Examination of Consultant's Noise Report Measurements – "Billington Lakes Noise Measurements 26th Feb 24 V2"

Deadline for receipt: Friday 8th March 2024

Unique Reference Number: 20040614

Consultant's Noise Report.

I commissioned a Noise Consultant who is a Member of the Institute of Acoustics to perform Noise Measurements at a strategic location between the Railway Line and affected NSRs. I have submitted The Consultant's Noise Report to the Examining Authority as "Billington Lakes Noise Measurements 26th Feb 24 V2".

I had been trying for several weeks to have these Noise Measurements performed, but matters had been delayed the combination of the inclement Winter Weather and the Noise Consultant's limited availability.

The Noise Measurements were conducted over a continuous and uninterrupted Test Period of 24½ hours at the property known as Billington Lakes, and were performed with the Owner's permission. The Measurements were performed at a location indicated by Grid Reference 52.557018° N, 1.321985° W, which is at a distance of 200 metres from the Nearside Rail of the Railway Line, and is indicated in Figure 1. The Noise Measurement Parameters were recorded continuously at 15-minute intervals throughout the Measurement Period starting at 11:44:34 on Friday the 16th February 2024 and ending at 12:14.34 on Saturday the 17th February 2024.

I have copied the Noise Measurements at Billington Lakes directly from the Consultant's Noise Report into an Excel Spreadsheet for further examination and analysis. This Excel Spreadsheet has in turn been submitted to the Examining Authority as "Excel Examination of Billington Lakes Noise Measurements".

In that Spreadsheet I have, for the purposes of calculation, used an *exact* 24-hour period that starts at 11:59:34 on the Friday and ends at 11:59:34 on the Saturday.

I have also downloaded from Real Time Trains their online postings of the Rail Movements that occurred on those same days of Friday the 16th February 2024 and Saturday the 17th February 2024 when the Noise Measurements were made. I have compared the Rail Movements on those two days with those posted by Real Time Trains in recent weeks and months and they appear entirely typical of the Train Movements prevailing on the Rail Line. In the interests of traceability I have submitted the two days of Real Time Trains data to the Examining Authority, in the form of a single png file.

Figure 1. Location of Billington Lakes Noise Measurements [BL] at Grid Reference 52.557018° N, 1.321985° W

Comparison of Billington Lakes Ambient Noise levels with NMP4 Ambient Noise levels.

In their Noise and vibration report, Tritax described how they performed Noise Monitoring at NMP4, **and then applied the Ambient L_{Aeq} Noise levels measured at NMP4 directly to the affected NSRs 1 to 8 and 24 to 26.** It is therefore instructive to compare the Ambient L_{Aeq} Noise levels measured at NMP4 with the Ambient L_{Aeq} Noise levels that have now been measured at Billington Lakes.

With reference to my Excel Spreadsheet, in the first Worksheet, ***Billington Parameters***, I have listed and generated a Graph which shows all of the measured data.

It was noticed that the L_{Aeq} Ambient Noise Level measured in just one of the 15-minute intervals was recorded as 63.1dB, which stands some 9.7dB above the Ambient Noise level in any other 15-minute interval. This was regarded as an outlier and was subsequently replaced by an Ambient Noise level equal to the logarithmic average of the Ambient Noise levels measured in the preceding and following 15-minute intervals.

By logarithmic averaging, I then went on to calculate three key L_{Aeq} Ambient Noise level parameters for comparison with the Noise data that Tritax acquired at NMP4 in the corresponding period from 12:00:00 on Friday the 23rd April 2021 through to 12:00:00 on Saturday the 24th April 2021.

These three L_{Aeq} Ambient Noise level parameters are, respectively, the 16-Hour Daytime value, the 8-Hour Night-time value and the overall 24-Hour value from that continuous 24-Hour monitoring period.

Now, two of those three corresponding NMP4 measurements are not listed directly in Tritax's Noise and vibration report, because of course the NMP4 Noise data was spread over the two consecutive days of the Friday and Saturday. Accordingly, in my second Worksheet ***NMP4 Parameters*** I have translated the NMP4 raw data given in the Graphs on pages 35 and 36 of Tritax's ES Appendix 10.10 "Summary Results" into digital form***,*** and have calculated the corresponding L_{Aeq} Ambient Noise levels at NMP4 directly from that digitised data.

