

REPORT



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VANCOUVER ISLAND MOTORSPORT CIRCUIT

DUNCAN, BC

REVIEW OF SAHTLAM NEIGHBOURHOOD ASSOCIATION REPORT

RWDI # 1803556

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SUBMITTED TO

Lorenzo G. Oss-Cech
c/o Vancouver Island Motorsport Circuit
4063 Cowichan Valley Highway
Duncan, BC V9L 6K4
lgo@hom-law.com

SUBMITTED BY

Andrew Williamson
Acoustical Specialist
andrew.williamson@rwdi.com

RWDI AIR Inc.
Consulting Engineers & Scientists
301-2250 Oak Bay Avenue,
Victoria, BC V8R 1G5
T: 250.370.9302



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Andrew Williamson, P.Eng.



1 INTRODUCTION

As requested, RWDI have reviewed the Sahtlam Neighbourhood Association’s (SNA) report “Noise Impact of the Vancouver Island Motorsport Circuit: Results of the Sahtlam Noise Monitoring Project” dated August 2019. This report provides our comments on the methodology SNA employed in their noise study and the conclusions they arrived at regarding the noise impact of the VIMC on the surrounding community. Our comments are numbered for ease of reference.

2 TECHNICAL QUALIFICATIONS

We understand the author of the report, Mariah Wallener, PhD, does not have formal training in the fields of acoustics or environmental noise. In our opinion, noise impact assessments (including field work and analysis) should only be carried out by qualified personnel; preferably under the direction and supervision of a professional engineer.

The report noted that BKL Consultants were hired by SNA to provide “equipment, guidance, and expertise” for their community noise monitoring project. It does not appear that the SNA retained BKL to conduct any equipment setup, measurements, analysis, or interpretation of results. *This noise study should have been produced by an independent and qualified acoustical consulting firm such as BKL.*

3 METHODOLOGY

3.1 Noise Criteria – BS 4142

The SNA study used “British Standard 4142 – Methods for Rating and Assessing Industrial and Commercial Sound” (BS 4142) to assess the noise impact of VIMC operation on the surrounding community. BS 4142 provides a framework for assessing the impact of industrial and commercial sound on adjacent residential land uses. The standard assesses the severity of the noise impact in a residential area by comparing the “specific sound level” (i.e., noise level of the industrial/commercial sound) to the “background sound level” (i.e., the level exceeded ninety percent of the time in the absence of the specific sound level). The standard defines an “ambient sound level” which is the total noise level in the residential area. The ambient sound level is then composed of both the specific sound level and a “residual sound level” (i.e., the sound level remaining in the absence of the specific sound level).

While BS 4142 is intended to assess a wide variety of industrial and commercial sounds, it is not intended to be applied to motorsport noise as noted in Section 1.3 of the standard:



1.3 The determination of noise amounting to a nuisance is beyond the scope of this British Standard.

Sound of an industrial and/or commercial nature does not include sound from the passage of vehicles on public roads and railway systems.

The standard is not intended to be applied to the rating and assessment of sound from:

- a) recreational activities, including all forms of motorsport;

However, despite BS 4142 not being an appropriate standard for assessing VIMC noise, we have reviewed the methodology employed in the SNA Noise Study. Our review is intended to answer the question: *If BS 4142 was applicable to motorsport noise, was the approach employed by the SNA Neighbourhood Association consistent with the framework of BS 4142?*

3.2 Noise Monitoring

The following items are noted regarding the methodology employed by the SNA in their noise monitoring:

1. While the SNA note that the SLM was calibrated upon delivery, the calibration the SLM should have been checked daily and corrected if necessary. Calibration records are not included in the report.
2. The supplied sound level meter was accompanied by detailed instructions of “how to use and set up the device”. Professional sound level meters can be inherently complicated to operate and assemble, and include a variety of options, settings, and parameters that can be manipulated by the user. A misstep at any stage can invalidate the results. Given the equipment was used by what appears to be a “lay” person and the report does not detail what settings were used or instructions followed, the validity of the results cannot be verified.
3. While the report notes that the SNA recorded weather conditions and the sources of noise present in the environment, this important information was not provided in the report.
4. The report states that photographs were taken of the measurement locations; however, these were not provided in the report. The selection of monitoring location relative to vegetation and buildings can be critical to obtaining credible results. The validity of the monitoring locations cannot be validated.
5. The report states that operator notes were recorded. This information along with complete details of the measurements would also have assisted with verification of the results.

