BEFOR THE SELWYN DISTRICT COUNCIL

RC225180

In the matter of	the Resource Management Act 1991	
	Sections 88-120, Resource Management Act 1991	
Between	**Party**	KeaX Limited
	Role	Applicant
And	**Party**	Robyn Casey, Clark and Elizabeth Casey and Dave and Donna Kewish ("Joint Submitters")
	Role	Submitter

EVIDENCE OF MARK DOUGLAS LEWTHWAITE

Date 16 February 2023

J M van der Wal
Barrister
40 Walker Street Chambers
Christchurch
Also at 14 Queen Street
Blenheim

NATURE, PURPOSE AND BASIS OF EVIDENCE

1 My full name is Mark Douglas Lewthwaite. I have been engaged by Robyn Casey, Clark and Elizabeth Casey and Dave and Donna Kewish ("Joint Submitters"), who have made a joint submission and an individual submission in opposition to Application RC225180 ("the application"), to provide expert acoustic evidence. I briefly address the reports and evidence of acoustic experts representing the Applicant and Council and comments made in the s42A report. Principally, I provide observations regarding the composition of measured samples of the existing sound environment, and the sound environment after the installation of proposed solar equipment to support an assessment of amenity values by others.

2 I am an acoustic consultant with 17 years of acoustic and mechanical engineering consultancy experience.

3 I am a Chartered Professional Engineer and Associate Member of the Acoustical Society of New Zealand.

4 Within the field of environmental noise assessment my expertise includes monitoring, prediction of noise from infrastructural and other activities, acoustic insulation of sensitive activities from road noise, providing expert evidence at planning and resource consent hearings.

5 I have read the Environment Court's code of conduct for expert witnesses within the Practice Note 2023 and agree to comply with it. My qualifications as an expert are set out above. I confirm that the issues addressed in this statement of evidence are within my area of expertise.

6 I have read and reviewed the following information:

1. Application Acoustic Report, "Brookside Solar Farm" by AES dated 12 Aug 2022 ("AES Report")

2. Marshall Day Acoustics report "Brookside Solar Farm – Noise Peer Review" dated 20 Sep 2022 ("MDA Report") s42A

3. Report by Jesse Aimer dated 01 Feb 2023

4. Evidence of Mr William Reeve dated 09 Feb 2023.

5. The data, information, facts and assumptions I have considered in forming my opinions are set out in the documents to which I refer above or the part of the evidence in which I express my opinions. I have not omitted to consider material facts known to me that might alter or detract from the opinions I have expressed. I have relied upon others at Powell Fenwick for some environmental sound observations, and processing of data.

6. This evidence addresses:

7. The reports and evidence of acoustic experts representing the Applicant and Council and comments made in the s42A report – all reviewed in brief only.

8. Principally, I provide observations regarding the composition of measured samples of the existing sound environment, and the sound environment after the installation of proposed solar equipment to support an assessment of amenity values by Mr Stewart Fletcher who is providing planning evidence. This assessment was limited to the outdoor environment due to time constraints.

9. I attach the following relevant documents, Appendix A: Figure A1: Logged Measurement at 324 Branch Drain Rd, Figure A2: Sound Composition of Sample Measurements

BACKGROUND

10. The application is as described in Mr Stewart Fletcher's Evidence.

11. I was requested to provide acoustic peer review of the application in particular the AES Report, and subsequently received the MDA report – an acoustic peer review on behalf of Council. I was also asked to assist with an assessment of the change in amenity values of the environment.

REVIEW OF EXPERT REPORTS AND EVIDENCE

12. Broadly I agree with the references to various standards and guidance and within the AES Report.

13. I also agree with the MDA Report which noted the absence of measurements of the existing sound environment and recommended a more conservative day-noise limit of 50 dB $L_{Aeq(15min)}$ during the relevant day-time period (0730-2000 h).