(Note that, in the ***NMP4 Parameters*** Worksheet, I show both Tritax's original Graphs and my new digitised Graphs directly against each other for comparison purposes, and also indicate independent cross-checks I have performed to verify the correctness of the digitisation.)

The Noise Levels measured at Billington Lakes were found to be much lower than those that Tritax measured at NMP4, as follows:

The Daytime Noise level of 47.9dB measured at Billington Lakes compares with the corresponding value of 59dB measured at NMP4. This indicates an error of 11.1dB.

The Night-time Noise level of 47.1dB measured at Billington Lakes compares with the corresponding value of 56dB measured at NMP4. This indicates an error of 8.9dB.

The 24-Hour Noise Value of 47.7dB at Billington Lakes compares with the corresponding value of 58dB measured at NMP4. This indicates an error of 10.3dB.

These differences between the L_{Aeq} Ambient Noise levels at Billington Lakes and those at NMP4 are caused by the attenuation of the Noise from the Train Pass-Bys that occurs between the Rail Line and the Noise Monitoring Position at Billington Lakes.

Although, of necessity, the Noise Monitoring at Billington Lakes covered just a single 24-Hour period, it is evident from the foregoing that similar errors would also arise on all of the of the seven days that Noise Monitoring was conducted at NMP4.

The above once again draws attention to a very serious methodological error that exists in Tritax's Noise and vibration report. To be clear, this error is not principally due to incorrect Noise Monitoring at NMP4. **Rather, the error is that Tritax have applied those Noise Measurements made close to the rail track at NMP4 directly to the affected NSRs without attenuation of the Train Pass-Bys caused by the distance of the NSRs away from the trackside.**

In my Written Representation of the 10th October 2023, my subsequent Comments Document of the 14th November 2023, and in various other submissions, I have described how Tritax have greatly overstated the Ambient Noise levels at NSRs by applying to them the Ambient Noise levels that they had measured at the NMPs located close to the Rail or Road.

The Billington Lakes Noise Measurements provide further and compelling evidence of the resulting gross errors that exist in Tritax's Noise and vibration report as a direct result of Tritax's methodological error.

Comparison of Billington Lakes Ambient Noise levels with Tritax's "Update Note" Ambient Noise levels.

Following on from their Noise and vibration report, Tritax subsequently submitted their "Written Statement of Oral Case ISH3 [Appendix F - Noise Assessment Update Note]" which comprised Noise Contour maps and further Noise data.

I shall now compare the Ambient L_{Aeq} Noise levels actually measured at Billington Lakes with the claims that Tritax have made in their "Update Note".

The Noise Monitoring Position at Billington Lakes lies well within the both the Daytime and Night-time Road Noise Contour Maps that Tritax have indicated in Figures 3 and 4 respectively of their Update Note. In those Contour Maps, for the area within which the Noise Monitoring Position at Billington Lakes lies, Tritax have indicated an L_{Aeq} Road Noise level of 54dB to 55.9dB for Daytimes, and a slightly reduced level of 52.0dB to 53.9dB for Night-times.

The Noise Monitoring Position at Billington Lakes also lies within the ***Night-time*** Rail Noise Contour Map that Tritax have indicated in Figure 2 of their Update Note.

In respect of their two Rail Noise Contour Maps, Tritax state in their Update Note:

"As the 55 – 59.9dB $L_{Aeq,T}$ contour for the daytime and night-time periods are very similar in location, it is reasonable to assume that the 50.0 – 54.9 dB $L_{Aeq,T}$ contour would also be similar."

Tritax then use this reasoning to apportion an L_{Aeq} Rail Noise level of between 50dB and 54.9dB to the area within which the Noise Monitoring Position at Billington Lakes lies.

Tritax then go on to logarithmically add together their L_{Aeq} Road Noise and L_{Aeq} Rail Noise levels to arrive at their ***Cumulative Indicative Road and Rail Traffic Noise levels $L_{Aeq,T}$*** of 56.2dB for Daytimes and 54.8dB for Night-times respectively for the area within which the Noise Monitoring Position at Billington Lakes lies.

Throughout all of this, Tritax make no distinction between Weekdays and Weekends, **so they apply those L_{Aeq} Ambient Noise levels to Weekends as well.**

Comparing the Ambient Noise Levels, we therefore have:

The Daytime Noise level of 47.9dB measured at Billington Lakes compares with Tritax's value of 56.2dB in their Noise Update Note. This indicates an error of 8.3dB.