3.3 Determination of the Background Sound Level

BS 4142 uses the ninety-percent exceedance level (L_{90}) to establish the background noise level. Table 1 of the SNA report presents L_{90} at their four monitoring sites for several 1-hour periods extracted from the multi-day monitoring period. In applying BS 4142, the SNA used the lowest one-hour L_{90} measured at each site. We offer the following comments regarding the methodology employed by the SNA:

6. Table 1 does not indicate whether these one-hour L_{90} reflect all the measured data or whether these L_{90} were extracted from a larger data set.
7. The lowest one-hour L_{90} should not have been used for the BS 4142 assessment. Rather, an average L_{90} should have been established which was representative of the range of background noise levels at each



- site, in particular closely linked in time to the measurements made of the track (e.g., the same day). At a minimum, we would expect this would involve establishing the L_{90} based on one full-day monitoring period (i.e., 8:30 a.m. to 5:00 p.m.).
8. The use of the principle of “predictable worst-case noise impact” referenced from the Ontario NPC-300 guideline is inappropriate to use with BS 4142. These assessment frameworks (i.e., BS 4142 and NPC-300) are derived from different policy directions and rationale, and mixing concepts from them is not appropriate. Further, as noted below, BS 4142 specifically suggests this principle not be applied to establish background sound levels.
 9. Since the VIMC noise measurements used in the study were conducted on a Saturday, the L_{90} should have also been established on a weekend day.
 10. The report should have noted the sources of sound present during the measurement periods.

These comments on based on the following guidance provided in Section 8.1 of BS 4142: 2014:

In using the background sound level in the method for rating and assessing industrial and commercial sound it is important to ensure that values are reliable and suitably represent both the particular circumstances and periods of interest. For this purpose, the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods.

Among other considerations, diurnal patterns can have a major influence on background sound levels and, for example, the middle of the night can be distinctly different (and potentially of lesser importance) compared to the start or end of the night-time period for sleep purposes. Furthermore, in this general context it can also be necessary to separately assess weekends and weekday periods.

8.1.5 To fully understand the context in which the sound from an industrial and/or commercial source(s) is being assessed, describe and report the sources of sound which comprise the acoustic environment.

3.4 Determination of the Residual Sound Level

The residual sound level was determined from the same data set used to establish the background sound level. Our comments on the methodology used to establish the ambient sound level are similar to those provided for the methodology used to establish the background sound level:

11. The lowest one-hour L_{eq} should not have been used for the BS 4142 assessment. Rather, an average L_{eq} should have been established which was representative of the range of noise levels at each site. At a minimum, we would expect this would involve establishing the L_{eq} based on one full-day monitoring period (i.e., 8:30 a.m. to 5:00 p.m.).
12. Since the VIMC noise measurements used in the study were conducted on a Saturday, the residual L_{eq} should have also been established on a weekend day.
13. The report should have noted the sources of sound present during the measurement periods. The report states that samples were selected that were “free of significant contamination noise” (such as people talking, tractors, chainsaws). Samples should be *completely free* of such contamination and appropriately representative of the sound source under consideration (i.e., ambient or track). This statement does not give confidence that the periods assessed were appropriately selected.



14. The SNA report notes that there were “breaks” between sessions at the VIMC on March 31, 2019. These breaks would have provided an opportunity for establishing/confirming the residual L_{eq} .

3.5 Determination of the Ambient Sound Level

The SNA established the ambient sound level based on two 20-minute measurements (each at different locations) conducted while the VIMC operated on March 31, 2018. We offer the following comments on the methodology employed by SNA:

15. Table 1 does not indicate whether these 20-minute L_{eq} reflect all the measured data or whether they were extracted from a larger data set. If a larger data set was available, rationale should be provided for basing the analysis on these two measurement periods alone.

3.6 Determination of the Specific Sound Level

As per BS 4142: 2014, the SNA established the specific sound level for the VIMC by logarithmically subtracting the residual sound level from the ambient sound level. We offer the following comments regarding the methodology employed by the SNA;

16. Based on measurements conducted by RWDI, we would expect the ambient sound levels measured by the SNA to be primarily dominated by a mixture of highway noise and VIMC noise. To determine the specific sound level (VIMC noise), the residual sound level (highway noise) is subtracted from the ambient sound level (total noise). Since the SNA used the *lowest* measured residual sound level in this calculation, it is likely that the specific sound level they calculated includes highway noise. As noted previously, establishing the residual sound during the breaks in VIMC operation on March 31, 2018 would have allowed for a more accurate calculation.
17. Based on measurements conducted by RWDI in 2016 (and presented in our October 2016 report), we expect that the difference between the residual sound level and the specific sound level would often be less than 3 dB. When this is the case, Section 7.3.5 of BS 4142 advises the following:

7.3.5 Where it is not possible to determine the specific sound level by measurement of the ambient sound level and the residual sound level at the assessment location(s), for example, because the difference between the ambient sound level and the residual sound level is ≤ 3 dB, determine the specific sound level by a combination of measurement and calculation. Report the method of calculation in detail and give the reason for using it.

