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West Gate Tunnel Project

Noise and Vibration Expert Report

Report Number 640.11507-R01

2 August 2017

Hobsons Bay City Council

PO Box 21

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Noise and Vibration Expert Report

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DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
640.11507-R01-v0.1	2 August 2017	Shane Elkin	Jim Antonopoulos	Shane Elkin

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INTRODUCTION

1. My name is Shane Elkin and I am a Technical Director employed by SLR Consulting Australia Pty Ltd (SLR) at Level 2, 15 Astor Tce, Brisbane. I have worked as an acoustical consultant in Brisbane since 1995, originally with Heggies Pty Ltd (1995 to 2010). SLR acquired Heggies Pty Ltd in 2010.

2. My academic qualifications include a Bachelor of Mechanical Engineering (from the University of Qld). I am a Registered Professional Engineer of Queensland (RPEQ 06365) and I am a Member of both the Australian Acoustical Society and Engineers Australia (#1307901). A short CV is provided in **Appendix A**.

3. My areas of expertise are environmental acoustics (particularly road, rail and mining) and vibration. I have been involved in numerous assessments of road traffic noise including all three road tunnel projects in Brisbane – Clem7 Tunnel, AirportLink Tunnel and Legacy Way Tunnel. I have also provided expert advice on 7 previous court matters.

4. This statement provides a summary of my investigations, findings and opinions in relation to the proposed West Gate Tunnel Project.

SUPPLIED INFORMATION AND INFORMATION RELIED UPON

5. My instructions were provided by Harwood Andrews in writing on 21 June 2017 and were to:
   - Review and provide my opinion on the acoustic impacts of the Project as it relates to the Hobsons Bay municipality,
   - Review and advise on the relevant submissions and community feedback in response to exhibition of the Environmental Effects Statement (EES),
   - If directed, prepare an expert report for the inquiry hearing (the subject of this report),
   - Review and advise on relevant expert reports on behalf of other parties, and
   - Present evidence on Council's behalf at the inquiry hearing.

6. I have been provided with a large number of documents associated with the EES. The most relevant parts of the EES that relate to my review are listed below**:**
   - *Technical Report H – Surface Noise and Vibration Impact Assessment* (dated 9 May 2017) prepared by AECOM (with Appendix F prepared by Golder Associates) – referred to as SNVIA in this report; and
   - *Technical Report I – Vibration and Regenerated Noise from Tunnel Construction Assessment* (9 May 2017) prepared by Heilig Partners – referred to as VRNTCA in this report.

7. Lastly, I would like to preface my comments/opinions provided below that I have not had sufficient time to interrogate the 3D SoundPLAN model developed for the ESS. I only received a link to the model on Friday 28 July 2017. I will endeavour to review the SoundPLAN model during the conclave with Matthew Stead of Resonate Acoustics.

SITE CONTEXT AND POTENTIAL NOISE ISSUES

8. In December 2015, the Victorian Government announced its intention to partner with Transurban to build the West Gate Tunnel, to provide an alternative river crossing to the West Gate Bridge.

9. The key components of the project are:
10. A tunnel under Yarraville, including ventilation structures, from norther portals connecting to a new bridge over the Maribyrnong River to southern portals connecting to the West Gate Freeway;
11. From the northern portals of the tunnel:
    (a) a bridge over the Maribyrnong River;
    (b) connections to the Port of Melbourne;
    (c) elevated roads along Footscray Road;
    (d) connections to CityLink and the CBD, including an extension of Wurundjeri Way;
12. From the southern portals of the tunnel to the connection with the Western Ring Road and Princes Freeway (**M80 Interchange**):
    (a) widening the West Gate Freeway; and
    (b) connections to:
        i. the West Gate Bridge;
        ii. Hyde Street / Douglas Parade;
        iii. Williamstown Road / Melbourne Road;
        iv. Millers Road; and
        v. Grieve Parade.

OVERALL NOISE & VIBRATION ISSUES

13. Based on my experience, the three (3) potential CONSTRUCTION noise and/or vibration issues associated with this (at-surface and tunnel) road project are:

14. Noise and/or vibration from at-surface construction activities (e.g. road widening for extra lanes, activities at construction compounds, construction of tunnel dive structures/portals),

15. Regenerated (sometime called ground-borne) noise and/or vibration from tunnelling inclusive of driven tunnelling via Earth Pressure Balance Tunnel Boring Machines (TBM), blasting (if required) and excavation of cross passages, and

16. Road traffic noise impacts in the surrounding area associated with changed traffic conditions such as spoil haulage and (typically to a lesser degree) delivery of construction materials.

17. Based on my experience, the three (3) potential OPERATIONAL noise issues associated with this (at-surface and tunnel) road project are:

18. Road traffic noise impacts from future, and logically higher volumes of, road vehicles using all the upgraded surface infrastructure (including noise emanating from the tunnel portals),

19. Mechanical noise from the tunnel ventilation system (namely the ventilation stations near the northern and southern portals), and

20. Road traffic noise impacts on the surrounding road network as a result of changed traffic conditions associated with the Project.

