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| IN THE MATTER | of the Resource Management Act 1991 |
| AND | |
| IN THE MATTER | of an Application for a Proposed Plan Change 48 |
| BY | **Judith Pascoe** – PC160048: Private Plan Change Request for Land at Creyke Road and Telegraph Road, Darfield |
| TO | **Selwyn District Council** |

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**STATEMENT OF EVIDENCE OF JEREMY WILLIAM TREVATHAN**
**DATED 16 FEBRUARY 2017**

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## 1.0 INTRODUCTION

### Qualifications and experience

1.1 My name is Jeremy Trevathan. I am an Acoustic Engineer and Director of Acoustic Engineering Services Limited, an acoustic engineering consultancy based in Christchurch. I hold the degrees of Bachelor of Engineering with Honours and Doctor of Philosophy in Mechanical Engineering (Acoustics) from the University of Canterbury. I am an Associate of the New Zealand Planning Institute, and a Member of the Acoustical Society of New Zealand.

1.2 I have more than ten years' experience in the field of acoustic engineering consultancy and have been involved with a large number of environmental noise assessment projects throughout New Zealand. I have previously presented evidence at Council and Environment Court Hearings, and before Boards of Inquiry. I have acted on behalf of applicants, submitters and as a peer reviewer for Councils.

1.3 While this matter is not before the Environment Court, I have read and agree to comply with the Code of Conduct for Expert Witnesses (Environment Court Practice Note 2014). I confirm this evidence is within my area of expertise, except where I state I am relying on facts or information provided by another person. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

**Background**

1.4 In September 2014, my company was engaged by Avanzar Consulting Ltd on behalf of Judith Pascoe (the applicant) to provide acoustic engineering advice in relation to a proposed plan change to rezone 13.5 hectares of land on the corner of Creyke and Telegraph Road from Living 2A Deferred to Living 2A.

1.5 My company prepared an assessment of environmental noise effects report (AES reference: AC14135 – 02 – D3, dated 12 May 2016). This report accompanied the Plan Change application (PC160048) submitted to the Selwyn District Council.

1.6 In response to a Request for Further Information from Selwyn District Council received 1 June 2016, we also prepared an addendum to this report (AES reference: AC14135 – 03 – D1), dated 15 July 2016, addressing specific questions raised by the Council.

1.7 I have also reviewed the Application, Submissions and Council Officers reports in relation to the noise effects.

## 2.0 SITE AND PROPOSAL

### Site and history

2.1 The applicant site is located on the corner of Creyke and Telegraph Roads to the south east of the Darfield township. The site consists of Lot 1 DP 56120, Lot 2 DP 56120, Lot 2 DP 391851 and Lot 1 DP 391851 and is currently zoned Living 2A (deferred). The applicant site currently contains three dwellings on semi-rural lots. Surrounding land is generally used for rural purposes with the exception of the Darfield Gun Club which is located on the opposing corner of Creyke and Telegraph Roads.

2.2 The proposed Plan Change site originally formed part of the application for Plan Change 24, Silver Stream Estates. This Plan Change was made operative on the 24th of June 2013 and resulted in the rezoning of the area of land to the north of the site into Living 1 and Living 2A. For the area of land in question, reverse sensitivity due to noise from the Darfield Gun Club was raised as a potential issue. There was a concern that noise from the existing Gun Club may annoy new residents in this area, to such an extent that they will complain, and as a consequence the operation of the Gun Club may be curtailed.

2.3 The commissioner (John Milligan) elected to retain the Living 2A deferred zoning for this land, reasoning that insufficient information had been provided about whether the consideration of reverse sensitivity was within the scope of the Plan Change given that the land is already zoned L2A deferred and requires both a potable water supply and the inclusion of an Outline Development Plan in the District Plan to remove the deferral. Mr Milligan also stated that insufficient information had been made available as to the extent that reverse sensitivity could be of concern, and also that none of the submissions suggested any appropriate protection against reverse sensitivity effects.

**Operation of the Darfield Shooting Centre (DSC)**

2.4 I understand that the Darfield Clay Target Club (DCTC) runs the majority of events at the Darfield Shooting Centre, using two 'down the line' traps which are oriented so that they face away (to the south or south-west) from the proposed Plan Change area. I have attached as Appendix 1 as email received by Judith Pascoe from Marcel van Leeuwen, the Secretary / Treasurer for the Darfield Shooting Centre, on the 13th of September 2015 which describes the activities of the DCTC. These can be summarised as follows:

- 14 Club Shoots. These are generally held on the first Sunday of each month between 1 pm and 6 pm, although three of these are full day events held between 10 am and 6 pm. The Club may also host additional weekend events such as the ANZAC Day Duck Shooters day (1 pm - 6 pm), or National Party Shoot (10 am - 6 pm). The club may also occasionally be asked to host a regional event (10 am - 6 pm).

