudmore