IN THE MATTER OF **The Resource Management Act 1991**

AND

IN THE MATTER OF **The Proposed Selwyn District Plan**
Deferred Residential Zoning
Darfield Areas 2, 3 and 4A
Reverse Sensitivity Assessment

RUSSELL MALTHUS

SENIOR ENVIRONMENTAL HEALTH CONSULTANT

NOVO GROUP LTD

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The Proposed Selwyn District Plan

Deferred Residential Zoning

Darfield Areas 2, 3 and 4A

Reverse Sensitivity Assessment

Novo Group Ltd
Level 1, 279 Montreal Street
PO Box 365, Christchurch 8140
P: (03) 365 5570
E: info@novogroup.co.nz
W: www.novogroup.co.nz

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Project Manager:	Russell Malthus
Prepared by:	Russell Malthus, Senior Environmental Health Consultant
Reviewed by	Jocelyn Lewes, Strategy & Policy Planner, Selwyn District Council

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INTRODUCTION

1. My name is Russell Charles Malthus, and I am Senior Environmental Health Consultant with Novo Group Limited, a Christchurch-based Traffic Engineering and Planning consultancy. I am a qualified Environmental Health Officer with over thirty years' previous employment by the Christchurch City Council. As a consultant in private practice since leaving the Council in 2004, I have provided expert advice to territorial authorities and private clients on the assessment of environmental health effects of land use proposals, including Plan Changes.

2. I have been engaged by the Selwyn District Council to assess potential reverse sensitivity effects of land use in three Areas in Darfield which are currently zoned Deferred Living 2A in the Operative Selwyn District Plan. The Areas are shown in the Outline Development Plans prepared by Boffa Miskell.

3. I previously assisted the Council with assessing reverse sensitivity issues in these Areas for Plan Change 31, which did not proceed. I also advised the Council on reverse sensitivity issues for Plan Change 24 (Silverstream) which is on the southern boundary of Area 3.

SCOPE

4. The purpose of this assessment is to inform the Council's Section 32 report for the proposed change from Deferred Living 2A to Large Lot Residential zoning.

5. Specifically I have been requested to recommend any provisions for Outline Development Plans and rules in the proposed Selwyn District Plan that would be necessary to mitigate reverse sensitivity effects of activities in other zones, that could arise if the Deferred zoning status is lifted and residential development of the three Areas is allowed.

MEANING OF REVERSE SENSITIVITY

6. "Reverse sensitivity" is not defined in the Selwyn District Plan or the Resource Management Act. The Ministry for the Environment's Quality Planning website[1] includes a definition from the Environment Court, which states:

   Reverse sensitivity is the legal vulnerability of an established activity to complaint from a new land use. It arises when an established use is causing adverse environmental impact to nearby land, and a new, benign activity is proposed for the land. The "sensitivity" is this: if the new use is permitted, the established use may

[1] http://www.qualityplanning.org.nz/plan-topics/noise-management/reverse-sensitivity.php

be required to restrict its operations or mitigate its effects so as not to adversely affect the new activity.

It is well settled law now that reverse sensitivity is an adverse effect, and is therefore to be avoided, remedied or mitigated.

7. Where residential development interfaces with existing business and rural zones, there is potential for complaints from new residents who consider themselves to be affected by business and rural activities involving:

    - Noise
    - Light spill and glare
    - Storage and use of hazardous substances
    - Dust, smoke, fumes and odour
    - Spraydrift from rural land

8. Examples of mitigation measures that may be introduced through planning provisions include buffers and setbacks, acoustic barriers (e.g. earth mounds and/or fences), acoustic insulation of dwellings, and also limiting the density of residential development near the shared boundaries so as to limit the numbers of persons potentially affected.

9. The New Zealand Transport Agency's 2015 "*Guide to the management of effects on noise sensitive land use near to the state highway network*"[2] addresses reverse sensitivity to the land transport network (i.e. State Highways) resulting from the development of new sensitive land uses close to the network. Mitigation measures include establishing buffer distances between the road and dwellings, and the acoustic insulation of dwellings if necessary, to achieve satisfactory interior noise levels. The NZTA negotiates with District Councils to include appropriate rules in their District Plans for this purpose.

RELEVANT PROVISIONS IN THE PROPOSED SELWYN DISTRICT PLAN

10. I have been provided with a summary of the relevant draft rules of the proposed Selwyn District Plan (pSDP), which are in Appendix 1 of this report. I understand those rules will be tested through public notification and hearings on submission.

11. I note that "*NZS 6801:2008 Acoustics - Measurement of Environmental Sound"* and "*NZS 6802:2008 - Acoustics Environmental Noise"* are now referenced in the zone noise rules which is appropriate, as these are the latest standards and they are consistent with current international best practice and guidance. Under the new Standards, LAeq replaces L10 as the principal parameter for the zone noise limits in the pSDP. LAFmax is retained, because NZS 6802 recommends this for protection of people from sleep disturbance at night. In this report, LAmax is also proposed as a control for noise from the Darfield Gun Club. A brief explanation of the noise terminology is in Appendix 2 of this report.

[2] https://www.nzta.govt.nz/assets/resources/effects-on-noise-sensitive-land/effects-on-noise-sensitive-land-use.pdf

12. The noise and time limits in the pSDP noise rules apply to noise received outdoors within any Residential zone, or at the notional boundary of any dwelling in a Rural zone (i.e. 20 m from the façade of a rural dwelling, or at its boundary if that is closer to the dwelling). The limits are consistent with current guidance in *NZS 6802:2008 Acoustics – Environmental Noise* for protection of sleep and reasonable residential amenity.

13. I also note that the proposed rules for the control of effects from road traffic noise have been agreed with the New Zealand Transport Agency, which is appropriate.

14. Where I consider that the proposed rules will not adequately address reverse sensitivity issues, I have recommended additional mitigation measures to be included in the Outline Development Plans (ODPs) and related rules.

POTENTIAL ISSUES OF REVERSE SENSITIVITY

AREA 2

15. Referring to the ODPs prepared by Boffa Miskell, Area 2 is located on the north-west corner of Creyke Road and Telegraph Road, Darfield. Living zones adjoin the area to the north and west. The Rural zone is on the opposite (south) side of Creyke Road.