14. The latest assessment from AES included in Mr Reeve's evidence, provided ambient sound measurements which were helpful, and Mr Reeves accepted the application of the 50 dB $L_{Aeq(15min)}$ limit proposed in the MDA Report.

15. Based on Mr Reeve's evidence, the operational noise levels from solar equipment would be up to 48 dBA at 324 Branch Drain Rd, and the louder equipment items are unlikely to have special audible characteristic penalties applied according to his witnessing of similar equipment. Therefore the operational levels should be compliant with the 50 dB $L_{Aeq(15min)}$ day-time limit now proposed at all nearby dwelling locations. Operation is not proposed to take place outside of day-time hours.

16. I note there is no assessment of noise generated (if any) from wind blowing across the solar panels and structure.

17. I agree NZS 6803:1999 should be referred to for construction noise management, and due to the scale of the works and period of construction in an environment with relatively low ambient noise levels, a Construction Noise and Vibration Management Plan is appropriate.

SECTION 42A REPORT

18. As my engagement is principally related to the sound environment assessment work described below, the most relevant paragraphs of the s42A report are 111-122 where *nature* of the environment is briefly mentioned amidst matters of noise level. The outcomes of my sound environment composition assessment may give useful context to the "…

peace and tranquillity …" of the environment referred to by submitters, and inform assessment of human factors and amenity values.

SOUND ENVIRONMENT COMPOSITION ASSESSMENT

19. Amenity values are defined in the Resource Management Act and are referenced in the Proposed and Operative Selwyn District Plans as: "…those natural or physical qualities and characteristics of an area that contribute to people's appreciation of its pleasantness, aesthetic coherence, and cultural and recreational attributes.

20. I do not have appropriate expertise to comment broadly on changes in amenity much of which is unrelated to sound. "Pleasantness" however is a term that would include the properties of the sound environment. The composition of a sound environment would affect pleasantness, as well as level. We therefore undertook to assess the composition of sound sources present during logged measurements of the existing noise environment. The timeframe available dictated that the assessment method would need to be simple and consider a modest number of locations and samples.

21. Our noise logging and observations were undertaken at the following locations and times, in the described environment:

    1. 324 Branch Drain Rd front garden, 01 Feb 2023, 1159-1214 h Weather: Fine, mixed clear sky and clouds, light winds with occasional gusts (NIWA 22°C, 24 km/h wind, gusts 37 km/h, NE)

    2. 56 Buckleys Rd roadside, 14 Feb 2023, 1203-1218 h Weather: Fine, overcast, light winds with occasional gusts (NIWA 21°C, 14 km/h wind ENE, gusts 26 km/h NE)

    3. 15 Stewarts Rd front garden, 14 Feb 2023, 1233-1248 h Weather: Fine, overcast, light winds with occasional gusts (NIWA 21°C, 14 km/h wind ENE, gusts 26 km/h NE)

4. 324 Branch Drain Rd front garden, 14 Feb 2023, 1310-1325 hWeather: Fine, overcast, light winds with occasional gusts (NIWA, 22^{o}C, 17 km/h wind ENE, gusts 27 km/h NE)

22. NIWA data from cliflo.niwa.co.nz, at weather station 17603 Lincoln, Broadfield Ews/Niwa/Plant & Food Research, 1 hour period data.

23. Prior to commencing sound logging we observed the sound environment and noted the contributing sound sources that were always evident. At all sites this was quieter bird sound, cicadas and, underlying those two sounds, distant road traffic.

24. During the course of each of the 15 min logged and observed periods we identified periods of time when other sound was more noticeable, which corresponded with a distinctly higher measured time-average (dB $L_{Aeq(5s)}$) noise level. At 324 Branch Drain Rd Mr Liam O'Brien, another member of the Powell Fenwick acoustic team, and myself, took records and compared afterwards, taking the average of our (very similar) observations when compiling the data presented in this evidence. In the other cases Mr O'Brien only was present, and the data is therefore derived from his observations only.

