Appendix I

Acoustic Assessment

DESIGN ADVICE MEMO

ACOUSTIC

Memo No	**A01 Issue B**
Job Name	**Rolleston West**
Job No	**201522/A**
Date	**17 November 2020**
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Rolleston West Plan Change (ODP Area 39 and 40)

1. Introduction

Powell Fenwick has been engaged by Rolleston West Residential Ltd to provide high level feedback regarding the reverse sensitivity noise implications of a proposed rezoning of the Holmes block and the Skellerup block in West Rolleston. Rolleston West Residential Ltd propose plan changes that rezone the land from Living 3 Zone to Living Zone Z. The Holmes block is located at 385 Burnham Rd adjacent to State Highway 1 (SH1). The Skellerup block is located on Dunns Crossing Rd over 1.5km south of SH1. The Skellerup block has no particular identifiable factors which would require noise assessment so therefore has not been considered further in this memorandum.

This memorandum does not constitute a full noise assessment of the Holmes block, which due to the likely noise exposure would be strongly recommended prior to residential subdivision consent. This memorandum is only intended to review the interests of the critical road infrastructure (NZTA SH1) and the amenity of future residential activities which occur onsite, to ensure the rezoning is acceptable from a reverse sensitivity perspective.

Specifically this memorandum draws comparisons between the proposal at 385 Burnham Rd and the nearby subdivisions ODP Area 1 (Stonebrook) and ODP Area 3/8 to gauge the suitability of the proposed rezoning.

2. Comparative Review

It is expected that the predominant source of noise which would affect the development will be from SH1. Noise from roads, particularly from busier State Highways can be readily predicted using the procedures detailed within the Calculation of Road Traffic Noise 1988. The relative noise exposure at a particular point is a function of the following variables:

- Traffic volume (annual average daily traffic (AADT))
- Road Surface Type
- Speed
- Gradient
- Angle of view and number of opposing reflecting surfaces.

Based on our review of the available SH1 road information we note the following observations:

- The traffic volume has not significantly increased since 2013 in the vicinity of Stonebrook; the application date of Stonebrook subdivision. Significant increases in traffic volume are required to measurably increase noise levels. As the Stonebrook subdivision is directly adjacent to the Holmes subdivision there will be little variance in traffic volumes.
- For ODP area 3/8 we note that traffic volumes are 20% higher which might equate to about 1 dB difference across the site.

- The road surface for the sections of road adjacent to the subdivisions are chip seal Grade 3/5.
- The marked road speed for the sections of road adjacent to the subdivisions are all 100 km/h (ODP Areas 3/8 temporarily have lower speed limits due to road works but we have assumed 100 km/h.)
- Relevant sections of SH1 have a similar gradient adjacent to the subdivision areas.
- There are no reflecting surfaces directly opposite any of the subdivisions.

Based on the above observations, we consider that the noise exposure at the Holmes Subdivision is likely to be similar to the Stonebrook subdivision and the ODP Areas 3 and 8. We have therefore compared the applicable District Plan rules to each of these Subdivisions in the following Section.

3. Rules

Holmes Block

We have been advised that Selwyn District Plan Rule 4.9.38 is applicable to the Living 3 zoned Holmes block (as currently zoned). This is presented below:

> *4.9.38 Any dwelling, family flat, and any rooms within accessory buildings used for sleeping or living purposes, and any internal areas associated with noise sensitive activities in the Living 3 Zone at Rolleston (as shown on the Outline Development in Appendix 39) shall be setback at least 80m from State Highway 1.*

Stonebrook Subdivision

We have been advised that Selwyn District Plan rules 4.9.3 and 4.9.4 are applicable to the Stonebrook Subdivision (as a generic case). These are presented below:

> *4.9.3 Except for the Living 3 Zone at Rolleston identified on the Outline Development Plan in Appendix 39 and Appendix 40, and ODP Area 3 and ODP Area 8 in Rolleston, and the Living 2A Zone in Darfield, as identified in the Outline Development Plan in Appendix 47, any dwelling, family flat, and any rooms within accessory buildings used for sleeping or living purposes shall be located no closer than 40m from the edge of the sealed carriageway of State Highways with a posted speed limit of 70 Km/hr or greater.*
>
> *4.9.4 Except for the Living 3 Zone at Rolleston identified on the Outline Development Plan in Appendix 39 and Appendix 40, and ODP Area 3 and ODP Area 8 in Rolleston, and the Living 2A Zone in Darfield, as identified in the Outline Development Plan in Appendix 47, any dwelling, family flat, and any rooms within accessory buildings used for sleeping or living purposes within 100m from the edge of the sealed carriageway of State Highways with a posted speed limit of 70 Km/hr or greater shall have internal noise levels from road traffic that do not exceed the limits set out below with all windows and doors closed:*
>
> - *Within Bedrooms: 35 dBA (Leq 24 hour)*
> - *Within Living Area Rooms: 40 dBA (Leq 24 hour)*

ODP Area 3 & 8

The below rules 4.9.35 and 4.9.36 are applicable to ODP Area 3/8 from the Operative Selwyn District Plan:

> *4.9.35 In ODP Area 3 and ODP Area 8 in Rolleston, no dwellings shall be located closer than 40m (measured from the nearest painted edge of the carriageway) from State Highway 1*
>
> *4.9.36 In ODP Area 3 and ODP Area 8 in Rolleston, for any dwelling constructed between 40m and 100m (measured from the nearest painted edge of the carriageway) from State Highway 1:*
>
> - *Appropriate noise control must be designed, constructed and maintained to ensure noise levels within the dwelling meet the internal design levels in AS/NZS2107:2000 (or its successor) – 'Recommended design and sound levels and reverberation times for building interiors'*
> - *Prior to the construction of any dwelling an acoustic design certificate from a suitable qualified and experienced consultant is to be provided to Council to ensure that the above internal sound levels can be achieved.*

Table 1 below summarises the requirements of the noise rules presented above, together with supplementary guidance from the NZTA document '*Guide to the management of effects on noise sensitive land use near to the state highway network Sep 2015 V1.0.*'

Table 1: Comparison of Subdivision Rules

Subdivision Rule/Guidance	Setback Distance (m)	Effects Buffer (m)	Noise Criteria
Living 3 Zone (Rule 4.9.38)	80m	n/a	n/a
Stonebrook (Rule 4.9.3/4)	40m	100m	Bedrooms 35 dB $L_{Aeq(24hr)}$ Living areas 40 dB $L_{Aeq(24hr)}$
ODP Area 3/8 (Rule 4.9.35/36)	40m	100m	Bedrooms 40 dB $L_{Aeq(T)}$, Living areas 45 dB $L_{Aeq(T)}$ – based on AS/NZS 2107:2016 criteria
NZTA Guidance	40m	100m	All habitable spaces 40 dB $L_{Aeq(24hr)}$

Notes: T in LAeq(T) is the duration for which the space is expected to be occupied.

We have the following commentary on the above rules:

- We have been advised by Novo Group that it is preferable to maintain consistency with rules in the District Plan.
- The original resource consent conditions for the Stonebrook site allowed properties within the 40m area provided that a specialist report was provided. Should residential activities be proposed within the 40m setback zone then we understand that this could be revisited by way of discretionary consent under Rule 4.9.56.
- AS/NZS 2107:2016 is now the most recent version of the standard, although this is accounted for within the rule. We also note that AS/NZS 2107:2016 is applicable to steady-state or quasi-steady-state noise sources and is not applicable to road traffic noise. The noise levels recommended, however, are broadly consistent with the internal noise criterion (Criteria C) presented within NZS 6806 for internal sound levels of 40 dB $L_{Aeq(24hour)}$ within dwellings near new and altered roads (which is also noted in the NZTA Guidance) but differ in the following ways:
    - The time period for assessment in AS/NZS 2107 for varying sources is the duration of the expected usage of the space. Bedrooms, for example, the expected duration might be 8 hours for night time. In this instance a space designed to the NZS 6806:2016 internal noise criterion of 40 dB $L_{Aeq(24hr)}$ would likely result in quieter levels during the night than the AS/NZS 2107:2016 40 dB $_{LAeq(8hr)}$.
    - The assessment of road traffic noise in New Zealand typically considers a 24 hour average $L_{Aeq(24hr)}$ which can readily be calculated from AADT without the need for detailed traffic information. Therefore we consider that the adoption of AS/NZS 2107 is not ideal for road traffic noise.
- The Stonebrook subdivision Rule 4.9.4 also considers a 24 hour average but has a more stringent requirement for bedrooms when compared to broader national and NZTA guidance. The 35 dB $L_{Aeq(24hr)}$ criterion is expected to broadly align with the World Health Organisation Guidelines for Community Noise 1999 guideline criterion of 30 dB $L_{Aeq(8hr)}$.
- The District Plan rules are more lenient (allow higher internal noise levels) than those written in the resource consent conditions (RC 135261). However, we have been advised that the District Plan rule is most relevant.
- The Living 3 Zone rules (whch are currently applicable) do not specify any noise criteria, and instead reverse sensitivity effects are dealt with through set back distances within the zone.
- The word '*maintained*' has been used in the Rule 4.9.36 which could imply that future increases in road noise levels (due to increasing traffic or otherwise) could trigger the occupants of dwellings to retrofit improvement measures. It is assumed that the word '*maintained*' is instead intended to ensure that any future refurbishments or modifications do not result in increased noise levels which exceed the standard. Similar wording is recommended with the NZTA Guide.
- Rules 4.9.4, 4.9.36 specify an internal level rather than a set façade reduction. The rule is therefore applicable to a wide range of developments with varying noise exposures as the target outcome is maintained.

- None of the rules provide any protection of outdoor amenity other than set back distance. The Stonebrook subdivision has a 3m acoustic barrier along the road consisting of a bund and paling fence. It is unclear without conducting a full assessment the extent that the barrier protects the outdoor amenity of the subdivision, however, it is expected to be what is *reasonably* practicable to reduce noise exposure to outdoor areas.
- We note there is no explicit requirement for mechanical ventilation where windows are required to be closed to achieve the internal design sound levels. We understand that this is consistent with the rest of the District.

Considering the above, we recommend that the existing rule wording and noise level criteria in rules 4.9.3 and 4.9.4 should be applicable to the proposed Holmes block (ODP Area 39). This rule wording is consistent with the adjacent Stonebrook subdivision, and with wider design *best practice* for road traffic noise. Any relaxing of this criteria would need to be assessed in more detail as part of a subdivision application.

In order to assist in achieving the internal design sound level criteria and to moderate outdoor noise levels we consider that a 3m high acoustic barrier should be included alongside SH1.The acoustic barrier should provisionally be 3m high and be constructed of a material with a surface mass exceeding 10 kg/m^2 such as 24mm overlapped timber palings. The barrier height may be made up in whole or in part by a landscaped bund. The detailed requirements should be determined as part of a subdivision consent.

4. Conclusion

Based on our comparative assessment and subject to the proposed rules for the Holmes block described above we consider the Holmes and Skellerup blocks are suitable for rezoning when considering road noise / reverse sensitivity effects.

DESIGN ADVICE MEMO

ACOUSTIC

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Rolleston West Plan Change (ODP Area 39 and 40) – Addendum 1 RFI Response

1. Introduction

Powell Fenwick has been engaged by Rolleston West Residential Ltd to undertake assessment of reverse sensitivity noise implications of a proposed rezoning of the Holmes block and the Skellerup block in West Rolleston. Rolleston West Residential Ltd propose plan changes that rezone the land from Living 3 Zone to Living Zone Z, resulting in intensification of residential activity relative to the status quo. The Holmes block is located at 385 Burnham Rd adjacent to State Highway 1 (SH1). The Skellerup block is located on Dunns Crossing Rd over 1.5 km south of SH1.