Area 2 interface with Darfield Gun Club

16. The Darfield Gun Club (DGC) is located in the Rural zone opposite the south eastern corner of Area 2. Noise from shooting at the DGC would be a potential cause of annoyance to residents in parts of Area 2, and this could cause reverse sensitivity to the DGC.

17. Referring to Appendix 1 of this report, there are no rules in the pSDP that address this. However, there are rules which address the same sort of reverse sensitivity effects on the DGC arising from the development of the Living 2 zone on the east Corner of Creyke Rd and Telegraph Rd, which is directly opposite Area 2. The rules relate to shooting noise contours which overlay the land, and were introduced through PC48, and which were plotted by Acoustic Engineering Services Ltd (AES) of Christchurch, the acoustics consultants for that Plan Change.

18. The level of protection those rules provide is consistent with the best practice guidance that is currently available, i.e. the UK Chartered Institute of Environmental Health's 2003 publication "*Guidance on The Control of Noise - Clay Target Shooting*"[3]. The guideline suggests that shooting noise levels (SNL, or the average dB LAmax level of the 25 loudest shots) below 50 dB LAmax show little evidence of significant levels of annoyance, whereas levels above 60 dB LAmax cause significant annoyance.

19. Under the rules introduced through PC48, new dwellings are not permitted within the 60 dB LAmax contour. Beyond that contour, the rules require

[3] https://www.cieh.org/media/1236/clay-target-shooting-guidance-on-the-control-of-noise.pdf

acoustic design of dwellings to achieve 35 dB LAmax in internal habitable rooms. This does not apply to bedrooms because the gun club does not operate at night-time, which the Addendum to Acoustic Engineering Services report on PC48 explains. Screening of primary outdoor living spaces to achieve 50 dB LAmax is required for the protection of outdoor amenity.

20. I consider that the rules for PC48 are an appropriate basis for rules for Area 2, with amendments as follows.

21. To address the effects of shooting noise within Area 2, I recommend that the ODP should include three contours: 60dB LAFmax, 55 dB LAFmax, and 50 dB LAFmax. These contours are necessary to define those parts of the Area where proposed rules restrict activities, or require acoustic design of buildings and external screening to reduce shooting noise, as follows:

    - Within the 60dB LAmax contour, no noise sensitive activities are permitted.
    - Between the 55dB LAFmax and 60dB LAFmax noise contours, all habitable rooms excluding bedrooms within new residential units shall achieve a design noise level of 35 dB LAFmax from the Darfield Gun Club noise.
    - Between the 50dB LAFmax and 60dB LAFmax noise contours, primary outdoor living spaces associated with any new residential unit shall be screened from the Darfield Gun Club noise to achieve a noise level not exceeding 50 dB LAFmax.

22. To give effect to the purposes of these contours, I recommend that the rules for PC48 should be as follows:

    1. *No noise sensitive activities shall be erected within the 60dB LAFmax noise contour area shown on the Outline Development Plan.*
    2. *All habitable rooms, excluding bedrooms, within residential units erected between the 55dB LAFmax and 60dB LAFmax noise contours shown on the Outline Development Plan shall be designed, constructed and maintained to achieve an internal design noise level of 35 dB LAFmax from noise generated by outdoor shooting activities at the Darfield Gun Club (located on the site legally described as RES 1511 BLK XI Hawkins SD).*
    3. *Primary outdoor living spaces associated with any residential unit erected between the 50dB LAFmax and 60dB LAFmax noise contours shown on the Outline Development Plan shall be screened from the Darfield Gun Club to achieve a noise level not exceeding 50 dB LAFmax.*
    4. *Prior to the construction of any residential unit, certification of compliance with (2) and (3) shall be confirmed in writing to the*

Council's Planning Manager by a suitably qualified and experienced acoustics expert.

5. *These requirements shall only apply until such time as the Darfield Gun Club (located on the site legally described as RES 1511 BLK XI Hawkins SD) ceases to operate outdoor shooting activities at the corner of Creyke and Telegraph Roads*.

23. I note that the Commissioner's decision for Plan Change 48 stated that the "…legal mechanisms for new dwellings would also include a no complaints covenant to ensure that new owners are aware of, and cannot make complaints against the noise generated by the Gun Club." I understand that the Commissioner's consideration of such covenants was not translated through into rules in the District Plan, nor have such covenants been imposed on any consents issued. I do not consider covenants need to be considered for Area 2, given that about 1 gun club event per week on average would be expected, and all occurring during daytime hours. Also, the ODP will inform developers of the contours. I understand that new dwelling sites in Area 2 which face Creyke Road would be Large Lots, possibly with a minimum area of 1 hectare as with those lots facing Creyke Road to the west of Telegraph Road, therefore a relatively small number of large lot dwellings would be affected.

Notes:

(i) The contours for this ODP have been remodelled by Acoustic Engineering Services, with the inclusion of a 50dB LAmax contour in Area 2 which defines a limit beyond which external noise screening is not required. This is because the Def L2A zone in Area 2 is much larger than the PC48 land, and external screening will be not be necessary in the more distant parts of Area 2 where gun club noise levels will be below 50 dB LAFmax.

(ii) AES's acoustic assessment for Plan Change 48 explains that SoundPlan computational noise modelling based on *ISO 9613 Acoustics – Attenuation of sound outdoors – Part 2: General method of calculation* was used to calculate the propagation of noise from the site, based on measured noise levels and conservatively assuming downwind conditions in all directions. (SoundPlan is the recognised industry standard for environmental noise monitoring).

(iii) The contours are based on real-time measurements of shotgun noise from clay shooting by the Darfield Gun Club at the DGC. Published information indicates this is likely to be the only significant type of noise from the DGC in terms of potential effects. AES's acoustic assessment for Plan Change 48 refers to noise measurements that I undertook during a club day shoot on the 10th of December 2010, as part of my environmental health assessment for Plan Change 24, Silverstream. I note that AES took additional measurements of clay target shooting. They noted that my measurements were consistent with theirs, therefore I consider that no further measurements need to be done to verify the contours.