25. In the case of 324 Branch Drain Rd on 01 Feb, the logged level was 43 dB $L_{Aeq(15min)}$, 5 dB lower than the predicted solar equipment noise levels of 48 dBA in Mr Reeve's Evidence para 7.7. Refer Appendix A Figure A1 for logged levels, with various sound sources notated.

26. The proportions of time from the different existing sound sources for each sample measurement are as per Appendix A Table A1.

27. We considered how those proportions might change with the introduction of solar equipment noise at the levels predicted by Mr Reeve. In the case of 324 Branch Drain Rd, we reviewed the change at 48 dBA, being the modelled noise levels from the evidence of Mr Reeve's, and also at 42 dBA, 6 dB less.

28. 42 dBA was included for the following reasons:

1. It might be representative of a lower noise level reflecting a less conservative noise prediction method or benefiting from equipment output controls or inherent screening of some elements as mentioned by Mr Reeve's Evidence para 7.9.

2. To be indicative of the change in composition at more distant locations subject to lower noise levels (assuming similar existing sound environment).

3. To be indicative of reduced levels in the case where additional acoustic screening was added to the nearest solar equipment as noise mitigation.

4. In the other locations the solar equipment assessment levels are based on the predicted solar equipment levels at the respective location, from AES Report Appendix B, then also at the 6 dB reduced level. The assessed composition at all locations is also included in Table A1.

29. Our process for determining the balance of noise sources with the solar equipment in operation was to assume all noise louder than the respective solar equipment levels would remain the most noticeable sound source and where the solar equipment was louder than the recorded ambient level the solar equipment noise would be most noticeable. This should not be misconstrued to mean that sound that isn't "most noticeable" isn't audible, as if a sound is of distinct character it may be audible even down to perhaps 10 dB below a more non-descript noise.

30. I considered an analysis that also factored in relative distinctiveness of character, however given the solar equipment noise may have aspects that are tonal (in accordance with NZS 6802:2008), of distinct character (not tonal in accordance with NZS 6802:2008), and more broadband in nature, any two-factor analysis considering both level and distinctiveness of character would be complicated, speculative and subjective.

31. To simplify the presentation of the change in composition of the environment, I grouped the different sound sources into those I considered desirable sound and those that would be (undesirable) noise. (The existing base level sound was observed to have some contribution from road traffic but this was less than that of either birds or cicadas so base level sound was considered desirable. Where distant traffic became an equal contributor this has been separately categorised.)

32. The results of the overall analysis at 324 Branch Drain Rd show 86% desirable sound and 14% noise without the solar equipment, changing to 0% desirable sound and 100% noise when the solar equipment noise is at 48 dBA. In the lower solar equipment noise scenario the outcomes are 4% desirable sound and 96% noise.

33. The average outcome across all four samples was 69% desirable sound and 31% noise without the solar equipment, changing to 6% desirable sound and 94% noise when the solar equipment was at the upper noise level. In the lower solar equipment noise scenario the outcomes are 18% desirable sound and 82% noise.

34. Both change in composition and noise level will be readily apparent in the conditions observed, and the noise environment less pleasant.

35. The measured periods did not include louder continuous anthropogenic noise sources involved in rural activities, or noise generated by more significant weather conditions. Seasonally natural sound will also vary e.g. cicada sound would be expected to be lower in winter, and the timing of bird sound will change. (Here ends my knowledge of entomology and ornithology.) These and other changes in the environment will alter the balance of desirable sound and noise.

36. At least to consider what might be typical wind levels, we again scrutinised NIWA Cliflo wind data for the 2022 period (0000-2400 h, hourly average presented). The wind speed range was 0-46.8 km/h, with -1 standard deviation of 5.2 km/h, average 13.0 km/h, +1 standard deviation of 20.8 km/h. Gusts were recorded up to 81 km/h. The logged measurements

therefore took place in above average wind speeds, although further analysis will need to be undertaken to determine the wind data within the period of 0730-2000 h.