21. My opinions provided below are based on achieving an acceptable outcome for the Hobsons Bay City Council and their constituents in relation to these 6 (potential) issues.

22. In my opinion, there will be no residual (operational) regenerated noise and/or vibration impacts from traffic movements within the tunnel provided the road surface within the tunnels is well maintained.

CONSTRUCTION

Recommended Noise & Vibration-related EPRs

23. I am of the opinion that all of the construction-related Environmental Performance Requirements (EPR) outlined in Appendix B of the SNVIA (NVP3, NVP4, NVP5, NVP6, NVP7, NVP8, NVP9, NVP12, NVP13, EMP4 and SP2) and Appendix 3 (all EPRs) of the VRNTCA are appropriate to manage construction noise and vibration for this Project. As such, I recommend that they all be adopted.

24. However, I also recommended that NVP3 be enhanced to include an extra (CNVMP) bulletpoint to cover "the requirement for building condition surveys for all properties and structures within 38 metres from surface works prior to commencement of vibration intensive work" - as stated in Section 6.3.3.1 (page 183) and Appendix E of the SNVIA.

CNVMP

25. I am of the opinion that a robust Construction Noise and Vibration Management Plan (CNVMP), adopting all relevant EPRs and inclusive of real-time noise and vibration monitoring, is required to ensure that construction noise and vibration is adequately controlled throughout construction. This is in-line with the recommendation for a CNVMP contained in Appendix E of the SNVIA.

26. In relation to real-time monitoring, the CNVMP should define the protocol for who has access to the real-time results. For issues like (potential) building damage, the criteria are absolute and it is unlikely that extraneous sources of vibration would trigger false-positives so results could more readily shared with the community "real-time" (although there would need to be a caveat that results need to be reviewed by a qualified professional prior to taking action). For other issues like noise, extraneous sources can more readily affect the results. For these reasons, it is my recommendation that the Hobsons Bay Council be allowed to review the draft CNVMP and provide input to these protocols to ensure the CNVMP is functional for both the contractor and the community.

27. Appendix E of the SNVIA provides a very comprehensive list of items that should be included/addressed in the CNVMP. It is my recommendation that all aspects of Appendix E be included in the CNVMP (subject to more detailed investigation and evaluation throughout the detailed design process).

28. However I recommend that the option to temporarily relocate residents is also included in the CNVMP. This can be a successful form of mitigation in the case of regenerated noise or vibration from a TBM passing under someone's home, where the impact is relatively short in duration (up to 1 week) and few other options for mitigation are available. The EES references this mitigation option in Table 9 and Section 9.2 of the SNVIA.

Inaudibility at Night for Construction Noise

29. The EES assessment has adopted "background + 5 dBA" as an acceptable external noise objective for determining compliance with the EPA's Noise Control Guideline Publication 1254 internal level of "inaudibility". SLR's Victorian office uses "background + 0 dB" and would typically adopt the background noise level from the quietest days of the week, rather than an average across the whole week as was done in the EES.

30. Inaudibility inside is difficult to generalise as it is dependent on a number of factors such as the frequency content of the construction noise, the fact that no two buildings are identical in terms of their building façade noise reduction (i.e. outside to inside noise reduction) and what the internal ambient noise level is (e.g. TV/radio/air-conditioning on or off). But having said that, I would not expect an external construction noise level of "background + 5 dBA" to be inaudible for a typical home.

31. Furthermore, this nominated night-time criterion (of background + 5 dB) results in the same criterion for the evening and night-time periods (noting that the background noise level could change between these 2 time periods). It is my opinion that this is inconsistent with the EPA's Noise Control Guideline Publication 1254 which makes a clear distinction between the evening and night-time periods.

32. Regardless of the criterion adopted for the EES assessment, EPR NVP4 contains the EPA's "inaudible" management level which I am satisfied with.

Reference to Daylight Hours

33. There are multiple reference to "daylight" hours throughout the EES. I believe these references to be in error and that they should have referenced "daytime" hours. It is important that the correct terminology (i.e. daytime) is used in the CNVMP.

Noise Monitoring Results (Appendix C of SNVIA)

34. Background (L90) noise levels have been determined by deriving the (inferred arithmetic) average background noise level over 7 days. I believe this could lead to artificially high background noise levels compared to contemporary Australian guidelines.

35. SLR's Melbourne office typically utilises the lowest (quietest) day of the week long monitoring to establish the background noise level for acoustic assessments.

36. Both Qld and NSW utilise what is known as a "rating background (noise) level" (RBL) where the lowest 90th percentile of the 15 minute L90 noise levels over the day, evening and night periods is documented as the "daily value" and then the overall value used for an assessment is the median of the 7 daily values.

37. The processes discussed above in paragraphs 35 and 36 would likely result in a lower background noise level for use in both the construction and operational assessments. It is my professional opinion that the use of a lower background noise level in accordance with paragraphs 35 or 36 is more appropriate for this project and therefore it is my recommendation that the CNVMP and the SEPP N1 limits used for the detailed design of mechanical plant noise (e.g. the 2 proposed ventilation stations) adopt one of these approaches.