Area 2 interface with Living 2A1 zone

24. Residential development in Area 2 would not be expected to cause reverse sensitivity to the Living 2A1 zone to the west of Greendale Road, because the same sorts of activities are permitted in both the zones, and they are controlled by the same proposed rules for noise, lighting, and hazardous substances (refer Appendix 1).

25. The proposed noise standards in Appendix 1, which apply generally to all residential zones and locations throughout the District, are consistent with currently accepted guidance for protection of sleep and for the protection of reasonable residential amenity in NZS 6802:2008 *Acoustics – Environmental Noise*, which is referenced in the proposed plan rules.

26. While there are no national standards for light emission, the proposed light limits in Appendix 1 are consistent with international guidance on standards for residential amenity and rural environments, e.g. *Guidance Notes for the Reduction of Obtrusive Light GN01:2011* published by the UK Institution of Lighting Professionals. The list of provisions for the purpose of minimising upward light and sky glow will also avoid nuisance light issues.

27. The proposed hazardous substances rules are limited to a consent requirement (in any zone) for any activity that falls within the definition of a 'Major Hazard Facility' that is listed in Appendix 1. None of the listed activities would be anticipated in any Residential zone.

Area 2 interface with the Rural zone

28. The Rural Outer Plains zone exists on the south side of Creyke Road, opposite Area 2. Activities in the Rural zone are controlled by more restrictive standards for light spill (1 lux) and by the limits for noise received in residential zones (refer Appendix 1). There is an exemption to the noise rules which is summarised as follows:

    In the Rural Zone, primary production activities undertaken for a limited and intermittent duration and using equipment which is mobile during its normal use. This includes activities such as harvesting, but does not include the use of bird-scaring devices or frost fans. Motorbikes and chainsaws are only exempt when being used as part of primary production activity.

29. Therefore, any fixed equipment is controlled by the residential zone limits, but there is potential for some seasonal or occasional effects of temporary or seasonal farming activities and other rural activities that feature moving equipment and machinery, which are not controlled by the residential zone standards. However, noise effects of such activities would be mitigated by the approximate 20 m buffer across Creyke Road between lots in the proposed Large Lot Residential zone and the closest boundary of the Rural zone. Also, new dwelling sites in Area 2 which face Creyke Road would be Large Lots, possibly with a minimum area of 1 hectare which will limit the limit the numbers of residents potentially affected.

30. The proposed hazardous substances rules require consent for any activity that falls within the definition of a 'Major Hazard Facility' that is listed in Appendix 1. None of the listed activities are currently present in the adjacent Rural zone, and the effects of any future proposal on the Large Lot Residential zone would be assessed through the consent process.

31. The Canterbury Regional Council's Canterbury Air Plan includes a number of rules which control the effects of air discharges and emissions from activities in the Rural zone, including the spraying and application of agrichemicals, storage and handling of fertilisers and bulk materials, burning of crop residues etc. There is a common requirement in the rules to avoid any noxious, dangerous or offensive discharge of air contaminants beyond the boundaries of the site where the activity is occurring. There is an unavoidable risk of emissions crossing boundaries into other sites, no matter how well managed, if there is a prevailing wind change, and this could result in occasional complaints. However, any effects of such discharges on the Large Lot Residential zone would be mitigated by their occasional occurrence and by the buffer across Creyke Road.

32. On balance, I consider the lifting of the deferred status over the proposed Large Lot Residential zone would not cause significant reverse sensitivity issue to rural land-owners, noting also that Residential/Rural zone interfaces are very common and compatible throughout the District.

AREA 3

33. Referring to the Outline Development Plans (ODPs) prepared by Boffa Miskell, the Deferred Living zone in Area 3 is located on the south side of State Highway 73, adjacent to the Business zone on Mathias Street which is occupied by Frew's Transport Ltd. Also, State Highway 73 and the main trunk railway line are close to the north boundary of the Area. Established activities in the Business zone, and the transport networks, could suffer reverse sensitivity effects if the Deferred status is lifted.

34. A Residential zone lies opposite the Area on the north side of SH73. There would be no reverse sensitivity effects on that zone, for the reasons stated in the section "Area 2 interface with Living 2A1 zone" above.

Area 3 interface with the Business zone

35. Frew's Transport's website lists the goods and services they supply from the Darfield site. This includes cartage of stock, logs, bulk fertiliser and lime, freight, general cartage, container cartage, and silage contracting. Both a Ravensdown Fertiliser consignment store and a Firth concrete batching plant are also run at the site. There is a large diesel storage tank on the site which complies with the rules of the Council and Environment Canterbury.

36. My previous discussions with Frew's management in 2010 for Plan Change 24 confirmed that trucks routinely operate from the site 24 hours a day. A view from the road shows that the site is unsealed, and some materials are stored uncovered outside. Such activities may be controlled by rules in the pSDP and the Canterbury Air Plan, however noise, glare, odour and dust emissions, hazardous substances

and litter have potential to affect residential amenity and cause disturbance, in particular when management practices or control processes fail for any reason.

37. To protect the amenity of residential development in Area 3, I recommend that a minimum setback for residential units in Area 3 should be 40 m from the west boundary that is shared with Frew's. This is consistent with the setback that has been included for the same purpose in the Outline Development Plan for Silverstream, following my recommendations for Plan Change 24.

38. In addition, I recommend that a 2 m high acoustic fence that meets the following specifications should be constructed in place of the existing low post and wire fence on the west boundary that is shared with Frew's, which will help to contain fugitive dust emissions and reduce noise.

    Minimum specifications for an acoustic fence:

    2.0 m in height with a surface mass of at least 10 kg/m2 (e.g. 25 mm treated timber, concrete tilt slab or block), constructed and maintained without gaps in its construction.

Area 3 interface with State Highway 73 and the Railway Network.

39. The north boundary of Area 3 adjoins State Highway 73, and it is approximately 7 m from the carriageway. This boundary is also 30 m from the main trunk railway line which runs parallel to the north of SH73.

40. Appendix 1 of this report sets out the rules in the pSDP which address reverse sensitivity on the State Highway Network and the Railway Network. I understand that the rules have been agreed to by NZTA.