Our earlier Design Advice Memo A01 Issue B titled *Rolleston West Plan Change (ODP Area 39 and 40)* dated 17 Nov 2020 drew comparisons between the Holmes block proposal at 385 Burnham Rd and the conditions on nearby subdivisions ODP Area 1 (Stonebrook) and ODP Area 3/8 to gauge the suitability of the proposed rezoning.

This addendum 1 is in response to a Selwyn District Council request for further information (RFI). The relevant RFI documents are:

- Selwyn District Council, titled *PC200073: Private Plan Change Request to the Operative Selwyn District Plan from Rolleston West Residential Limited in Rolleston – Request for further information*, dated 22 Dec 2020.
- The accompanying noise review by Acoustic Engineering Services, File Ref: AC20356 – 01 – D1, project *Selwyn District Council – Private Plan Change Request 73*, dated 18 Dec 2020.

Most particularly this addendum responds to RFI item 46 which states:

> "It appears that there may be other noise sources in the area which could be of concern from a noise reverse sensitivity perspective, such as the RRP (and associated heavy vehicle movements along Burnham School Road), traffic on Dunns Crossing Road, and the intensive farming operation to the north of the Skellerup block. An assessment of these sources should be provided."

The assessment of the above also addresses RFI item 10 which states:

> "Further, in relation to the RRP, the acoustic assessment is limited to an assessment of SH1 road noise and the impact on future residential amenity. Please consider the reverse sensitivity effects arising from heavy vehicle movements travelling to/from The Pines along Burnham School Road, particularly given the reduced road setbacks to residential activity proposed."

And addresses RFI item 6 which states:

> "While the various assessment included in the plan change request acknowledge the current operations of these facilities, and propose measures to address reverse sensitivity effects, these measures appear to only take account of the existing operating conditions/environment. Given the potential growth in the district in light of the various plan change requests currently before Council, the expansion of these facilities is anticipated by Council. Therefore the various assessments, including odour and acoustic, are to be amended to acknowledge the future capacity of these facilities…"

The Pines/RRP is the Pines Resource Recovery Park – Selwyn District's waste handling facility. The intensive farming operation referred to would most clearly relate to poultry sheds at Dunns Crossing Rd immediately north of the Skellerup Block. The below plan shows key features relevant to the assessment of these matters.

Noise from SH1 is addressed in our earlier design memo and no further comment is provided in this addendum.

Figure 1. Location plan including relevant features.

We point out that the land subject to the proposed plan change is already zoned Living 3 which provides for rural residential activity and is therefore, at a planning level, suitable for residential activities. This further assessment will therefore give particular attention to where effects change as a result of intensification outcomes from the rezoning.

2. Site Survey

Observations of the existing noise environments at the Skellerup and Holmes block were conducted on Thursday 26 Jan 2021 and measurements taken between 0936 hours and 1017 hours. The survey was undertaken by James Glen of Powell Fenwick. The site measurements were intended to support an observational analysis of the likely noise generating activities rather providing a comprehensive account of noise exposure under all conditions.

During the survey, wind speeds were generally less than 5 m/s for the Skellerup Block, but were between 5 m/s and 10 m/s during the measurements conducted at the Holmes Block. Wind induced noise (rustling of trees etc.) is likely to have some contribution to the noise levels in both surveys.

Measurements at Skellerup Block (LT1) were conducted using an unattended sound level meter (NTi XL2-TA SN:A2A-15282-E0) for the duration of the survey. The Class 1 sound level meter was calibrated to 114 dB before and after the survey and no significant drift was observed. The sound level meter was laboratory calibrated on 04 Dec 2020. The calibrator (SV33a: ser.58057) was calibrated on 05 Mar 2020. Audio recordings were made throughout the survey such that peak noise events could be analysed to establish the source.

A second sound level meter (B&K 2250: ser.2625254) was used to measure the noise on the southern corner of the Holmes Block, nearest the RRP. The sound level meter was also calibrated to 114 dB before and after the survey and no significant drift was observed. The sound level meter was laboratory calibrated on 05 Mar 2020. The calibrator (SV33a: ser.58057) was calibrated on 05 Mar 2020.

All instrumentation used within this survey is therefore considered to be in calibration.