The Night-time Noise level 47.1dB measured at Billington Lakes compares with Tritax's value of 54.8dB in their Noise Update Note. This indicates an error of 7.6dB.

Comparison of Road Noise levels at NMP4 and Billington Lakes.

As I described in my Written Representation of the 10th October 2023, and also in further detail in my Comments Document of the 14th November 2023, the Noise Monitoring at NMP4 can be used directly to establish the ***Road Noise*** levels prevailing at NMP4 over the entire measurement period. This is because the Road Noise at NMP4 is continuous in nature (although of course it varies slowly with the traffic load throughout the day) whereas the Rail Noise occurs only for the short individual durations of the Train Pass-Bys. **From this it follows that the Ambient Noise levels measured at NMP4 during those times when there are no Train Pass-bys actually indicate the Road Noise levels ruling at NMP4 at those times.**

In the case of NMP4, the Noise level parameters were all individually logged over 15-minute intervals, and it is very easy to see when no Train Pass-Bys occurred during those 15-minute intervals by simple reference to the L_{Amax} Maximum Noise levels that Tritax also logged at NMP4 at the trackside during those same 15-minute intervals. And, unsurprisingly, those 15-minute intervals when there were no Train Pass-Bys always correspond to the lowest L_{Aeq} Ambient Noise levels measured at NMP4.

Using this principle, in the Worksheet ***NMP4 Parameters,*** I have derived from the digitised NMP4 Noise data the L_{Aeq} Road Noise levels ruling at NMP4 over the period 12:00:00 on Friday the 23rd April 2021 through to 12:00:00 on Saturday the 24th April 2021. The results are shown in Graph 1 below. The resultant L_{Aeq} Road Noise profile, shown by the thick blue line, varies in the manner you would expect over the complete 24-Hour period.

In the Worksheet, I have then proceeded to logarithmic average the L_{Aeq} Road Noise levels measured during the 15-minute intervals when there are no Train Pass-Bys, and so arrive at an L_{Aeq} Road Noise level of **44.4dB** at NMP4 over the whole 24-Hour Period.

Similarly, in the Worksheet ***Billington Parameters***, I have derived from the Billington Noise data the corresponding L_{Aeq} Road Noise levels ruling at the Billington Lakes Noise Monitoring Position over the measurement period from 11:59:34 on Friday the 16th February 2024 through to 11:59:34 on Saturday the 17th February 2024. The results are shown in Graph 2 below. The resultant L_{Aeq} Road Noise profile is again shown by the thick blue line over the complete 24-Hour period. The L_{Amax} Maximum Noise levels that were logged are again also shown.

