Expert Witness Statement of William Leslie Huson

In the matter of the Goschen Rare Earths and Mineral Sands Project Inquiry and Advisory Committee (IAC)

Proponent: VHM Limited

Expert retained by: D. S. T. Legal, acting for Mine Free Mallee Farms Inc.

NAME AND ADDRESS OF EXPERT

1 William Leslie Huson

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QUALIFICATIONS

5 BSc (Hons) Applied Physics, UK 1975

6 MSc Sound and Vibration Studies, Institute of Sound and Vibration Research, Southampton, UK 1977

PROFESSIONAL AFFILIATIONS

7 Chartered Physicist, UK

8 Member of the Institute of Physics, UK

9 Member of the Institute of Acoustics, UK

10 Member of the Australian Acoustical Society

11 Member of the AV0001acoustics working group for Standards Australia since 1999

12 Australian representative for the International Institute of Noise Control Engineers (I-INCE) Technical Study Group 5 *A GLOBALAPPROACH TO NOISE CONTROL POLICY* (Now disbanded after completion of the scope of work defining this group – see http://www.i-ince.org/data/iince061.pdf)

EXPERIENCE

13 Since graduating I have been involved in a number of scientific areas of research and development. My early experience was in constructing a microwave device to measure the temperature of plasma inside a nuclear fusion experimentation device at the UKAEA, Culham

Laboratory in the UK. I then worked in research and development of thermal imaging devices prior to completing my Masters in Sound and Vibration Studies. My work since then (1977) has been primarily associated with acoustics and vibration both terrestrial and underwater.

14 For the past 34 years I have worked in Australia as a noise and vibration consultant and have operated through my own consultancy firm for the past 28 years. I am experienced in modelling acoustic propagation from a variety of sources such as railways, roads, aircraft, underwater ordnance, wind farms, pile driving, blasting, quarries, landfills, coal terminals and numerous types of industry.

15 I have been called as Expert Witness in many Panel hearings and Environment Court proceedings over the past 30 years.

OTHER CONTRIBUTORS TO THIS REPORT

16 None

SCOPE OF THIS REPORT

17 I have been commissioned in an email from DST Legal in relation to the IAC into the Goschen Mineral Sands and Rare Earths Project as an expert witness on noise and vibration issues, to prepare an expert witness statement for the IAC.

18 The requested scope of this report is to:

- firstly, review the proponent's EES Chapters and Technical Reports, with particular regard to the **noise impact assessment** (https://www.vhmltd.com.au/ees/); and
- secondly, to provide your opinion on the methodology, analysis and results in a report to be submitted by 13 March 2024 for the Inquiry's consideration.

19 The requested scope falls within my area of expertise and in preparing this report I have endeavoured for it to be complete and accurate.

GENERAL COMMENTS

20 The Goschen Mineral Sands and Rare Earths Project will be referred to in this document as the 'Project'.

21 Technical report 'F' in the EES, prepared by SLR Consulting Australia Pty Ltd is titled 'Noise Impact Assessment' and will be referred to as the NIA.

22 I note that the *increase* in noise levels from the Project have not been addressed in the NIA, only absolute predicted sound levels are considered.

23 The NIA predicts an increase in noise from the Project operations of more than 20 dB above current minimum background sound levels in the Day, Evening and Night periods. This is a significant change to the acoustic environment that neighbours to the Project will experience and this will be an adverse effect on their current acoustic amenity.

24 The NIA contains background survey data for four locations representing the Project area and notes that the low sound level measurement capabilities of the sound level instrumentation used has likely artificially elevated the lower sound levels tabled in Appendix C.

25 Construction activities are addressed in the NIA regarding noise but not vibration.

26 A vibratory roller is listed as an item of equipment that will be used. If this equipment is operated near to dwellings there could be an adverse impact from vibration.

27 The NIA does not identify if the vibratory roller will be used in the pipeline construction activities that are close to numerous residences.

28 Sound from construction of the pipeline for the Project has correctly identified the requirement for a Noise Management Plan (NMP) to be prepared within a Construction Environmental Management Plan (CEMP), however, details of a CEMP and NMP have not been provided in the EES for review.

29 The NIA refers to and applies the Environment Reference Standard (ERS) gazetted on 26 May 2021, that was amended on 29 March 2022 (No. 158 Gazette), that allocates acoustic objectives to different land use categories.

30 The ERS is subordinate legislation under the Environment Protection Act, section 93(1), "to assess and report on environmental conditions in the whole or any part of Victoria." Section 93(2) of the Act states that the ERS "must identify environmental values to be achieved or maintained in the whole or any part of Victoria."

31 The ERS is not a compliance standard, however, the Environment Protection Act 2017 requires the Environment Protection Authority to consider the environmental values in the ERS when deciding whether to issue development and operating licenses.

32 The NIA has identified several public conservation and resource zones close to the Project and allocated Category IV to:

- Talgitcha Bushland Reserve
- Lalbert Recreation Reserve
- Mystic Park Bushland Reserve
- Forest Plantation East Road
- Adj. Kangaroo Lake and Murray Valley Highway

33 Table 3.3 of the ERS allocates fixed sound level objectives for Category IV land use categories but applies qualitive indicators for Category V land use areas being; "A sound quality that is conducive to human tranquillity and enjoyment having regard to the ambient natural landscape."

34 To apply a conservative noise impact assessment, I believe that the areas categorised as IV in the NIA (paragraph 32 above) should be considered Category V and that the sound level *increase* that the Project will have on these areas should be considered.

NOISE PREDICTIONS

35 The NIA explains that the ISO9613-2 noise model procedures have been implemented through a SoundPlan software package.

36 ISO9613-2 requires several inputs to be supplied from which an estimate of sound pressure level at remote locations from sound sources can be determined.

37 The accuracy of an ISO9613-2 noise model is estimated in Table 5 of this standard to be +/-3dB for overall A-weighted levels at a distance of 1000m but with the caveat that "The estimates of accuracy in table 5 are for downwind conditions averaged over independent situations (where there are no effects due to reflection or attenuation due to screening). They should not necessarily be expected to agree with the variation in measurements made at a given site on a given day. The latter can be expected to be larger than the values in table 5".

38 ISO9613-2 also states that;" The estimated errors in calculating the average downwind octave-band sound pressure levels, under the same conditions, may be somewhat larger than the estimated errors given for A-weighted sound pressure levels of broad-band sources in table 5."

39 The average A-weighted accuracy of the ISO9613-2 noise model (+/-3dB) assumes that the inputs are accurate.

40 A conservative noise model would include the +3dB uncertainty in sound level predictions.

41 If model input values for sound power of a sound source are too low by, say, 5dB then the predicted sound level will also be 5dB too low.

42 Other input parameters have an influence of predicted sound pressure levels. These input parameters are: the directivity of a sound source, atmospheric absorption, geometric divergence, attenuation due to the ground effect, barrier attenuation and miscellaneous attenuation through such things as foliage, an industrial site or through a built-up region of houses.

43 The NIA has applied reasonable assumptions for temperature and humidity that affects air absorption, but has not applied any directivity effects from the sound sources.

44 The NIA states that barrier effects from terrain features or pit walls and the presence of hard reflecting surfaces have been included and that the ground absorption value of G=0.6 has been applied in the noise models.

45 Hard ground, represented by G=0, includes water and all other ground surfaces having a low porosity such as tamped ground. The first page of EES Chapter 21 shows a photograph of the farming land surrounding the Project after harvest. The ground is tamped, dry and has low porosity that warrants a ground attenuation value term of G=0, not G=0.6.

46 While it is possible that G=0.6 could apply to the farming area before harvest it is not representative of times after harvest.

47 Sound propagation from the pumping station at Kangaroo Lake to the residents at the northern end of the lake is across water so G=0 should be used, not G=0.6.

48 The implication of using G=0 instead of G=0.6 in ISO9613-2 is to increase sound propagation (reduce ground attenuation) and predicted sound pressure levels presented in the NIA will be higher by typically 1.5 dB.

49 If an account is made of the +3dB uncertainty with a different ground value of G=0 then predictions in the NIA are at least 4.5dB too low.

50 Several assumptions have been made in the ISO9613-2 noise model where, for example, four haul trucks traversing a haul route have been modelled as a ‘line source’. The method of distributing the haul truck sound power across these routes is not described in the NIA. If not distributed properly sound levels predicted can be underestimated.