NOTE In some cases, measurements can be supplemented by calculations. Calculations are often more reliable than a single short-term measurement when long-term averages are to be determined and in other cases where it is impossible to carry out measurements because of high residual sound levels. In case of the latter, it is sometimes convenient to carry out the measurements closer to the source and then use a calculation method to estimate the specific sound level at the assessment location(s).



Had the SNA not used the *lowest* measured residual sound level in their analysis, the difference between the residual sound level and the specific sound may have been less than 3 dB and an alternative method would be necessary to determine the specific sound level.

3.7 Determination of Noise Impact

As per BS 4142, the noise impact was established based on how much the specific sound level exceeds the background sound level. We offer the following comments regarding the methodology employed by the SNA:

18. In calculating the margin by which the specific sound level exceeds the background noise level, the SNA used the *lowest* measured values to establish the residual sound level and the background sound level, which is inappropriate and not in keeping with the standard. This approach would tend to:
 - o Underestimate the background sound level;
 - o Overestimate the specific sound levels; and therefore
 - o Overestimate the margin between the specific sound level and the background sound level.

As a result, the conclusions and discussion based on the noise impact determined in the SNA report cannot be considered appropriate for assessment of the impact per the methods outlined in BS 4142.

3.8 Proposed Noise Limit

The SNA report provides discussion on how the proposed noise limit of 59 dBA based on a 15 minute L_{20} , as well as proposals of 60 dBA L_{eq} , is not appropriate. In contrast:

19. research into community noise response conducted over the last 40 years by the U.S. Environmental Protection Agency¹, World Health Organization^{2,3}, and supported by Health Canada⁴, have repeatedly concluded that the A-weighted L_{eq} is the best single number descriptor of environmental noise and use it to establish community response reactions. The L_{eq} is a form of “average” that reflects the total acoustical energy of a sound. For this reason, it is the basis of most environmental noise legislation. The assertion in the SNA report that listeners *do not experience an “average sound level”* is incorrect relative to the science of environmental noise and community response.

The L_{20} is a statistical measure of sound that will be reflective of the L_{eq} when there are periodic sounds that are louder than others. Hence, while uncommon in use, the proposed L_{20} metric would be consistent with other community noise parameters and is expected to produce the same outcome.

20. The SNA report discusses the influence of topographical factors and critiques the use of 6279 Mina Drive as an assessment location for VIMC. Given the proposed limits apply to VIMC noise only, the limiting case will

¹ “Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety”, Report No. 550/9-74-004, U.S. Environmental Protection Agency, Washington, D.C., 1974.

² “Guidelines for Community Noise”, World Health Organization, Geneva, Switzerland, 1999.

³ “Environmental Noise Guidelines for the European Region”, World Health Organization, Copenhagen, Denmark, 2018.

⁴ “Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise”, Health Canada, Ottawa, Ontario, 2017.



be a location closest to the track since sound attenuates with distance. In other words, compliance at the nearest point to the source will mean compliance with all points further away.

3.9 Interpretation of CVRD Bylaw Limit

The SNA report states that the CVRD noise bylaw limit of 60 dBA for continuous sound is referencing a maximum sound level (L_{max}). Our interpretation of the bylaw is as follows:

21. The bylaw does not define what noise metric should be used to assess the 60 dBA limit. However, municipal noise bylaw limits for continuous noise are more commonly based on the L_{eq} than on the L_{max} . Therefore, in the absence of guidance to the contrary, we would consider use of the L_{eq} to be the appropriate metric for measuring continuous noise in the context of this bylaw.

4 CONCLUSIONS

While we noted many methodological errors in the SNA assessment, our key concerns can be summarized as follows:

- The noise study should have been carried out by a qualified and independent consulting firm or individual, and preferably under the supervision of a professional engineer;
- The standard used by the SNA (BS 4142: 2014) is not intended to be applied to motorsport noise; and
- By using the lowest measured values to represent the background sound level and the residual sound level, the SNA overcalculated the impact of VIMC noise.