37. In Mr Reeve's Evidence para 2.4 he reported: "… extended daytime periods where noise levels are between 38-48 dB $L_{Aeq(15\ min)}$, often with several louder periods during the day." These levels are broadly supported by the time-average levels of our sample measurements, which for reference were:

    1. 324 Branch Drain Rd, 01 Feb 2023: 43 dB $L_{Aeq(15min).}$ Some wind noise in local foliage

    2. 56 Buckleys Rd, 14 Feb 2023: 51 dB $L_{Aeq(15min).}$ Elevated noise due to close proximity to wind break.

    3. 15 Stewarts Rd, 14 Feb 2023: 45 dB $L_{Aeq(15min).}$ Higher noise due to proximity to Hights Corner intersection

    4. 324 Branch Drain Rd, 14 Feb 2023: 50 dB $L_{Aeq(15min).}$ Increased distant road traffic activities during this period

38. In Mr Reeve's Evidence item 2.10 he reported: "There may be times during the day when noise from the solar farm is clearly audible in the areas outside those dwellings, depending on the weather conditions and the presence or absence of other sources of environmental noise from birds or animals and agricultural activity." Based on our sample analysis conditions, which are within Mr Reeve's anticipated existing ambient noise level range, there are likely to be prolonged periods of days when the solar equipment is the most noticeable component of the sound environment.

MITIGATION

39. Acoustic screening of solar equipment could be investigated to reduce noise emissions thereby reducing the change in the sound environment.

CONCLUSION

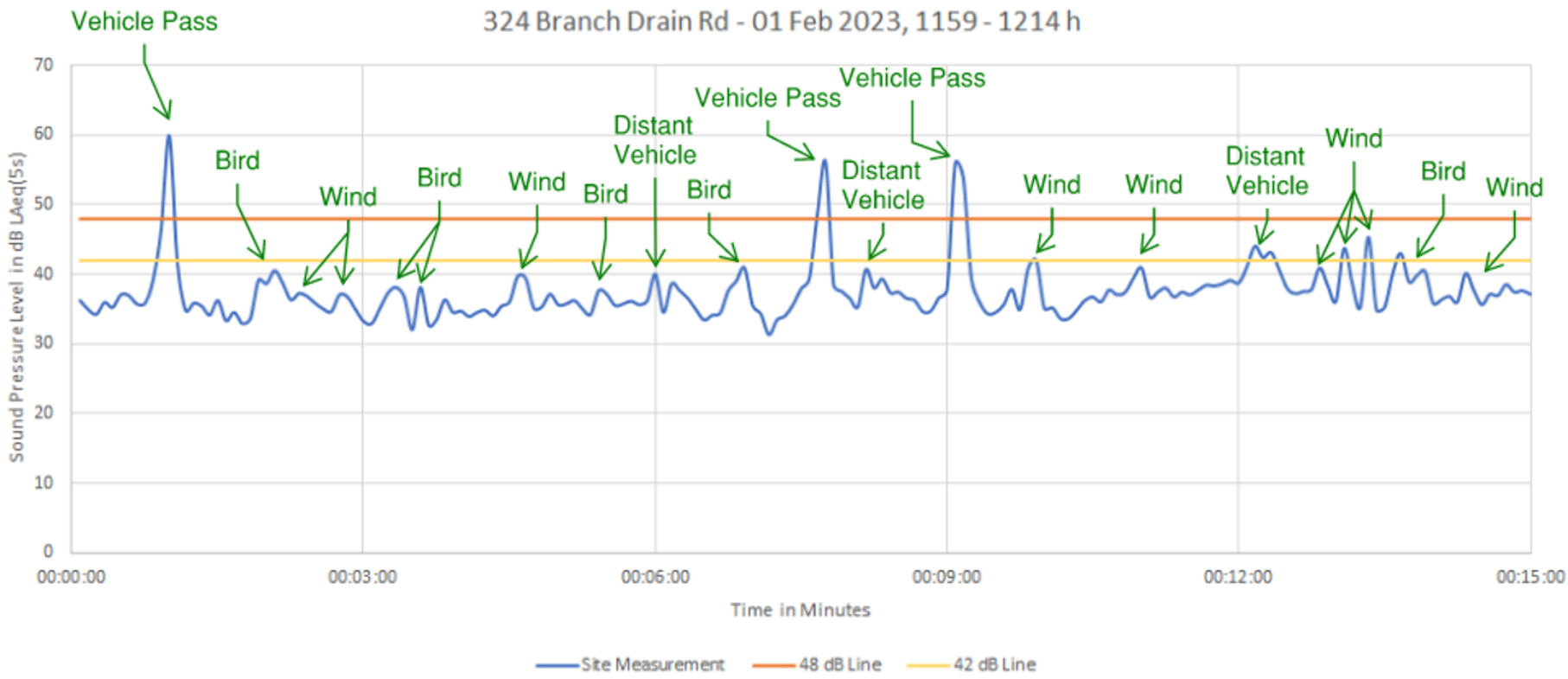
40. While the levels of noise emissions from the solar equipment are within appropriate standards and guidance criteria, properties such as 324 Branch Drain Rd will experience a change in the sound environment composition and level, which will be readily apparent in conditions similar to those we observed. The change will be a shift from one of more commonly natural sound to operational sound from the batteries (assumed to be ventilation noise) and the inverter electronics. This will make the sound environment less pleasant, which should be considered as part of assessing the change in amenity.