41. To control external road noise received by noise sensitive activities (as defined in the pSDP – refer Appendix 1), the rules require that:

> *Any new building for a noise sensitive activity shall be greater than 100 metres from the edge of a state highway carriageway, except where:*
>
> (*a) external road noise levels are less than 57 dB LAeq(24h) at all points 1.5 metres above ground level within the notional boundary of the new building; or*
>
> *(b) there is a noise barrier at least 3 metres high which blocks the line-of-sight to the road surface from all points 1.5 metres above ground level within the notional boundary of the new building.*

42. To control internal road and railway noise received in new buildings or alterations for noise sensitive activities, the rules state:

> *Any new building or alteration to an existing building for a noise sensitive activity shall be greater than 100 metres from the legal boundary of any railway network or 100 metres from the edge of a state highway carriageway, except where the building or alteration:*

(a) is designed, constructed and maintained to achieve indoor design noise levels not exceeding the maximum values in the following table[4]; or

(b) is at least 50 metres from the carriageway of any state highway or 50 metres from any railway network, and is designed so that a noise barrier blocks line-of-sight from all parts of doors and windows, to the road surface and/or to all points 3.8 metres above railway tracks.

43. To control indoor road and railway vibration, the rules state:

> *Any new building or alteration to an existing building for a noise sensitive activity, that is closer than 40 metres to the boundary of a State Highway or closer than 60 metres to the boundary of a railway network, shall be designed, constructed and maintained to achieve road and rail vibration levels not exceeding 0.3 mm/s vw,95.*

44. Furthermore, the rules require that a design report or a construction schedule prepared by a qualified acoustic engineer demonstrating compliance shall be submitted to the Council prior to the construction or alteration of any building for a noise sensitive activity.

45. The rules are complex and there may be considerable variation in the setbacks and other solutions that are implemented at different sites to achieve compliance, depending on factors such as single storey vs two storey, avoiding line of sight from external balconies to the transport networks, specific design of barriers at local street openings etc. For these reasons, and because the rules will apply in any case, I consider that the ODP for this Area doesn't necessarily need to include setbacks. However, if a setback needs to be shown, I suggest that the minimum permissible setback of 100 m without barriers should be specified and shown in the ODP as a trigger point, with the following notation:

Any new building or alteration to an existing building for a noise sensitive activity shall be greater than 100 metres from the edge of State Highway 73. Any closer setback shall be assessed on a site by site basis in accordance with Rule ##.

46. This would also satisfy the minimum permissible 100 metres setback from the legal boundary of the railway network.

(Note: Rule ## would be the entire proposed Traffic/ Railway network noise reverse sensitivity rule set out in Appendix 1 of this report).

AREA 4A

47. Area 4A is near the corner of Cridges Road and State Highway 73. Residential zones adjoin Area 4A to the west, north and south. There would be no reverse sensitivity effects caused by development of Area 4A on those residential zones, for the reasons stated in the section "Area 2 interface with Living 2A1 zone" above.

[4] (see the Table in Appendix 1 of this report)

48. The east boundary of Area 4A adjoins an established sawmill site operated by Mitchell Bros Sawmillers Ltd. During my assessment for PC31, I visited the sawmill site on 21 February 2012 by arrangement with Mr Tony Mitchell. From that visit, and from observations in subsequent noise monitoring and recent discussions with Mr Pearson the owner of Area 4A, I have identified the following potential causes of reverse sensitivity:

    - Noise from process machinery, timber drying kilns, woodwaste collection systems, woodwaste burner, and yard activities including handling of materials, loading and unloading trucks, chainsawing of timbers, vehicle movements.
    - The storage and use of hazardous substances
    - Light spill and glare
    - Dust, smoke and fumes from woodwaste collection and combustion processes (in 2009 consent CRC093662 was obtained from Environment Canterbury to allow burning of wood waste, with coal being allowed only when sufficient woodwaste is not available).
    - Dust from yard areas

49. The majority of the sawmill equipment is operated within buildings, with the exception of the timber drying kilns and the woodwaste burner that supplies heat to them, which are located close to the east boundary of Area 4A. Unsealed open yard areas where finished timber products are stored and handled are situated next to an occupied residential property at 19 Cridges Road in the south-east corner of Area 4A. Sawmilling and other yard activities are located further east and are largely shielded from Area 4A by buildings on Mitchell's site.

50. The woodwaste system burner and kilns generally operate concurrently and continuously, "24/7", whereas sawmilling equipment and yard activities generally operate during daytime. Mitchell Brothers' activities are not subject to any time limits, except that the timeframes of the pSDP noise rules in Appendix 1 of this report will apply to any future new plant or equipment or changes to their processes and activities that are not protected by their existing use rights. The timeframes and noise limits in those rules are consistent with current guidance in *NZS 6802:2008 Acoustics – Environmental Noise* for protection of sleep and reasonable residential amenity, therefore compliance with those limits will provide adequate protection to residents in Area 4A for noise from any future new plant or equipment at Mitchell's site or from changes to their processes and activities.

51. Mitchell Brothers' existing plant and equipment is not controlled by the pSDP noise limits because of their existing use rights. However the burner and kilns are subject to resource consents issued by the Selwyn District Council in 1993 (R300511) to install and operate a coal-fired timber drying kiln, and in 1999 (R304128) to install and operate two further timber drying kilns. Also, in 2009 consent CRC093662 was obtained from Environment Canterbury to allow burning of wood waste, with coal being allowed only when sufficient woodwaste is not available.

52. Although the Council's consents do not specify any noise limits for the burner and kiln, the acoustic report submitted for the 1999 consent predicted that the kilns would not exceed 61 dBA Leq at a distance of 15 m, which in Area 4A is close to the sawmill boundary, and 42 dBA Leq at a distance of 135 m, which in Area 4A is corresponds to the current Living 2 zone boundary on the west boundary. The predictions were made on the basis that there was no attenuation by buildings or other features, i.e. with clear line of sight to the burner and kilns, and this is the current situation in Area 4A. It was not stated if the 1999 predictions included noise from the fuel-burning equipment that supplied heat to the kilns, but I consider that this can be assumed because the same burner was operating as in the 1993 assessment.