38. The opening sentence of "Operational Road Noise Monitoring Results" (page 313 of SNVIA) states that "the below table of LA10(18hr) noise levels shows the average, highest and lowest noise levels". The table only actually documents the average values.

39. Whilst it is typical practice to use the (arithmetic) average of the LA10(18hr) values to state the measured road traffic noise level, viewing the highest and lowest daily values (or alternatively each daily value as is required in Queensland) would help me to be comfortable that traffic noise levels over the week-long monitoring period were typical of normal operations.

40. I seek clarification why measurements were not re-scheduled for Site 5 (77 Eirene St Yarraville) when the measurements failed. There is a proposed construction compound directly adjacent this residence (as well as other residences) and it is very close to the eastbound southern portal hence it is important that accurate existing ambient noise levels are understood to competently manage impacts during the project.

41. It is my recommendation that ambient (including background) noise levels be measured at this residence (or one of the other residences directly abutting the proposed construction compound) prior to commencement of the project and preparation of the CNVMP.

42. Lastly, Appendix C (and therefore the EES) does not provide all the information required to be provided in VicRoads' *Traffic Noise Measurement Requirements for Acoustic Consultants*. See extract below:

9 INFORMATION TO BE PRESENTED

(a) Hourly L_{10} and Leq levels in dB(A)
(b) Hourly L_{max} dB(A) and L90 dB(A) when requested
(c) The $L_{10\ (18hr)}$, (arithmetic average) 6.00 am to midnight in dB(A), for a single day,
(d) The $L_{eq\ (15hr)}$, (logarithmic average) 7.00 am to 10.00 pm in dB(A), for a single day,
(e) The $L_{eq\ (16hr)}$, (logarithmic average) 6.00 am to 10.00 pm in dB(A), for a single day,
(f) The $L_{eq\ (9hr)}$, 10.00 pm to 7.00 am in dB(A) for a continuous period.
(g) The $L_{eq\ (8hr)}$, 10.00 pm to 6.00 am in dB(A) for a continuous period.
(h) The latitude and longitude of the microphone position to six decimal places.

Items (a) to (h) are to be provided in a Microsoft Excel format. A template for the presentation of this data is available from VicRoads.

Missing Construction Compounds

43. Section 5.3.1.2 of the SNVIA does not list the Lynch St (north of Freeway) or Melbourne Rd (south of Freeway) construction compounds shown on West Gate Tunnel project Proposed Construction Plans 8 (of 31) and 13 (of 31) respectively. Both of these compounds are very close to residences.

44. Furthermore, there is no assessment of these compounds in the EES to allow me to review and provide opinion on.

45. I recommend that all construction compounds be included in the CNVMP to ensure the community is adequately protected.

Reductions Applied to Construction Noise Predictions

46. It is stated twice (that I have found) that 10 dB has been taken off the construction predictions in the vicinity of residences on the basis that noise barriers or enclosures will be built around construction activities. I seek confirmation that this 10 dB was taken off all construction predictions undertaken for the EES, that is for construction compounds, all earthworks and pavements works for the widening of the Freeway, construction of the dive and tunnel portals etc.

47. I also seek clarification that the 10 dB insertion loss for the generator enclosure (Table 13 in SNVIA) and 5 dB insertion loss for the concrete saw screen (first table in Appendix D) are in addition to the 'blanket' 10 dB noise reduction. That is, has 15 dB and 20 dB been taken off the unmitigated Sound Power Level (SWL) for the concrete saw and generator respectively?

48. It would further appear that all the construction noise predictions also take into account the early construction of all operational noise barriers. Clarification on this point will be provided once I have reviewed the EES SoundPLAN model.

49. If paragraphs 46, 47 and 48 are correct, then it starts to become difficult to achieve the nominated construction noise criteria when the predictions are up to 25 dB over the noise limits (e.g. Table 53 – Altona North residential).

Acoustic Sheds

50. Can I please seek confirmation that acoustic sheds will be built over both southern tunnel portals. There are comments within the EES to suggest this may be the case but I am left wondering if this is a firm recommendation of the EES.

51. Tunnel portal acoustic sheds are common practice in Australia when 24/7 tunnelling is required for major transport infrastructure. If 24/7 construction activities are planned for these southern portals, it is my recommendation that acoustic sheds be constructed as it will be very difficult to adequately protect against sleep disturbance (at night) any other way.

Construction Traffic Routes

52. Table 72 of the SNVIA states that the proponent is planning on using heavily-trafficked roads for the Little Boundary Rd compound (which I fully support) which the EES states has the highest volume of construction traffic, however the traffic routes to other compounds are:

    - Not stated - as is the case for the Williamstown Rd compound,
    - Along streets that are less-heavily trafficked – as is the case for New St, South Kingsville, or
    - Misunderstood by me – as is the case for the Simcock Avenue compound given (a) the only construction compound shown on West Gate Tunnel Project Proposed Construction Plan 16 (of 31) is on Hall St (not Simcock Av) which is not connected to (and indeed is on the other side of the Freeway) from Williamstown Rd and Francis St. Will trucks travelling to the construction compound on Hall St use Hall St itself to access the compound? The Emma McLean Kindergarten is close to Hall St and I would like to understand whether there is a potential noise impact at the kindergarten.