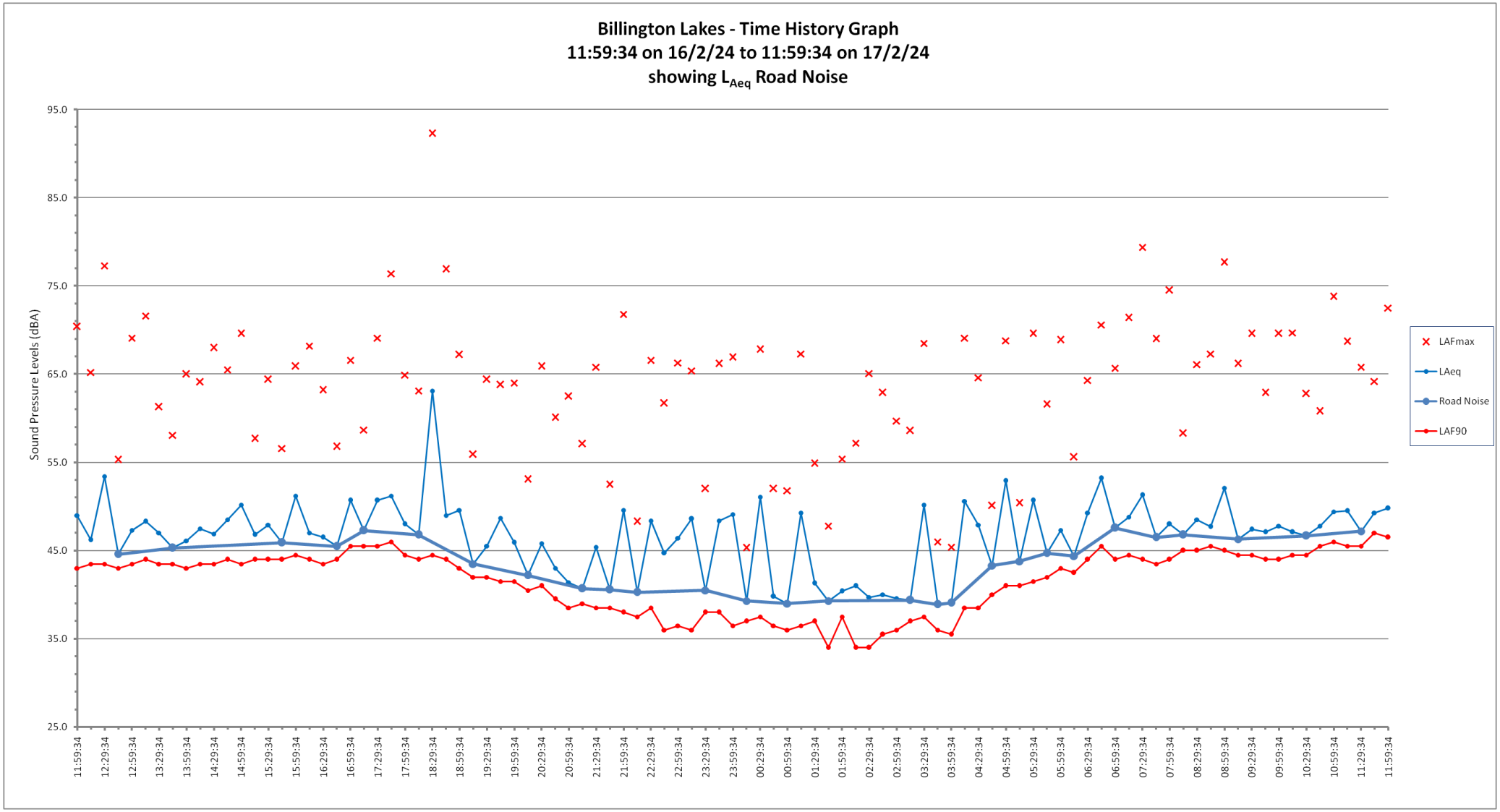
In the Worksheet, I have again logarithmic averaged the L_{Aeq} Road Noise levels measured during the 15-minute intervals when there are no Train Pass-Bys, and have arrived at an L_{Aeq} Road Noise level of **44.4dB** at the Billington Lakes Noise Monitoring Position over the 24-Hour period. This is of course identical to that indicated for NMP4 over its own 24-Hour Period.

Close agreement between the L_{Aeq} Road Noise levels at NMP4 and Billington Lakes is unsurprising. As I described in much more detail in my earlier document "Comments on the Applicant's Responses to the Examining Authority's Written Questions" of the 9th February 2024, the M69 lies fully 1.21 kilometres away from NMP4, with the (obviously much smaller) B4668 also very distant at 1.06 kilometres away. Moreover, these two roads lie in opposite directions, so that as you move away from NMP4, the changes in their respective Road Noise contributions tend to cancel each other out, and so give rise to a very "flat" local Road Noise profile. And this is exactly confirmed by what we are seeing here.