53. The 1999 consent was granted on the basis of the information provided. Therefore, the predicted levels may be regarded by the Selwyn District Council as performance standards for compliance assessment in my opinion. They are also a relevant factor for consideration of noise intrusion into Area 4A, for the purposes of my assessment.

54. I have undertaken noise measurements of the kilns and woodwaste burner for comparison with the predicted levels in the 1999 report, for the purpose of this assessment. The measurements were taken in Area 4A on 14 March 2012 between 8 pm and 10:30 pm, and again on 18 July 2019.

55. The measurements were taken with a sound level meter calibrated and operated in accordance with NZS6801:2008 *Acoustics - Measurement of Environmental Sound.* There was clear line of sight to the kilns and the woodwaste burner from all the monitoring locations. There is no fence or barrier at the sawmill site boundary, therefore the noise was attenuated only by the distances to each measurement location.

56. The measurements are summarised in Appendix 3 of this report. Figure 1 below indicates the approximate positions of the measurement locations.

Figure 1: Area 4A, showing noise monitoring locations

(source: Canterbury Maps)

57. The noise from the kilns and burner was steady, continuous and non-fluctuating in character. There was some tonality that was noticeable close to the burner, but which dissipated with distance. Third-octave measurements revealed some prominence around 31.5 Hz and 80 Hz. However, analysis of the recordings using the Simplified test method in Table B2 of NZS 6802:2008 shows that tonal penalty adjustment of the recorded levels was not justified.

58. Referring to Appendix 3, the measured levels at locations 1 and 6 (which are approximately 15 m from the burner and kilns), were 65 and 64 dB LAeq respectively. This exceeds the 1999 predicted level of 61dB LAeq at 15 m by 3 to 4 dB.

59. At location 5, which is at the Living 2 zone boundary on the west side of Area 4A 135 m from the sawmill boundary, a level of 46dB LAeq was recorded. After deducting 2dB to adjust for the influence of residual sound (i.e. ambient sound without sawmill noise, which was 41 dB LAeq in Greendale Street approximately 450 m south of the sawmill site), the adjusted sawmill sound level on the west side of Area 4A was 44 dB LAeq. This exceeds the 1999 predicted level of 42dB LAeq at 135 m by 2 dB.

60. Appendix 3 shows that LAeq levels measured in 2019 are generally 2 or 3 dB lower than in 2012, except at location 1 which is approximately 10 m from the burner, where the 2019 level is 6 dB less than in 2012. The difference decreases with distance to the extent that there is no difference between the 2012 and 2019 levels at the current Living 2 zone boundary on the west side of Area 4A, which is

135 m from the sawmill boundary. I called Tony Mitchell of Mitchell Brothers on 29 August 2019 to enquire what the reasons could be for this difference. He said that noise insulation had been installed round the fuel feed lines, but not to the burner or kiln fans as far as he knew. He would expect the latest noise measurements would be "typical" for the plant as it operates now through the night. He also said in other parts of the sawmill, new equipment was quieter than the equipment it replaced, and noise proofing has also been installed. This would also be done for any future changes to the burner or kilns as a matter of policy.

61. With ongoing maintenance and replacement of equipment by Mitchell Brothers, it is quite possible that compliance with the predicted levels in the 1999 noise report for Resource Consent R304128 might be achieved at some future date. However, the levels of noise received in Area 4A would still be significantly higher than current guidance in NZS 6802:2008 for protection of sleep and reasonable residential amenity, i.e. 55 dBA Leq daytime and 45 dBA Leq night-time with windows open or closed. Therefore, additional attenuation will need to be installed within Area 4A to protect the sleep and amenity of future residents from the current "typical" levels of noise that were measured on 18 July 2019 and which are expected to continue.

62. Calculations indicate that the noise from Mitchell Brothers site would be reduced below 45dBA Leq across all residential lots in Area 4A, by requiring the following mitigation:

    a. A 3 m high earth mound topped with a 2m high acoustic fence shall be constructed parallel to the entire length of the Business Zone (east) boundary, and as close to as close as is practicable to that boundary.

    b. The acoustic fence shall meet the following specifications: 2.0 m in height with a surface mass of at least 10 kg/m2 (e.g. 25 mm treated timber), and be constructed and maintained without gaps in its construction

    c. On any new residential lot, a 60 m building setback from the Business Zone boundary shall apply to dwellings.

63. Barriers with this mound/fence configuration are commonly used for road noise attenuation, e.g. adjacent to SH1 at Rolleston, and in Christchurch on Innes Road, QEII Drive and Halswell Road at Aidanfield. The setback and barrier would block future residents' view of the sawmill site from the dwelling sites, while also mitigating nuisance wood particles, dust, odour and smoke emission from the sawmill site at all times of the day and night.

Area 4A interface with State Highway 73

64. The north boundary of Area 4A adjoins State Highway 73, and it is approximately 8 m from the carriageway. For the reasons set out in my assessment of this issue for Area 3, I suggest that the minimum permissible setback of 100 m without barriers should be specified and shown in the ODP as a trigger point, with the following notation:

Any new building or alteration to an existing building for a noise sensitive activity shall be greater than 100 metres from the edge of State Highway 73. Any closer setback shall be assessed on a site by site basis in accordance with Rule ##.

65. This would also satisfy the minimum permissible 100 metres setback from the legal boundary of the railway network.

(Note: Rule ## would be the entire proposed Traffic/ Railway network noise reverse sensitivity rule set out in Appendix 1 of this report).

CONCLUSIONS AND RECOMMENDATIONS

1. For the reasons set out in this report, I recommend that the following mitigation should be included in the Outline Development Plans for the various Areas:

   AREA 2

   Darfield Gun Club Noise

2. I recommend that the ODP for Area 2 should include three contours: 60dB LAFmax, 55 dB LAFmax, and 50 dB LAFmax. These contours are based on contours applying to neighbouring land under Plan Change 48. The contours define those parts of the site where proposed rules require acoustic design of buildings and external screening to reduce shooting noise.

3. I recommend that the following rules should apply to Area 2:

   (i) No noise sensitive land uses shall be erected within the 60dB LAFmax noise contour area shown on the Outline Development Plan.