53. Also, Table 72 does not provide traffic routes or construction-related vehicle numbers for the other construction compounds listed in Section 5.3.1.2 of the SNVIA nor the “missing” compounds listed in paragraph 43 of this report.

54. Furthermore, Section 5.3.2.11 (containing Table 72) of the SNVIA does not provide any calculations to allow me to scrutinise the comment “…. the expected increase in traffic noise as a result of construction traffic is less than 2 dB, and no specific mitigation is warranted.” These calculations are requested to allow a thorough review of this (potential) issue.

55. A 2 dB increase in road traffic noise is nominated as the applicable goal to assess adverse noise impacts from construction traffic on the wider road network in Section 3.4.1.4 of the SNVIA.

56. It is my recommendation that this project utilise heavily-trafficked roads at all times for construction traffic, in particular heavy vehicles. As such, subject to safe practices, it is recommended that access to the construction compounds be via on and off ramps to the West Gate Freeway itself. This would alleviate what I believe would be adverse impacts on streets like New St, particularly the northern end which is past the industrial areas at the southern end (and west) of New St.

Bored Piling

57. Section 5.3.2.1 and Table 92 refer to bored piling and yet the table of equipment SWLs (Table 13 of the SNVIA) says driven piling. The SWL provided in Table 13 matches that of a bored piling rig therefore I suspect Table 13 contains a typographic error. I seek confirmation of this.

Distances to Construction Site Compounds (Tunnel Section)

58. Table 94 states that the nearest residential receivers to site compounds are 150m in Spotswood

59. By my calculations, the nearest residential receiver to the District 15 compound (west of Newport Freight Railway Line) is 40m (see Westgate Tunnel Project Proposed Construction Plans Sheet 12 of 31) and similarly, the nearest residences to the compounds north and south of the freeway just west of Williamstown and Melbourne Roads are less than 10m (see Westgate Tunnel Project Proposed Construction Plans Sheet 13 of 31).

60. It stands to reason that the predicted noise levels at these closer distances will be significantly higher than the values predicted in the EES documentation assuming the same activities are occurring in each compound.

61. This is further justification for a very robust CNVMP inclusive of real-time monitoring.

62. I note that the Westgate Golf Course is identified as a “receiver area” in Table 91 when it is 290m from the portal construction area yet is missing from Table 94 when there is a site compound directly adjacent to the Golf Course.

SWLs Used in Construction Noise Modelling

63. I seek confirmation that the individual SWL list in Table 13 were used to undertaken the prediction of construction noise and vibration (as is stated on page 35 of the SNVIA) rather than the “activity” and “scenario” equipment groupings in Appendix D of the SNVIA.

64. As an example, I could not find a direct comparison for the equipment associated with establishment of construction compounds in Table 95 to the equipment listed for the activities/scenarios contained in Appendix D.

Regenerated Noise and Vibration from Tunnelling

65. As shown in Appendix 4 of the VRNTCA, vibration (Plate No's 1 and 2) and to a greater extent regenerated noise (Plate No's 5 and 6) from the TBM have the potential to adversely impact on neighbouring properties.

66. However, (airborne) noise levels from traffic along the West Gate Freeway and/or surface construction works has the potential to mask regenerated noise from the TBM.

67. The same (as paragraphs 65 and 66 above) may occur for residents located around the eastbound southern portal – see Plate No's 11 and 12 (in Appendix 4 of the VRNTCA).

68. Should regenerated noise and/or vibration adversely impact residents as part of this project, the temporary (in the order of 1 week for the TBM) relocation of residents is a mitigation measure I have witnessed as being effective for some members of the community.

Active and Passive Open Spaces

69. In relation to outdoor recreation and public open spaces, Table 40 of the SNVIA lists all of the parks/reserves within the Hobsons Bay Municipality however Tables 53, 59, 62, 65 and 71 assess, and make mitigation/management recommendations for, only some of these outdoor spaces.

70. I recommend that the CNVMP cover all the active and passive outdoor spaces listed in Table 40.

OPERATIONAL

Recommended Noise & Vibration-related EPRs

NVP1

71. I seek clarification of the following phrase in NVP1 "….. Category A and Category B buildings facing the traffic noise, being those adjacent to or with direct line of sight to the freeway".

72. What is meant by "facing the traffic noise"? Does this mean that the front of the house (rather than the side or rear of the house) needs to be facing the freeway or local roads?

73. What is meant by "adjacent to"? Does this mean that the noise-sensitive property has to share a common boundary with the freeway or local road?

74. What is meant by "Direct line of sight to the freeway"? Does this mean that you need to be able to see traffic on the freeway or just any part of the freeway structure itself?

75. By way of example, how was the assessment undertaken for 16 Cullen Court, Spotswood where the side of the house is in the direction of the freeway and the rear of the house is in the direction of Williamstown Rd? At the present time, all you can see towards the freeway is a noise barrier. Traffic on Williamstown Rd would be visible from the rear of the home.