41. These effects will be able to be reduced to some degree by acoustic screening of the solar equipment.

Dated 16 February 2023

Mark Lewthwaite

Appendix A: Figure A1: Logged Measurement at 324 Branch Drain Rd



Appendix A: Table A1: Sound Composition of Samples

	Natural or favourable sound, "desirable sound"				Unfavourable or anthropogenic sound "noise"				Totals	
Measurement	**Quiet birds, cicadas, underlying distant road traffic**	**Distant, slight wind**	**Moderate wind/gust**	**Bird quacks, tweets, warbles etc.**	**Distant vehicles**	**Nearby vehicle passes (3)**	**Impacts and Distant Machinery**	**Solar equip.**	**Total desirable sound**	**Total noise**
Measured at 324 Branch Drain Rd, 01 Feb 2023, 1159 – 1214 hrs	59.9%	7.0%	13.6%	5.4%	3.0%	11.1%	-	-	85.9%	14.1%
With solar equip. 48 dBA	-	-	-	-	-	4.4%	-	95.6%	0%	100%
With solar equip. 42 dBA	-	-	3.3%	1.1%	3.3%	6.6%	-	85.7%	4.4%	95.6%
Measured at 56 Buckleys Rd, 14 Feb 2023, 1203 – 1218 h	24.6%	-	45%	2.6%	7.4%	4.7%	15.7%	-	72.2%	27.8%
With solar equip. 44 dBA	-	-	25.5%	-	7.4%	4.7%	11.1%	51.3%	25.5%	74.5%
With solar equip. 38 dBA	-	-	45%	2.6%	7.4%	4.7%	15.7%	24.6%	47.6%	52.4%

Measured at 15 Stewarts Rd, 14 Feb 2023, 1233 – 1248 h	25.9%	-	24.2%	1.5%	39.4%	9%	-	-	51.6%	48.4%
With solar equip. 43 dBA	-	-	0.5%	-	-	3.8%	-	95.7%	0.5%	99.5%
With solar equip. 37 dBA	-	-	17.9%	-	18.6%	8.8%	-	54.7%	17.9%	82.1%
Measured at 324 Branch Drain Rd, 14 Feb 2023, 1310 – 1325 hrs	50.2%	-	14.3%	0.2%	19.5%	15.8%	-	-	64.7%	35.3%
With solar equip. 48 dBA	-	-	-	-	-	6.6%	-	93.4%	0%	100%
With solar equip. 42 dBA	-	-	1.1%	0.2%	1.1%	8.8%	-	88.8%	1.3%	98.7%