   (ii) All habitable rooms, excluding bedrooms, within residential units erected between the 55dB LAFmax and 60dB LAFmax noise contours shown on the Outline Development Plan shall be designed, constructed and maintained to achieve an internal design noise level of 35 dB LAFmax from noise generated by outdoor shooting activities at the Darfield Gun Club (located on the site legally described as RES 1511 BLK XI Hawkins SD).

   (iii) Primary outdoor living spaces associated with any residential unit erected between the 50dB LAFmax and 60dB LAFmax noise contours shown on the Outline Development Plan shall be screened from the Darfield Gun Club noise to achieve a noise level not exceeding 50 dB LAFmax.

   (iv) Prior to the construction of any residential unit, certification of compliance with (2) and (3) shall be confirmed in writing to the Council's Planning Manager by a suitably qualified and experienced acoustics expert.

   (v) These requirements shall only apply until such time as the Darfield Gun Club (located on the site legally described as RES 1511 BLK XI Hawkins SD) ceases to operate outdoor shooting activities at the corner of Creyke and Telegraph Roads.

AREA 3

Business Zone boundary

4. I recommend that the ODP for Area 3 should include a minimum setback for noise sensitive activities of 40 m from the west boundary that is shared with the Business Zone. This is consistent with the setback that was included for the same purpose in the Outline Development Plan for Silverstream, following my recommendations for Plan Change 24.

5. In addition, I recommend that a 2 m high acoustic fence that meets the following specifications should be constructed in place of the existing low post and wire fence on the west boundary that is shared with Frew's, which will help to contain fugitive dust emissions and reduce noise. The minimum specifications for an acoustic fence are as follows:

    - 2.0 m in height with a surface mass of at least 10 kg/m2 (e.g. 25 mm treated timber, concrete tilt slab or block), constructed and maintained without gaps in its construction.

Road and Rail Network Noise

6. I suggest that the minimum permissible setback of 100 m without barriers should be specified and shown in the ODP as a trigger point, with the following notation:

Any new building or alteration to an existing building for a noise sensitive activity shall be setback greater than 100 metres from the edge of State Highway 73. Any closer setback shall be assessed on a site by site basis in accordance with Rule ##.

This would also satisfy the minimum permissible 100 metres setback from the legal boundary of the railway network.

(Note: Rule ## would be the entire proposed Traffic/ Railway network noise reverse sensitivity rule set out in Appendix 1 of this report).

AREA 4A

Business Zone

7. I recommend that the ODP and rules for Area 4A should include the following measures to mitigate noise and air contaminant emissions from the Business Zone:

    a. A 3 m high earth mound topped with a 2m high acoustic fence shall be constructed parallel to the entire length of the Business Zone (east) boundary, and as close to as close as is practicable to that boundary.

    b. The acoustic fence shall meet the following specifications: 2.0 m in height with a surface mass of at least 10 kg/m2 (e.g. 25 mm treated timber), and be constructed and maintained without gaps in its construction

c. On any new residential lot, a 60 m building setback from the Business Zone boundary shall apply to dwellings.

Area 4A interface with State Highway 73

Road Network Noise

8. I recommend that a minimum permissible setback of 100 m without barriers should be specified and shown in the ODP, and the following rule should apply to Area 4A:

Any new building or alteration to an existing building for a noise sensitive activity shall be setback greater than 100 metres from the edge of State Highway 73. Any closer setback shall be assessed on a site by site basis in accordance with Rule ##.

This would also satisfy the minimum permissible 100 metres setback from the legal boundary of the railway network.

(Note: Rule ## would be the entire proposed Traffic/ Railway network noise reverse sensitivity rule set out in Appendix 1 of this report).

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APPENDIX 1 PROPOSED SELWYN DISTRICT PLAN ENVIRONMENTAL EFFECTS-BASED RULES

Rules or limits that are proposed for shooting ranges

Darfield Gun Club

For land use activities, the following applies to the Darfield Gun Club

1. No additional dwellings shall be erected within the 60dB noise contour area shown on the Outline Development Plan.
2. All habitable space excluding bedrooms, within the new residential units erected outside the 60dB noise contour shown on the Outline Development Plan shall be designed, constructed and maintained to achieve a design noise level of 35 dB LAFmax from noise generated by outdoor shooting activities at the Darfield Gun Club (located on the site legally described as RES 1511 BLK XI Hawkins SD).
3. Primary outdoor living spaces associated with any new residential unit shall be screened from the Darfield Gun Club noise to achieve a noise level not exceeding 50 dB LAFmax.
4. Prior to the construction of any residential unit, certification of compliance with 4.9.44 (i) and (ii) shall be confirmed in writing to the Council's Planning Manager by a suitably qualified and experienced acoustic expert.
5. These requirements shall only apply until such time as the Darfield Gun Club (located on the site legally described as RES 1511 BLK XI Hawkins SD) ceases to operate outdoor shooting activities at the corner of Creyke and Telegraph Roads.

West Melton Rifle Range

SUB-REQ15	Noise sensitivity management	
West Melton Rifle Range Noise Management overlay	SUB-REQ15.1. Every site created shall be outside the West Melton Rifle Range Noise Management overlay identified on the planning maps	Activity status when compliance not achieved: SUB-REQ15.2. When compliance with any of SUB-REQ15.1 is not achieved: RDIS Where: a. A no-complaints covenant shall be included on each record of title issued. This covenant shall be registered with the deposit of the subdivision plan, in a form acceptable to the Council under which the registered proprietor will covenant to waive all rights of complaint, submission, appeal or objection it may have under the Resource Management Act 1991 or otherwise in respect of any subdivision, use or development of the New Zealand Defence Force's land at the West Melton Rifle Range. SUB-REQ15.3. When compliance with any of SUB-REQ15.2 is not achieved: NC Matters of discretion: SUB-REQ15.4. The exercise of discretion in relation to SUB-REQ15.2 is restricted to consideration of: a. All the matters listed in SUB – Matters for control or discretion b. The potential for reverse sensitivity effects on the West Melton Rifle Range. This shall include, but not be limited to: i. the proposed use of the building, ii. the distance from the West Melton Rifle Range, and iii. surrounding topography; iv. The location of each building square; c. Any proposed mitigation measures to address potential reverse sensitivity effects and the effectiveness of those measures; and d. Any consultation undertaken with the New Zealand Defence Force and the outcome of that consultation. Notification: SUB-REQ15.5. Any application arising from SUB-REQ15.2 shall not be subject to public notification. Absent their written approval, notice shall only be served on the New Zealand Defence Force