76. It is my opinion that <u>all</u> facades of <u>all</u> surrounding noise sensitive locations should (reasonably and feasibly) achieve the nominated criterion (at the ground floor).

77. Subject to responses on the above requested clarifications, I recommend the clause contained in paragraph 71 be replaced with a more simple definition for Category A and B buildings in NVP1.

78. I also recommend that further definition be given to the term "equivalent level of attenuation" in relation to off-site noise attenuation. Section 4.4.2.5 of the SNVIA recommends the use of AS2107 design sound levels for this purpose. I am in agreement with this approach.

NVP2

79. I seek clarification on why further traffic noise monitoring prior to the opening of the Freeway is required?

80. I recommend that further clarification be given in relation to the post-construction compliance noise measurements. My recommendation is that NVP2:

    - defines a time period within which the measurements should be undertaken (typically within 12 months of opening in my experience),

    - defines the number of locations where the measurements should be undertaken. My recommendation would be for the compliance noise measurements be taken at the same locations as monitored for the EES, and

    - stipulates that either further noise monitoring is undertaken (say 5 and/or 10 years post-construction) or that analysis is undertaken on the first round of measurements to show that compliance will still be achieved in the design year (2031). In this regard, simultaneous traffic counts are recommended during the noise monitoring to be undertaken during the first year of opening.

NVP11

81. I recommend that further clarification be given in relation to the post-construction compliance noise measurements. NVP11 currently says to "Measure noise …….. from the ventilation system for up to 5 years post opening ….. ". Was it intended that this monitoring be annual? My recommendation is that the monitoring be undertaken annually for the first three (3) years. If over this time, the noise emissions are shown to be consistent (typically accepted as within +/- 2 dB) and also compliant with the noise limit, then monitoring could cease. If however, the first three (3) year's results showed a trend of deterioration in performance, annual noise monitoring should continue (potentially beyond 5 years) until such time as the noise emissions stabilise and compliance with the noise limits is verified.

82. Definition should also be provided in relation to where, or at least how many sites, noise monitoring should be undertaken. I would recommend 2 sites adjacent each of the ventilation stations and 1 site adjacent any other facilities (associated with this project, if any) that emit mechanical plant noise.

Active and Passive Open Spaces

83. VicRoads – Traffic Noise Reduction Policy (TNRP) does not contain noise limits specific to parks and passive open spaces. However, page 2 of the TNRP states that: "In addition, VicRoads will consult with Councils and affected local communities on the need for and type of protection (if necessary) for small areas of passive open space."

84. In NSW, for an upgraded freeway/highway, the daytime controlling criterion for a residence is 60 dBA Leq(15hr). The corresponding controlling criterion for active parks is 60 dBA Leq(15hr) – the same as residences – and for passive parks is 55 dBA Leq(15hr) – 5 dB more stringent than residences.

85. In Qld, for an upgraded freeway/highway, the criterion for outdoor educational and passive recreational areas (63 dBA L10(18hr) – free field) is more stringent than for residences (68 dBA L10(18hr) – including façade reflection).

86. Based on the approach adopted in NSW and Qld (and given the lack of a numerical limit in Victoria), I do not consider it unreasonable to adopt a numerical limit for (active and passive) parks equal to that of residences. This approach is relaxed compared to NSW and Qld given that parks have lower (ie more stringent) limits than homes in both States..

87. Below is the list of the parks and outdoor passive spaces within Hobsons Bay Council (all of which are referenced in Table 40 of the SNVIA) and what the EES is predicting. Note that I have based the below on my visual inspection of the noise contours provided in the SNVIA. As previously stated, I have not reviewed the EES SoundPLAN model at the time of writing this report.

88. WLJ Crofts Reserve – predicted noise levels are above the 63 dBA L10(18hr) criterion, however there is a decrease in noise levels compared to both 2016 and 2031 without project (most exposed areas decrease is greater than 5 dB which is noticeable). The proposed noise barrier (8.25m high), designed to protect adjacent homes, extends across the whole park.

89. A W Bond Reserve – below 63 dBA L10(18hr) criterion and a decrease in noise levels compared to both 2016 and 2031 without project.

90. D N Duane Reserve – below 63 dBA L10(18hr) criterion for the most part (apart from eastern end where noise levels are dominated by Millers Rd, not the Freeway) and a decrease in noise levels compared to both 2016 and 2031 without project (apart from eastern end again due to Millers Rd).

91. Donald McLean Reserve - above 63 dBA L10(18hr) criterion however there is a decrease in noise levels compared to both 2016 and 2031 without project for most of the area – on the eastern side around the club rooms the decrease is greater than 5 dB which is noticeable. The proposed noise barriers (3m to 6m high), designed to protect adjacent homes, extend across the whole reserve.

92. Westgate Golf Course – above 63 dBA L10(18hr) criterion and an increase in noise levels compared to both 2016 and 2031 without the project. The proposed noise barrier (6m high for freeway noise only, not the Hyde St off-ramp), designed to protect adjacent homes, extends across part of the golf course.