- 13 Practices. These are held fortnightly in summer between 5 pm and 7 pm.

- 20 School kid shoots. These are held on Monday afternoons between 3 and 6 pm (although may be rescheduled to a Tuesday instead of a Monday).

- 7 Corporate shoots. These could be held on various days and would be between 2 and 3 hours in duration.

2.5 The Malvern Deerstalkers Association and Malvern Small Bore Rifle Club also use the DSC grounds and clubrooms. The Deerstalkers Association holds a 'running boar' shoot using .22 calibre rifles on the south side of the site. The Malvern Small Bore Club operates a concrete bunker attached to the DSC clubrooms, although the future of the tunnel has been undecided since the 2012 earthquakes. Noise from these activities is at least 20 dB quieter

than that associated with the DCTC, and is not expected to have any effect on the Plan Change site.

2.6 I have been advised that the information provided by the gun club is conservative and takes into account for future activity on site, and that there is unlikely to ever be any gunshot activity after 8 pm.

**Noise levels generated by the Darfield Clay Target Club (DCTC)**

2.7 Russell Malthus was engaged by Selwyn District Council to provide an environmental health assessment for Plan Change 24. As part of this assessment, he undertook noise measurements of a DCTC shoot on the 10th of December 2010.

2.8 Mr Malthus recorded levels at the existing dwelling at 193 Creyke Road, 200 metres from the Gun Club. When both traps were operating continuously, approximately 150 gunshots took place in a 10 minute period, with noise levels ranging from 55 to 65 dB $L_{Amax}$.

2.9 To confirm the measurements undertaken by Mr Malthus, Mr George van Hout from my office also undertook measurements of activity during a DCTC shoot at the site in December 2015. Measurements were undertaken at 315 metres from the closest trap, and at various distances along Creyke Road. At 325 metres from the closest trap, noise levels of 60 dB $L_{AFmax}$ were recorded, which accords with the earlier measurements of Mr Malthus.

2.10 Based on these measurements my company undertook noise modelling to produce a visual representation of the DCTC noise levels typically experienced over the Plan Change site. The resulting 60 dB $L_{Amax}$ and 55 dB $L_{Amax}$ contours were included in my original assessment and are now incorporated into the proposed Outline Development Plan 41A for the site.

## 3.0 ACOUSTIC CRITERIA FOR NOISE FROM GUNSHOTS

3.1 I have considered a number of sources of guidance to determine whether the noise generated by the DCTC has the potential to result in a significant reverse sensitivity effect in this case.

**District Plan noise standards**

3.2 The Selwyn District Plan daytime noise limits which apply to noise received in residential areas from non-residential activities during the daytime are 50 dB LA10 / 85 dB LAFmax. However, I note that NZS 6802:1991 *Assessment of Environmental Sound*, which the District Plan references, specifically excludes impulsive noise from gunfire from its scope.

3.3 In line with NZS 6802:1991, I consider that the District Plan limits are not suitable for examining the potential noise effects associated with the DCTC activity. Due to the short duration of each noise emission event this noise would easily comply with the District Plan 50 dB LA10 noise limit. The noise would also easily comply with the 85 dB LAFmax noise limit – as for an impulsive sound such as a gunshot, this is subjectively a high level of noise.

**Other guidance**

3.4 A body of guidance is available with regard to reasonable maximum noise emissions associated with shooting ranges. In a review of international shooting noise regulations Desamaulds et al (1998) observed that noise limits typically imposed by regulators at residential receivers generally fall between 50 and 60 dB LAFmax, with some exceptions (both higher and lower limits). Research conducted by Sorensen and Magnurror (1979) suggests that the threshold for annoyance for gunshot noise is in the order of 60 to 65 dBA LAFmax.

3.5 Other guidance from the UK Chartered Institute of Environmental Health regarding Clay Target Shooting, uses a Shooting Noise Level (SNL) to quantify noise effects. The SNL is the average LAFmax of the 25 loudest shots. This guidance states that annoyance is less likely to occur at a mean SNL of below 55 dBA and highly likely to occur at a mean SNL above 65 dBA. That document also states:

*"At shooting noise levels below the mid 50's dB(A) there is little evidence of significant levels of annoyance at any site, whereas for levels in the mid to high 60's, significant annoyance is engendered in a majority of sites. For levels in between however, the extent of the annoyance varies considerably from site to site. Thus a level of, say, 60 dB(A) may be deemed acceptable at one site, but not at another."*

It is suggested that the range in acceptable noise levels from gun club activities is dependent on local conditions, including community attitude to the club, cumulative shooting time, number of shooting days, time at which shooting occurs, predominant meteorological conditions and how the site is managed.