Observations made during the survey of the Holmes Block are as follows:

- The dominant source of noise along the south boundary was traffic on Burnham School Rd, the loudest event was attributed to a passenger vehicle approaching at approximately 100 km/h on the chip seal road.
- Some commercial vehicles (skip lorries, Waste Management rubbish trucks and a selection of light commercial vehicles) were measured during the survey. Noise from these vehicles was not observably louder than cars travelling at cruising speed along the road.
- There was no observable noise from the Pines Resource Recovery Park, and we noted that it was operating with approximately 15 arrivals/departures during the 15 minute measurement period.

Observations made during the survey of the Skellerup Block are as follows:

- The dominant source of noise was traffic on Dunns Crossing Rd, with heavy vehicle pass bys reaching up to 80 dB L_{Amax} at a distance of approximately 5m from the road edge (at the position of the fence line).
- We understand that a poultry farm is established on the block directly north of the site. Noise from the farm included what appeared to be a conveyor/feeding system type noise and was briefly audible between road traffic movements. Considering the continuous background level of other noise sources in the area (wind in trees etc.) we estimate the specific level of this source to be approximately 46 dB L_{Aeq} at a measurement distance of approximately 70 m from the sheds.
- Other sources of noise include the construction of a new retirement village in the lot opposite which became more significant towards the end of the measurement period.

A summary of the measurement results is present in Table 1 below:

Table 1: Summary of measurements undertaken on 26 Jan 2021

Measurement Location	Time	Duration(mins)	LAeq	LAFmax
M1 - Holmes	09:49 - 10:04	15	62	85.2
M2 - Skellerup	09:36 - 10:17	41	60.1	82.6

3. Assessment

Holmes Block

The survey affirmed that the noise environment is typical of rural environments with moderate traffic volume rural roads, notwithstanding the potential for seasonal farming activities to be part of the sound environment.

The RRP public operations did not generate noise effects on the Holmes site observable within the day-time noise environment and the opening hours are 0900-1630 hours (7 days) therefore no night-time effects are anticipated from public operations. These comments are valid even with significant expansion of usage/activities.

Considering the removal of waste from the RRP, we made contact with Andrew Boyd who is the SDC Solid Waste Manager. Mr Boyd informed us that "H-marked" truck and trailer units remove the waste between 0400-1300 hours most days. He was uncertain of the exact number of truck and trailer units (although this information would be attainable with his scrutiny of records) but estimated seven movements in and out each day, with perhaps 2-3 prior to 0800 hours. The truck and trailer units drop off empty containers and take full containers – identifiable as the blue containers in the image below. Mr Boyd expected the departure route was typically north-east along Burnham School Rd then north-west along Dunns Crossing Rd to the State Highway.

Figure 2. Resource Recovery Park image from SDC Website.

The truck and trailer units are likely to cause noise effects similar to the louder vehicles measured during the sample measurement i.e. in the order of 85 dB L_{Amax} at 5 m from the road. While this is louder than ideal and would exceed some criteria for potential to cause night-awakenings at properties close to the road (as would be expected with intensification), other vehicles causing similar noise levels could reasonably be expected during night-time hours on Burnham School Rd (as per any through-road near a township) and in that context the effect would not be as apparent.

Further, the expected route of the units through the Selwyn District would presently include proximity to dwellings in Rural zones and likely proximity to more intensified housing in Living zones on Dunns Crossing Rd which may indicate community acceptance of the noise effects.

Sound reduction considerations are as follows:

- As the setback to the façade of any dwelling is likely to be greater than 5 m from the road, sound levels will be reduced, in the order of 3 dB lower should the façade be at 10 m from the road, with other areas of the dwelling subject to further reduced noise levels.
- We understand Rolleston West Residential Ltd is considering installation of a bund, fencing or combination of both along Burnham School Rd, of total height 2 m, which we endorse for reduction of road traffic noise. Such an acoustic barrier, where continuous, would provide in the order of 5 dB of reduction. Fencing would need to be of a continuous nature, free of gaps and in the order of 10 kg/m^2 surface mass, specifics to be approved by an acoustic engineer during landscape detailed design.