93. McIvor Reserve (Footscray Hockey Club) – above 63 dBA L10(18hr) however there is a decrease in noise levels compared to both 2016 and 2031 without project on the eastern side including the clubrooms - the decrease in this eastern area is greater than 5 dB which is noticeable. The proposed noise barrier (8.75m high), designed to protect adjacent homes, extends across the eastern half of the reserve.

94. Hyde St Reserve (Stoney Creek) – below 63 dBA L10(18hr) apart from the very south-west corner however there is an increase in noise levels compared to both 2016 and 2031 without the project.

95. Based on the precedence in NSW and QLD for protecting outdoor parks to an acoustic amenity (at least) equal to that of residences, I do not consider it unreasonable for the proponent to consider the following for those parks/reserves that are predicted to exceed 63 dBA L10(18hr) in 2031:

96. WLJ Crofts Reserve - extending the 8.25m high noise barrier further west with the goal being to achieve 63 dBA L10(18hr) for as much of the reserve as possible.

97. Donald McLean Reserve – increasing the height of the recommended noise barriers to achieve 63 dBA L10(18hr) for as much of the reserve as possible.

98. Westgate Golf Course – increasing the length and extending the height of the 6m high noise barrier and introducing a noise barrier on the northern side of the Hyde St off-ramp to achieve 63 dBA L10(18hr) for as much of the course as possible.

99. McIvor Reserve (Footscray Hockey Club) - extending the 8.75m high noise barrier further west with the goal being to achieve 63 dBA L10(18hr) for as much of the reserve as possible.

Comparison of LA10(18hr) and LA10(12hr) Parameters

100. Section 4.4.2.2 of the SNVIA states that the L10(18hr) and L10(12hr) parameters are equal based on analysis contained in the table on page 328 (Appendix C) of the SNVIA. This table does show that on average, LA10(12hr) noise levels are only 0.2 dB louder than LA10(18hr) levels.

101. However, this average analysis has been influenced by some locations where the measured LA10(12hr) noise level is less than the measured LA10(18hr) noise level.

102. In my experience, the measured LA10(12hr) is typically 1 dB higher than the measured LA10(18hr) on the same day (at the same location). This is because traffic volumes are typically less between the hours of 6pm and midnight (which are excluded from the calculation of the LA10(12hr) level) when compared to the traffic volumes between 6am and 6pm.

103. An exception to this can occur if there is significant congestion during the 6am to 6pm period whereby the speed at which vehicles travel along the road is significantly reduced. Reduced traffic speeds on highways/freeways (signposted at speeds of 80km/hr or greater) will result in reduced noise emissions.

104. In order for me to provide an opinion on the acceptability of the statement that the LA10(12hr) is equivalent to the LA10(18hr) for the purposes of this assessment, I request a spreadsheet of the hourly LA10 noise levels (as outlined in paragraph 42) so that I can investigate this relationship in further detail. Simultaneous traffic count and speed information is also requested (if available).

105. Regardless of the outcome of the above analysis (but still subject to my review of the EES SoundPLAN model), predicted operational noise levels at the Emma McLean Kindergarten will be below Vic Roads 63 dBA L10(12hr) noise criterion for Class B (including kindergartens) buildings based on my inspection of Figure 18 of the SNVIA.

OGA Road Surface

106. There are multiple references to OGA being applied to “sections of the freeway” rather than “all sections of the freeway”. I request a map/figure showing the pavement surface types along the upgraded West Gate Freeway and associated roadworks (e.g. on and off ramps) so that I can cross-check this information in the EES SoundPLAN noise model.

Minor Exceedences of the 63 dBA Operation Noise Criterion

107. Section 5 of the SNVIA states that there are a number of locations where minor exceedences of the 63 dBA L10(18hr) operational noise criterion has been predicted but no further mitigation was recommended because “it is not considered a practical option at this stage of the project”.

108. In these instances, “at property” noise treatments have been recommended in consultation with the residents impacted.

109. In my opinion, “at property” treatments should always be considered a last resort given they (a) provide only internal noise amenity and (b) require the consent of the residents in order to be installed.

110. Vicroads Road Design Note (RDN) 6–1a *Interpretation and Application of Vicroads Traffic Noise Reduction Policy 2005* states at the bottom of Page 4 that a benefit/cost analysis should be undertaken for on and off-reservation mitigation options. I have been unable to find such analysis justifiying that some noise barriers do not go higher or longer to achieve full compliance with the 63 dBA L10(18hr) criterion.

111. I request that the cost/benefit analysis undertaken to limit the noise barriers in some locations from achieving full compliance with the 63 dBA L10(18hr) bb supplied to me in order to form an opinion.

Appendix F SEPP N1 Background Noise Errors

112. Appendix A of the Ventilation Noise Impact Assessment (Appendix F of the SNVIA) appears to have erred in bringing across some incorrect background noise levels from the table of average measured L90 noise levels on pages 311 and 312 (Appendix C of SNVIA) into the Victorian EPA's State Environmental Protection Policy (SEPP) N1 Noise Limit Calculation sheets.