Zone Noise limits

Noise limits (at the site receiving the noise), for all residential zones:

- 7am to 10pm - 50 dBL_{Aeq}
- 10pm to 7am - 40 dBL_{Aeq}
- 10pm to 7am - 65 LAmax

Noise limits for the rural zones are:

- 7am to 10pm - 55 dBLAeq
- 10pm to 7am - 45 dBLAeq
- 10pm to 7am - 65 LAmax

The requirements in relation to measurement and assessment of noise are:

Measurement and Assessment of Noise

1. Other than where expressly provided for, noise levels arising from activities must be measured in accordance with NZS 6801:2008 Acoustics - Measurement of Environmental Sound and assessed in accordance with NZS 6802:2008 - Acoustics Environmental Noise.
2. The noise standards shall apply at any point within a site receiving noise from any activity, except where:
3. (i) the site boundary is a boundary with a road or railway network in which case noise standards shall apply at or beyond the far boundary of the road or railway network;

(i) the standards specify otherwise.

Where a site is divided by a zone boundary then each part of the site divided by the zone boundary shall be treated as a separate site for the purpose of these rules.

Zone Residential Standards

Low Density Residential Zone:

Density – minimum of 600m^2, average of 750m^2, minimum 15m x 15m dimensions

Any wall or fencing between the applicable building setback on a site and any road boundary, or that shares a boundary with a reserve or walkway, must be a maximum of 1.2m in height if solid, or no higher than 1.8m if visually permeable for the full height; or solid up to 1.2m and visually permeable between 1.2 and 1.8.

Large Lot Residential Zone:

Density – 3000m^2 minimum, average of 5000m^2, minimum 15m x 15m dimensions

Any fencing must be a maximum of 1.2m in height, at least 50% visually permeable and post and rail, post and wire, tennis court or swimming pool fencing

Traffic noise setbacks and external/internal limits for SH noise as agreed with NZTA

The rule for new buildings or building extensions within proximity to the State Highway is:

Any new building for a noise sensitive activity shall be greater than 100 metres from the edge of a state highway carriageway, except where:

(a) external road noise levels are less than 57 dB $L_{Aeq(24h)}$ at all points 1.5 metres above ground level within the notional boundary of the new building; or

(b) there is a noise barrier at least 3 metres high which blocks the line-of-sight to the road surface from all points 1.5 metres above ground level within the notional boundary of the new building.

Indoor road and railway noise

1. Any new building or alteration to an existing building for a noise sensitive activity shall be greater than 100 metres from the legal boundary of any railway network or 100 metres from the edge of a state highway carriageway, except where the building or alteration:

(a) is designed, constructed and maintained to achieve indoor design noise levels not exceeding the maximum values in the following table; or

Building type	***Occupancy/activity***	***Maximum road noise level $L_{Aeq(24h)}$***	***Maximum railway noise level $L_{Aeq(1h)}$***
Residential	*Sleeping spaces*	*40 dB*	*35 dB*
	All other habitable rooms	*40 dB*	*40 dB*
Education	*Lecture rooms/theatres, music studios, assembly halls*	*35 dB*	*35 dB*
	Teaching areas, conference rooms, drama studios, sleeping areas	*40 dB*	*40 dB*
	Libraries	*45 dB*	*45 dB*
Health	*Overnight medical care, wards*	*40 dB*	*40 dB*
	Clinics, consulting rooms, theatres, nurses' stations	*45 dB*	*45 dB*
Cultural	*Places of worship, marae*	*35 dB*	

b.is at least 50 metres from the carriageway of any state highway or 50 metres from any railway network, and is designed so that a noise barrier blocks line-of-sight from all parts of doors and windows, to the road surface and/or to all points 3.8 metres above railway tracks.

Mechanical ventilation

2. *If windows must be closed to achieve the design noise levels in clause 2(a), any new building or alteration to an existing building for a noise sensitive activity shall be designed, constructed and maintained with a mechanical ventilation system that*

a. *For habitable rooms for a residential activity, achieves the following requirements:*

   i. *provides mechanical ventilation to satisfy clause G4 of the New Zealand Building Code; and*

   ii. *is adjustable by the occupant to control the ventilation rate in increments up to a high air flow setting that provides at least 6 air changes per hour; and*

   iii. *provides relief for equivalent volumes of spill air;*

   iv. *provides cooling and heating that is controllable by the occupant and can maintain the inside temperature between 18°C and 25°C; and*

   v. *does not generate more than 35 dB $L_{Aeq(30s)}$ when measured 1 metre away from any grille or diffuser.*

b. *For other spaces, is as determined by a suitably qualified and experienced person.*

Indoor road and railway vibration

3. *Any new building or alteration to an existing building for a noise sensitive activity, that is closer than 40 metres to the boundary of a State Highway or closer than 60 metres to the boundary of a railway network, shall be designed, constructed and maintained to achieve road and rail vibration levels not exceeding 0.3 mm/s $v_{w,95}$.*

Design report *[may be replaced with a construction schedule]*

5. *In order to comply with clauses (1) to (4) above (as relevant), a report prepared by a qualified acoustic engineer demonstrating compliance shall be submitted to the Council prior to the construction or alteration of any building for a noise sensitive activity. In the design report:*

a. *railway noise shall be assumed to be 70 $L_{Aeq(1h)}$ at a distance of 12 metres from the track, and shall be deemed to reduce at a rate of 3 dB per doubling of distance up to 40 metres and 6 dB per doubling of distance beyond 40 metres; and*

b. *road noise shall be based on measured or predicted noise levels plus 3 dB.*

Definition of "noise sensitive activity":

Means any:

a. Residential activity
b. Educational facility
c. Visitors' accommodation
d. Camping ground
e. Hospital or healthcare facility
f. Place of worship
g. Cultural facility