51 The NIA does not show a specific equipment schedule proposed by VHM Limited but includes generic items of plant and equipment in Appendix B, except for the ten Cummins KTA50-G9 power plant units.

52 Assumptions have been made of the sound power spectra for the Cummins diesel generators and their enclosure attenuating properties. It would be advisable to request more details from Cummins for this equipment.

53 Bulldozers are available in different capacities from different manufacturers and each have different sound power levels and audible characteristics that are largely governed by their capacity in kW. For example, the sound power of a CAT D5 (170 HP) is lower than a CAT D9 (474HP).

54 A CAT D9 has an overall sound power level of 116 dBA but the mine fleet bulldozer as listed in Appendix B of the NIA has a sound power level of 108 dBA.

55 More detail of the mine fleet equipment is required to check sound power levels used in the noise models.

CORRECTIONS FOR SPECIAL AUDIBLE CHARACTERISTICS

56 Special audible characteristics add a penalty to predicted or measured sound levels to account for the increase in annoyance caused by such sounds. The NIA lists these characteristics as:

- tonal noise
- noise impulsive in character
- intermittent noise
- low frequency noise

57 Tonal noise from reversing noise alarms is suggested to be mitigated by using broadband alarms. Whilst this reduces the perceived tone from such alarms it still produces a sound that is impulsive in character.

58 Other commonly available audible reversing alarms generate alternate tones that change frequency. When objectively analysing these alarms using the one-third octave band method described in EPA Publication 1997: *Technical guide: Measuring and analysing industry noise and music noise* the tones appear in adjoining frequency bands and this defeats the objective assessment method even though the alarm is subjectively tonal.

59 The NIA explains in Appendix B that no penalty has been applied in the noise modelling to account for tonality, impulsive noise, intermittent noise, or low frequency noise.

60 Diesel engines used for electricity generation operate at set revs per minute and exhaust emissions are generally tonal in character.

61 Diesel engines in mobile equipment change in rpm when accelerating or decelerating and tonal emissions are common from the exhaust and engine fan. Both engine fan and exhaust noise can be directional.

62 The NIA asserts that in the ‘detailed design stage’ for equipment enclosures of fixed plant that tonal noise will be eliminated and that overall sound power levels from fixed plant will not exceed the sound power levels listed in the NIA.

63 The NIA further asserts that all mobile equipment will be sourced such that no tonal emissions will occur and that maximum sound power levels described in Appendix B of the NIA will be achieved.

64 The NIA describes impulsive noise that includes banging, impacting or hammering events and that such noise is uncommon for sand mining. Unfortunately, unless care is taken in the procurement of tracked equipment such as a bulldozer it is a common feature of many such plant that impulsive plate slap of the metal treads occurs when reversing, which can lead to increased annoyance.

LOW FREQUENCY NOISE

65 It is my opinion that low frequency noise has not been correctly addressed in the NIA.

66 The NIA refers to the EPA Publication 1997: *Noise guidelines: Assessing low frequency noise* that suggests using low frequency measurement data from similar equipment when predicting low frequency noise. The NIA is deficient in that it has extrapolated spectrum data from the 63 Hz octave band to lower frequencies from large mobile diesel equipment, rather than use low frequency measurements from representative items of plant.

67 Predictions of low frequency noise appear to have been based upon ISO9613-2, yet this calculation method is only validated for the lowest octave band of 63Hz and it is not suitable for predicting sound levels down to the 10 Hz one-third octave band.

68 Despite the potential noise modelling deficiencies for low frequency sound the NIA predicts that dwellings R3, R12 and R14 may be exposed to low frequency noise over the life of the Project. It is proposed in the NIA that VHM Limited acquire property R14.

NOISE LEVEL TARGETS

69 The NIA has used equipment sound power levels assuming high efficiency noise controls in the form of enclosures and engine modifications for mobile and static plant.

70 Even with such noise control measures implemented the NIA predicts exceedance of target noise limits at several dwellings (R3, R7, R12, R13) at night from mining activities.