**Conclusions regarding acoustic criteria**

3.6 Based on the above guidance, and my own observation and experience of noise from gun clubs, I consider that a noise limit of 50 - 55 dB LAFmax would be appropriate for a new gun club, looking to establish in the vicinity of existing residential receivers.

3.7 With regard to the factors other than noise level which also influence reaction, in this case I consider the fact that there are relatively few 'shooting days' per year, with major shoots operating during the daytime and finishing by 6 pm will reduce the likelihood of an adverse effect. In addition, there are a number of 'off' weekend days, with gun club activity occurring perhaps 1 or 2 weekend days per month, for a limited duration.

3.8 Finally, I consider the fact that in this case residents will be choosing to locate in the vicinity of the gun club, and not vice versa, to be a relevant factor.

3.9 Considering all of the above, in this case it appears that there would be some risk of reverse sensitivity effects if residential development is to proceed where noise levels at dwellings exceed 60 dB LAFmax, whereas at 50 dB LAFmax there will be little risk of reverse sensitivity effects.

3.10 In areas which experience noise levels of between 50 and 60 dB LAFmax specific mitigation will need to be considered to ensure potential noise effects are appropriately managed. In this area, noise levels both inside dwellings, and in outdoor living areas, should be considered.

3.11 Based on my conclusion above, provided each dwelling in this area has an outdoor living area where gunshot noise does not exceed 50 dB LAFmax I expect any potential noise effects to be minimal. With regard to noise indoors, I observe that a typical dwelling will provide a reduction in the order of 15 dB with windows open. It follows that an external noise level of 50 dB LAFmax would result in internal noise levels of 35 dB LAFmax. Therefore, again in line with my conclusions above, if new dwellings in this area are constructed to achieve this internal noise level target, then I would consider potential noise effects are appropriately managed.

## 4.0 NOISE MITIGATION REQUIRED

4.1 Based on the above, I do not recommend any new dwellings are constructed in the Plan Change area where noise levels associated with the DSC exceed 60 dB LAFmax. I have now considered in detail what controls will be required to mitigate noise for new residential development in the portion of the Plan Change area where noise levels associated with the DSC are between 50 and 60 dB LAFmax.

**Noise levels within dwellings**

4.2 A typical modern dwelling with windows closed will achieve an outdoor to indoor reduction in the order of 25 dB. Therefore, for dwellings with external noise levels of 50 to 60 dB LAFmax, an internal level of 35 dB LAFmax is easily achieved.

4.3 Given that activities at the DSC occur during daytime hours, I consider that noise received in living spaces (not bedrooms) is most likely to be of concern. I note that the orientation of habitable spaces used during the daytime period will also likely face to the north (away from the gun club). Therefore the 35 dB LAFmax internal noise level target may be achieved even with windows open for ventilation. However if windows must be closed to achieve the required reduction, then it would be appropriate that an alternative fresh air ventilation system be provided.

**Noise levels in outdoor areas**

4.4 As described above, I consider it necessary for an outdoor living area to be provided for each dwelling, within which noise levels do not exceed 50 dB LAFmax. I note that the concept of providing a screened primary outdoor living area is consistent with the approach adopted in the NZTA *Guide to the management of effects on noise sensitive land use near to the state highway noise*, with regard to road traffic noise.

4.5 In order to confirm whether this is realistic in this case, I have investigated the shielding provided by a typical dwelling on the Plan Change site.

4.6 My modelling has confirmed that an outdoor living area where noise levels would be below 50 dB LAFmax could be provided without difficulty on the north or north east sides of dwellings constructed on the Plan Change site. With specific acoustic design such as fencing or by considering a different dwelling shape (for

example an L-shaped dwelling) this outdoor area could be optimised.

## 5.0 PROPOSED RULES

5.1 As outlined on page 20 of the Application, I understand that two rules are being proposed to give confidence that noise emissions associated with the operation of the DSC will not give rise to reverse sensitivity noise effects. I have considered whether these rules give adequate effect to my recommendations and conclusions outlined above.