- A speed reduction to 60-80 km/h on Burnham School Rd would provide in the order of 2-4 dB reduction (should speed reduction be under consideration).

The Waste Water Treatment Plant, located approximately 800m from the boundary of the Holmes block would not be expected to have observable noise effects within the Holmes Block. Related irrigation would be intermittent and has a minimum setback of approximately 160 m from the block, with further margin to housing considering likely odour setbacks. Some irrigation activities can be expected near residential interfaces with rural land. Any vehicle traffic related to the Waste Water Treatment Plant would be occasional and be consistent with observations above on the nature of traffic on Burnham School Rd.

We expect that Dunns Crossing Rd will remain at 50-60 km/h and therefore will have noise effects similar to a number of township through-roads, and is consistent with similar roads in the District and other residential developments on Dunns Crossing Rd, which do not require specific noise mitigation.

Skellerup Block

The survey affirmed that the noise environment is typical of rural environments with moderate traffic volume rural roads, notwithstanding the potential for seasonal farming activities to be part of the sound environment.

The poultry farming equipment in the sheds created observable noise estimated to be 46 dB L_{Aeq} at the measurement position 70 m from the sheds, identifiable in between road traffic and natural environmental noise sources. We understand due to odour concerns, the closest housing proposed will be 150 m from the sheds and therefore noise levels would be expected to be in the order of 40 dB L_{Aeq}. This level is reasonable and common in a residential context and meets NZS 6802:2008 *Acoustics – Environmental noise* guidance of 55 dB L_{Aeq} and 45 dB L_{Aeq} during the day-time period and the more stringent night-time period respectively.

We expect that Dunns Crossing Rd will remain at 50-60 km/h and therefore will have noise effects similar to a number of township through-roads, and is consistent with similar roads in the District and other residential developments on Dunns Crossing Rd, which do not require specific noise mitigation.

Expansion of the WWTP and RRP

Expansion of infrastructure related to growth in the District (refer RFI item 6), is not expected to have significant impact on the proposed rezoning, for the following reasons.

- Whether is it the same on site activity occurring twice as frequently (such as drop offs at the RRP) or twice the output required (such as two pumps operating instead of one at the WWTP), acoustic scaling would predict noise increase in the order of 3 dB in average noise levels which is minimal increase in the context of the low operational noise exposure.
- If the infrastructure activity was to fundamentally change, it would still need to address noise exposure at the blocks, which are presently zoned for rural residential activities.
- Additional service vehicle movements on the road would not increase the maximum noise exposure, and as they are likely to be a small proportion of overall traffic flow, average noise levels are unlikely to measurably increase.
- The possibility of additional truck and trailer unit trips during early hours would presumably increase proportionally with other vehicle traffic so the effect would remain in context (refer comments above).
- Significant further growth in housing may also result long term in reduced speeds on Burnham School Rd, which would reduce average noise levels from road traffic.

4. Conclusion

The Holmes site and the Skellerup site are subject to noise effects from the nearby RRP and poultry farming activities respectively. Otherwise the noise environment would be typical to rural areas adjoining urban residential environments.

Noise from RRP truck and trailer units and other vehicle movements on Burnham School Rd may cause night-time disturbance at residential sites located alongside Burnham School Rd within the Holmes block. However, subject to the landscaping on Burnham School Rd incorporating an acoustic barrier of at least 2m height, this would mitigate the noise exposure to levels in the order of 77 dB L_{Amax} which is reasonable in our view, for the reasons stated above.

Noise from the poultry farming sheds at Dunns Crossing Rd immediately north of the Skellerup block, if the proposed 150 m setback from the poultry sheds to housing within the Skellerup site was implemented, would result in expected noise levels of 40 dB L_{Aeq} which is reasonable in the context of New Zealand guidance criteria.

The expanded use/capacity of the WWTP and RRP is not expected to result in significant increase in noise effects.

The initial assessment of SH1 noise and conditions, and this addendum addressing other noise sources are considered to provide a full assessment.