113. Examples include:

- 2 Carlsson Ct, Brooklyn
- 12 Deleware St, Yarraville
- 77 Eirene St, Yarraville (this is the site of the failed measurements and yet there is a SEPP N1 calculation sheet for this location)
- 6 Murdoch St, Altona North
- 1/66 Primula Avenue, Brooklyn
- 29 The Avenue, Spotswood
- 9 / 13-17 Blackwood St, Yarraville

114. I also seek clarification that the SEPP N1 calculation sheet for Site 31 "Bradmill Precinct, Yarraville" has utilised the background noise levels from 228 Fogarty Avenue, Yarraville given its close proximity.

115. Furthermore, it does not appear that 2 dBA has been taken off the measured background noise levels where the microphone was positioned 1m from a building façade, as is stated in Schedule C of SEPP N1. See C1 (3) in extract below.

SCHEDULE C

MEASUREMENT OF BACKGROUND LEVELS

C1. BACKGROUND LEVEL

1. The background level shall, where possible, be measured outdoors in the noise sensitive area.

2. Where it is not possible for the measurement of the background level to be made in the noise sensitive area, then the measurement may be made at another point which appears to be representative of the likely background level at the noise sensitive area.

3. When the microphone is located outdoors and 1 to 2 metres from an acoustically reflecting surface an adjustment of +2 dB shall be made to the measured L_{A90}.

116. Paragraphs 112, 113 and 115 will change the calculated SEPP N1 criteria in the EES however the proposed EPR NVP10 would not be affected.

117. I am confident that noise mitigation is available to treat ventilation noise on this project.

118. During the detailed design process, it is vital that correct SEPP N1 calculations are undertaken to ensure an acceptable outcome for the neighbouring community.

Existing Model Verification

119. For the significant number of road traffic noise assessments I have undertaken in my professional career, model verification (predictions within +/- 2 dB of measurements) has always been undertaken at each individual receiver, not as an average across the whole project as has been undertaken for the EES (see page 327 of SNVIA).

120. Furthermore, if there is a "catchment area" within the overall model where the measurements are higher than the modelled predictions, consideration is given to lifting the modelling results to be equal with the measured results. For conservatism, the reverse is not applied (i.e. lowering predictions in areas where the model shows higher values than the measured results).

121. Lastly, it is my opinion that project calibration factors should only be applied after applicable road surface corrections and ARRB corrections have been made. The approach taken for verification of the EES model was the opposite in that a project calibration factor was applied to compensate for all other factors.

122. I would also like to request how many model validation locations were used in the 2012 AECOM state wide traffic noise assessment? More specifically, how many of these 2012 validation locations were within boundaries of this project? I suspect that the monitoring completed in 2016 specifically for the EES would have provided a more recent and more comprehensive dataset, all within the project boundary, for determining a project calibration factor (if required).

Increased Post-Construction Noise Levels on Millers Rd

123. Section 5.2 *Risk Assessment* of the SNVIA states that a risk from noise and vibration during operation includes an increase in traffic volumes and heavy vehicle percentages that may result in an increase of more than 2 dB(A) resulting in noise disturbance for local receptors.

124. Section 5.3.4.7 of the SNVIA assesses the change in noise levels in the surrounding road network as a result of the Project. Table 79 (of the SNVIA) highlights which streets/roads exceed this 2 dB increase, being Millers Rd (north of the Freeway) and Simcock Avenue.

125. The SNVIA then recommends that traffic volume and noise monitoring should be undertaken post-construction but does not suggest any form(s) of mitigation should monitoring confirm the predictions to be accurate.

126. There are no noise-sensitive receivers adjacent the section of Simcock Avenue with the predicted increase in noise level of greater than 2 dB so I do not have any issues with this location.

127. However there are a number of noise-sensitive locations (namely residences) that a situated along the western side of Millers Rd that are going to be exposed to noticeably higher noise levels, primarily due to an increase in heavy vehicles.

128. It is my opinion that this level of noise increase would likely result in adverse noise impacts (and therefore complaints) for residents along Miller Rd and as such I make the following suggestions.

129. Can an alternative route be considered such that heavy vehicles travelling along the Princes Highway access the West Gate Freeway via Grieve Parade (further to the west) as there are no noise-sensitive receivers on Grieve Parade (between the Princes Hwy and the West Gate Freeway)?

130. If this option is not reasonable or feasibly from a traffic perspective, off-site noise treatments (designed to AS2107 internal noise levels) could be offered to residents along Millers Rd.

131. Alternatively, an (absorptive) noise wall along the median strip of Millers Rd could be investigated to see what noise reduction it might achieve for vehicles travelling south along Millers Rd. It is noted however that gaps (for turning onto and off Millers Rd) in such a median strip noise barrier would be required in a number of locations which would degrade the acoustic performance of this option.

Operational Road Traffic Noise Correction Factors

132. The road surface correction factor for open-graded ashapht is incorrect. It has been modelled as –3 dB (when compared to dense-graded asphalt). Vicroads Road Design Note (RDN) 6–1a *Interpretation and Application of Vicroads Traffic Noise Reduction Policy 2005* states on Page 8 that –2 dB is the appropriate noise reduction (when compared to dense-graded asphalt). This factor would increase all the noise predictions by 1 dB and result in considerably more homes not achieving the 63 dBA L10(18hr) noise criterion.