5.2 Proposed rule 4.9.43 states:

> *In the Living 2 zone identified in Appendix 41A at Darfield, no additional dwellings shall be erected within the 60dB noise contour area shown on the Outline Development Plan at Appendix 41A.*

As discussed above, I would expect heightened risk of reverse sensitivity effects if residential development is to proceed where noise levels at dwellings exceed 60 dB LAFmax. I therefore consider this rule to be appropriate.

5.3 Proposed rule 4.9.44 states:

> *In the Living 2 zone identified in Appendix 41A at Darfield, the following shall apply:*
>
> *i. Any new dwellings erected outside the 60 dB noise contour shown on the Outline Development plan in Appendix 41A will be designed, constructed and maintained to achieve a design noise level of 35 dB LAFmax from the noise generated by outdoor shooting activities at the Darfield Gun Club for all*

*habitable spaces excluding bedrooms.*

ii. *Primary outdoor living areas associated with any new residential dwelling must be screened from the Darfield Gun Club noise to achieve a noise level not exceeding 50 dB LAFmax.*

iii. *Prior to the construction of any dwelling, compliance with the above standard shall be confirmed in writing to the Council's Planning Manager by a suitable qualified and experienced acoustic expert.*

I consider these proposed rules to adequately implement the controls I have described in this evidence.

**Council officer's report**

5.4 In paragraph 5.8 of his report, Mr Joll also supports the adequacy of the proposed rules, stating - '*from a planning perspective and the mitigation proposed, I consider that potential reverse sensitivity effects on the Gun Club have been adequately mitigated*'

## 6.0 REVIEW OF SUBMISSIONS

6.1 Two submissions have been received for this Application. Neither of these submissions commented on the noise from the gun club as a concern.

6.2 In their submission Mr Dye and Mrs Lyttle have however raised concerns regarding potential reverse sensitivity effects from this Plan Change influencing their existing horticultural and agricultural activities.

6.3 As Mr Joll has described in his report, the Dye / Lyttle property is already surrounded by Living zoned properties, which will have a similar level of noise sensitivity to any new dwellings constructed on the Plan Change site. I therefore do not consider this proposal significantly increases the risk of reverse sensitivity effects in this regard.

## 7.0 CONCLUSIONS

7.1 I have considered whether residential development is appropriate on the Plan Change site with regard to potential reverse sensitivity effects associated with the Darfield Gun Club.

7.2 Based on a review of international guidance with regard to appropriate criteria for gunshot noise, and when also considering the nature and level of use of the Gun Club, I have concluded that:

- No new dwellings should be constructed in areas of the Plan Change site where gunshot noise levels exceed 60 dB LAFmax.

- In areas which experience noise levels of 50 to 60 dB LAFmax, reverse sensitivity effects will be appropriately mitigated if noise levels within living spaces do not exceed 35 dB LAFmax, and a primary outdoor area is provided where noise levels are less than 50 dB LAFmax

7.3 I am satisfied that these controls are reasonable and realistic in this case, and will be appropriately implemented via proposed rules 4.9.43 and 4.9.44.

Jeremy William Trevathan

16 February 2017

## APPENDIX 1 – DARFIELD GUN CLUB ACTIVITY

**From:** Marcel MalvernGIS Limited [mailto:marcel@malverngis.co.nz]
**Sent:** Sunday, 13 September 2015 2:56 p.m.
**To:** 'Judith Pascoe' <jcpascoe@xtra.co.nz>
**Subject:** Gun Club schedule

Hi Judith

Been looking at it for a few days now
This is what we came up with.
I have shown it to the committee

**Total of 54 shoots**

14 regular Club shoots
Club shoots are generally on the first Sunday of the month and run from 1-6pm
Exceptions;
January 3rd or last Saturday of the month 1-6pm
Extra April 25th ANZAC Day Duck shooters Day 1-6pm
Extra July or August National Party Shoot Sunday 10am-6pm
October first Sunday 10am-6pm
December first Sunday 10am-6m
Extra December second Sunday 1-6pm
Sometimes we are asked to host a regional event that mostly is a full day event 10am-6pm

13 Regular practises
In summer once a fortnight 5-7pm

20 Regular School kids shoots
Every Monday afternoon 3-6pm

7 Corporate shoots for fundraising
Various days, afternoon for 2 or 3 hours

Most of these dates and times are set for the long term.

Changes might occur as said before we might be asked to host a regional event for seniors or juniors. If our shoot clashes with a regional event we might shift to second Sunday of the month.

Schoolkids might shoot on a Tuesday instead of a Monday.
There might be coaching sessions that are not planned long-term.

This is the schedule at this moment changes might be made at any time.

Cheers,
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