71 Sound levels predicted in the residential area of Mystic Part on the norther part of Kangaroo Lake show a sound level of 35 dBA for P4. This is only 1 dB below the night time noise level target, assuming there are no special audible characteristic penalties that may be applied.

72 If G=0 is used when predicting sound level at P4 (propagation over water) then the predicted sound level would exceed the target noise limit used in the NIA and this property will be yet another property where target noise limits will be exceeded.

SUMMARY OF OPINIONS

73 The NIA is effectively a Feasibility Study and lacks sufficient detail to assess compliance with the noise targets described in the NIA that are based on current legislation and EPA Guidelines.

74 If an account is made of the +3dB uncertainty in ISO9613-2 with a different ground value of G=0 then predictions in the NIA are at least 4.5dB too low.

75 There are numerous references to further ‘detailed design’ of noise mitigation measures over and above those already proposed in the NIA. Approval for the Project should be withheld

until these detailed designs demonstrate a comfortable margin of compliance with target noise limits.

76 The Project rests on the viability of additional noise mitigation in the first 8 years of mining in Area 1 for dwellings R12 and R13 that are predicted to exceed night time noise limits by 4 to 5 dB (NIA page 109).

77 Additional noise mitigation will be required to comply with noise limits at R7 during mining operations in Area 3, whereby ultimate compliance requires a more detailed evaluation. Until such additional detailed evaluation is made available for review, approval of the Project operations in Area 3 should be withheld.

78 Predicted sound levels at other properties may also exceed target noise limits if consideration of the ISO9613-2 noise model uncertainty is accounted for.

79 The NIA acknowledges that the low frequency noise modelling offered has limitations but nonetheless that it is likely R3, R12 and R14 could be adversely affected by low frequency noise over the duration of the Project. Low frequency noise has not been adequately addressed in the NIA and it should be assumed that adverse low frequency noise impacts will occur throughout the life of the Project.

80 Approval of the Project should be withheld until further appropriate noise modelling and 'detailed design' has been completed and presented for review showing adequate mitigation of low frequency noise.

81 Cumulative noise impacts surrounding the Kangaroo Lake pumping station have not been completed with the NIA stating that this will need to be evaluated during the detailed design stage. Sound levels predicted in this area have been underestimated and approval of the Project should be withheld until detailed designs can demonstrate compliance with target noise limits.

82 To apply a conservative noise impact assessment, I believe that the areas categorised as IV in the NIA (paragraph 32 above) should be considered Category V and that the sound level *increase* that the Project will have on these areas should be considered.

83 More detail of the mine fleet equipment is required to check sound power levels used in the noise models to ensure that the noise model outputs are not overly optimistic.

84 Vibration impacts during pipeline construction have not been assessed.

85 In summary, I do not believe that the NIA provides enough detail to approve the Project in the form presented. Furthermore, additional noise mitigation that the NIA describes could make the Project unviable.

DOCUMENTS REFERENCED

86 The following documents have been referenced and used to assist in preparing the opinions described in this report. All documents related to the Application were downloaded from the Proponent's website (https://www.vhmltd.com.au/ees/).

87 Noise Impact Assessment, Goschen Rare Earths and Mineral Sands Project prepared by SLR Consulting Australia, report reference 640.30299.00200-R02-v1.0, 15 September 2023.

88 ISO 9613 Acoustics – Attenuation of sound during propagation outdoors

Part 1:1993 Calculation of the absorption of sound by the atmosphere

Part 2:1996 General method of calculation

89 Other references are fully described within the body of this statement.

DECLARATION

90 In preparing this report I have made all the enquiries that I believe are desirable and appropriate and no matters of significance which I regard as relevant have to my knowledge been withheld from the Panel.

91 If it is necessary to present evidence to the IAP by video conference I confirm that:

- I will be alone in the room from which I am giving evidence and will not make or receive any communication with another person while giving my evidence except with the express leave of the Panel
- I will inform the Panel immediately should another person enter the room from which I am giving evidence
- during breaks in evidence, when under cross-examination, I will not discuss my evidence with any other person, except with the leave of the Panel
- I will not have before me any document, other than my expert witness statement and documents referred to therein, or any other document which the Panel expressly permits me to view.

92 William Leslie Huson

93 12 March 2024