133. However, the modelling has not included Ausroad's -1.7 dB correction factor for Australian Roads correction factor. I believe this should have been utilised for this study.

134. The cumulative effect of both errors is that the modelling undertaken would be slightly conservative by over-predicting future noise levels from the upgraded freeway by 0.7 dB.

SUMMARY AND CONCLUSIONS

135. I have reviewed the EES in relation to potential noise and vibration impacts on the Hobsons Bay Municipality.

136. The EES addresses the key environmental noise and vibration sources that could impact the surrounding community.

137. In relation to construction noise, it is critical that a comprehensive CNVMP be developed inclusive of all the elements discussed in my report. I also recommended that EPR NVP3 be enhanced to include an extra (CNVMP) bulletpoint to cover "the requirement for building condition surveys for all properties and structures within 38 metres from surface works prior to commencement of vibration intensive work.

138. In relation to operational noise, it is critical that the clarifications and recommendations I have put forward in relation to EPRs NVP1, NVP2 and NVP11 are duly considered to allow modification of these 3 EPRs prior to finalisation. It is also important that consideration be given to reducing the increased post-construction noise levels on Millers Rd as well as to achieving a more acceptable noise environment for the parks/reserves adjacent this project.

139. I have made all the inquiries 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.

Yours sincerely

SHANE ELKIN
Technical Director

Curriculum Vitae of Shane Elkin

SHANE ELKIN

Technical Discipline Executive

Curriculum Vitae

QUALIFICATIONS

BE Mechanical (UQ 1993)

MEMBERSHIP

Member Australian Acoustic Society

Member of Institution of Engineers Australia

Registered Professional Engineer of Qld

Past Vice Chairman & Secretary of the Association of Australian Acoustic Consultants (AAAC)

BACKGROUND

Shane Elkin is an acoustic consultant with experience in environmental, mining, transportation and industrial noise assessment and control. In his twenty-two years with SLR Consulting, he has worked on a large number of environmental, mining and transportation related assessments.

These projects have included measurement and analysis of noise and vibration emissions from construction and manufacturing industries, materials handling, road/rail vehicles and investigation of effects on people and land uses.

He is competent in the use of the SoundPLAN noise prediction model and in developing noise mitigation strategies for proposed transportation systems and large mining and industrial developments.

Shane has been involved on a large number of projects requiring varying degrees of community consultation and has utilised a number of key consultation initiatives to facilitate amicable outcomes.

Shane has also presented as an expert witness in the Land and Environment Court.

SPECIAL EXPERTISE

- Mining Noise and Vibration Assessment
- Transportation Noise and Vibration Control
- Environmental Noise Assessment and Control
- Architectural Acoustics
- Engineering Noise and Vibration Control
- Community Consultation
- Expert Witness

SELECTED PROJECT EXPERIENCE

Major Road Transportation Projects

Clem7, Airport Link and Legacy Way Road Tunnels
Gateway Upgrade Project
Northern Busway Project
South East Transit Project
Pacific Motorway Reassessment
Inner City Bypass NIA
Gladstone Port Access Road Noise Assessment
Toowoomba Range Crossing NIA

Major Rail Transportation Projects

Bus and Train (BaT) Tunnel EIS
Mayne to Virginia Track Quadruplication Upgrade
Virginia to Petrie Track Triplication Upgrade
Stuart Rail Yard Assessment
Moolabin Goods Yard Assessment
Implementation of NNMP for Cleveland Rail Line

Mining, Quarries and Construction

Mt Isa Mine Environmental Management Plans
Caval Ridge Coal Mine EIS
Saraji East Coal Mine EIS
BMA Bowen Basin Mine Noise Management Plans
Mt Isa Mine Site Wide Noise Models
Mt Isa Black Star Open Cut Deep MPV
Goonyella Riverside Mine Expansion
Ravenswood Gold Mine NIA
Blackwater South Coal Mine NIA
Duranbah Sand Quarry EIA

Industrial Projects

Review of CSG Noise Criteria Worldwide
Hay Point Coal Terminal Expansion
Aldoga Aluminium Smelter EIA
Mt Isa Sulphuric Acid Plant Assessment
Wiggins Island Coal Terminal
Oakey Power Station NIA
Nickel/Cobalt Refinery, Calliope NIA
Kareeya Power Station Upgrade Works
SimsMetal Fragmentiser NIA

Training

DERM (EPA): Noise Office Training (2 days) 2005 & 2006 – Brisbane, Rockhampton and Cairns
DTMR: Noise Training (1 day) 2005 – Toowoomba, Rail Noise Training (1 day) 2011 - Brisbane
Townsville City Council: Noise Training (2days)
QR: Noise Measurement, Modelling and Assessment Training (1 day) 2012

Legal

New Acland Coal Mine, Oakey
Colton Coal Mine, Aldershot
Composting Facility, Oakey
Woolworths Supermarket, Maleny
Twin Waters West Residential Development
Tropical Pet Resort, Townsville
Composting Facility, Oakey