Hazardous substances rules for the various zones

Given the changes to the RMA, the only hazardous substances rule is a consent requirement (in any zone) for any activity that falls within the definition of a 'Major Hazard Facility', as follows:

means any facility which involves one or more following activities:

- *Manufacturing of hazardous substances (including industries manufacturing agrochemicals, fertilisers, acids/alkalis or paints)*
- *Oil and gas exploration and extraction facilities*
- *The storage/use of more than 100,000l of petrol*
- *The storage/use of more than 50,000l of diesel*
- *The storage/use of more than 6 tonnes of lpg*
- *Galvanising plants*
- *Electroplating and metal treatment facilities*
- *Tanneries*
- *Timber treatment*
- *Freezing works and rendering plants*
- *Wastewater treatment plants*
- *Metal smelting and refining (including battery refining or re-cycling)*
- *Milk treatment plants*
- *Fibreglass manufacturing*
- *Polymer foam manufacturing*
- *Asphalt/bitumen manufacture or storage*
- *Landfills*

The following are examples of activities which are not considered to be major hazardous facilities:

- *The incidental use and storage of hazardous substances in minimal domestic scale quantities*
- *Retail outlets for hazardous substances intended for domestic usage (e.g. supermarkets, hardware stores and pharmacies)*
- *Retail service stations and truck stops*
- *Pipelines used for the transfer of hazardous substances such gas, oil, trade waste and sewage*
- *Fuel in motor vehicles, boats, airplanes and small engines*
- *Military training activities*

• *The transport of hazardous substances (e.g. in trucks or trains)*

Light spill/glare

- Any fixed artificial outdoor lighting must be directed away from and/or screened from adjacent properties and roads
- Maximum light spill levels:
-

Zone of the adjacent site receiving light spill	**10pm - 6am**	**Hours of darkness outside 10pm - 6am**
Rural Zone	1 lux	5 lux
Rural Zone where it adjoins Special Purpose Dairy Processing Zone and Special Purpose Port Zone	3 lux	5 lux
Residential Zones Kaianga Nohoanga Zone	2 lux	10 lux
All Commercial Zones Industrial Zone Special Purpose Port Zone Special Purpose Knowledge Zone	5 lux	25 lux

For the purpose of minimising upward light and sky glow:

(a) Only flat glass luminaires shall be installed, and they shall be installed at zero degree tilt to ensure all flux distribution is below the horizontal plane;

(b) Luminaires shall be angled in a downward direction with no upward light output above 10 degrees below the horizontal;

(c) The luminaires' distribution beam shall be angled downwards so the cut-off angle of the flux distribution all lies within a downward vertical angle of 10 degrees below the horizontal;

(d) Luminaires shall have a nominal correlated colour temperature of not more than 4000K (neutral white);

APPENDIX 2: EXPLANATORY INFORMATION - NOISE TERMINOLOGY

- NZS 6801 and 6802:2008 have introduced changes to noise metrics to make them consistent with international standards and practice. In the following definitions, the new terminology is shown within brackets.

- Decibels (dB) are descriptors used in sound measurements.
- dBA means decibels "A-weighted"; i.e. decibels adjusted to approximate human hearing response.
- dBA Lmax (dB L_{AFmax}) is the highest level heard in the measurement period
- dBA L10 (dB L_{AF10}), is the 10-percentile level, which indicates the most frequently occurring louder, but not loudest, sounds heard during the measurement period.
- dBA Leq (dB L_{Aeq}) is a single figure which contains the equivalent energy of all the varying sounds recorded in the measurement period
- dBA SEL (dB L_{AE}) or Sound Exposure Level is the 1-second equivalent level which contains the same sound energy as is received during a given noise event
- dBA L90 (dB L_{AF10}) or the 90-percentile level, indicates the background sound level.
- Total Sound or 'Ambient sound' refers to all sound that is present on an occasion of monitoring, whether or not the specific sound under assessment is present.
- Residual sound is noise that remains when the specific sound under assessment is supressed or is an insignificant part of the total sound.

APPENDIX 3: NOISE MEASUREMENTS – MITCHELL BROTHERS

Noise Measurements in Area 4A Deferred Living 2 A zone near Mitchell Brothers' site
Wood burning furnace and kilns operating

Weather:
21/2/2012: 17 °C, 2-3 m/s Easterly, clear/light overcast
18/7/2019: 5 °C, <1 m/s north-easterly, broken light overcast

Date	Time	Min/sec	Monitoring location (refer Fig 1)		dB LA10	dB LAmax	dB LA90	dB LAeq
21/2/2012	21:09	2 min 04s	1	Approx. 15 m from wood fired furnace	72	73	70	71
18/7/2019	20:43	2 min 40s			66	69	64	65
21/2/2012	20:30	5 min 06s	2	Approx. 35 m from sawmill boundary, facing wood fired furnace	60	71	57	59
18/7/2019	20:50	2 min 15s			57	67	55	56
21/2/2012	20:46	2 min 02s	3	Approx. 60 m from sawmill boundary, facing wood fired furnace	56	62	54	55
18/7/2019	20:56	2 min 14s			53	59	52	52

21/2/2012	20:53	2 min 08s	4	Approx. 85 m from sawmill boundary, facing wood fired furnace	53	61	51	52
18/7/2019	21:00	2 min 11s			51	58	49	50
21/2/2012	20:57	2 min 03s	5	Approx. 140 m from sawmill boundary, facing wood fired furnace	47	53	45	46
18/7/2019	21:06	2 min 07s			47	56	45	46
21/2/2012	21:06	2 min 02s	6	Approx. 15 m from kilns	67	68	66	67
18/7/2019	21:24	2 min 07s			65	66	63	64
21/2/2012	20:22	5 min 05s	7	Approx. 35 m from sawmill boundary, facing kilns	60	70	58	59
18/7/2019	21:13	2 min 08s			58	56	60	57
Note: Road traffic noise paused out or back-erased from all measurements								
Night-time ambient noise, away from sawmill noise influence								
14/3/2012	21:33	3 min 24 s	8	North Terrace, east of Maxwell St – road traffic on West Coast Rd and South Tce paused out	41	59	37	40
18/7/2019	21:49	1 min 42s	9	Greendale Street, outside Darfield School. No traffic noise	43	58	37	41