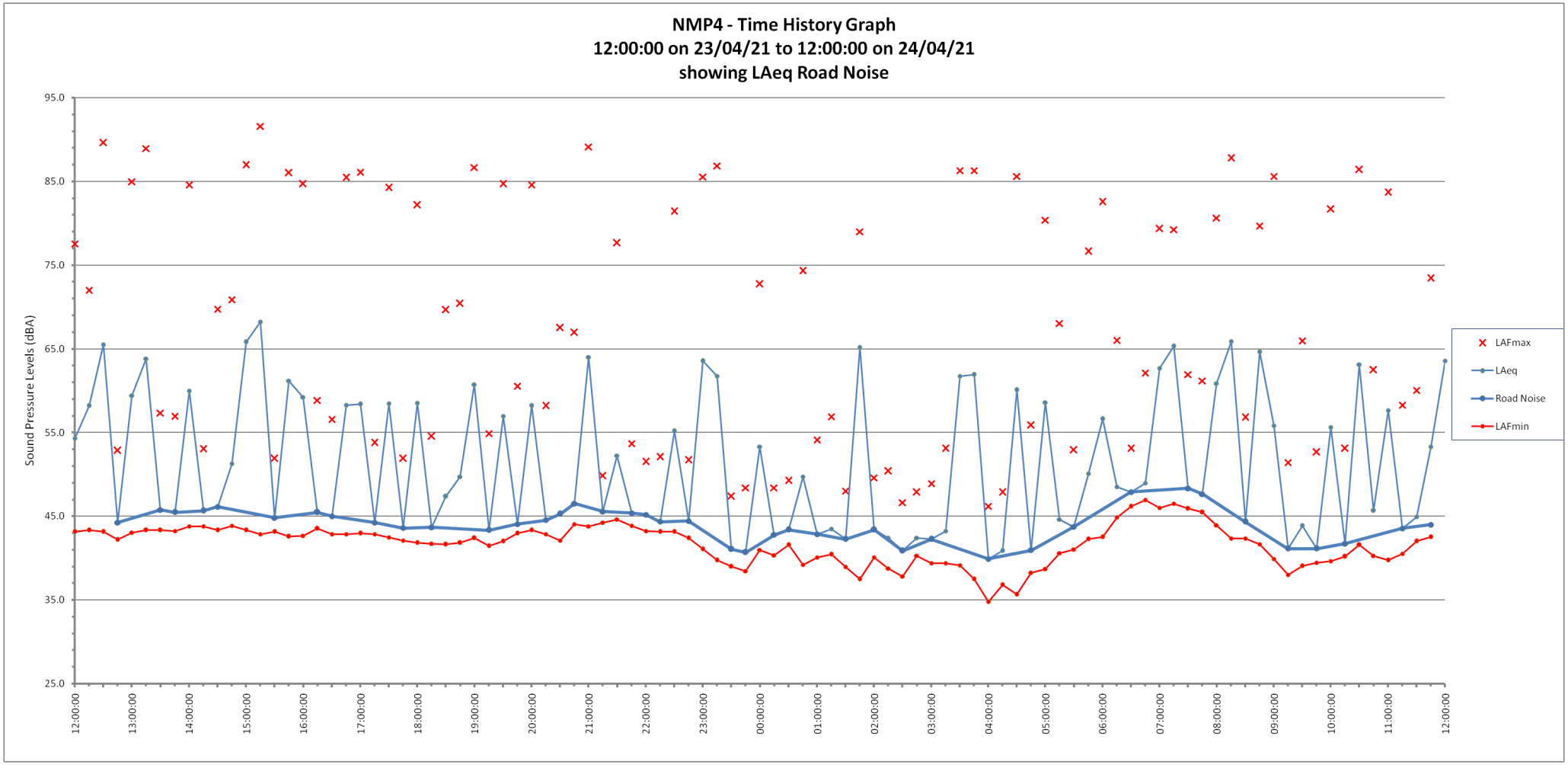
This procedure I have used above in respect of Road Noise is in accordance with BS4142:2014+A1:2019 “Methods for rating and assessing industrial and commercial sound”, because it is simply measuring the sound from a noise source (this being the L_{Aeq} Road Noise) in the **absence** of another noise source (this being the L_{Aeq} Rail Noise).

For accurate assessment of the L_{Aeq} Road Noise level from the measured L_{Aeq} Ambient Noise data, all that is required is that the 15-minute intervals when there are no train Pass-Bys should be correctly identified. Care has been taken, by reference to both the L_{Amax} Maximum Noise level data, and also the Real Time Trains record of Rail Movements, to ensure that this is has been achieved.

Nevertheless, it is worth noting here that, if any 15-minute interval should be wrongly identified, then the result would be that the L_{Aeq} Road Noise level would be inflated by some element of L_{Aeq} Rail Noise from the Train Pass-Bys. This means that, although the L_{Aeq} Road Noise level arrived at here might **overestimate** the true L_{Aeq} Road Noise level, they will certainly not be too low.



Graph 1. Noise Measurements at Billington Lakes



Graph 2. Noise Measurements at NMP4

Comparison of Billington Lakes Road Noise levels with Tritax's "Update Note" Road Noise levels.

As I have indicated in a previous Section of this document, in their "Update Note" Tritax have claimed that, for the area within which the Noise Monitoring Position at Billington Lakes lies, the L_{Aeq} Road Noise level is between 54dB to 55.9dB for Daytimes, and 52.0dB to 53.9dB for Night-times.

In contrast we have seen in the previous Section that the L_{Aeq} Road Noise levels at the Noise Monitoring Position at Billington Lakes and also at NMP4 are both sensibly identical at 44.4dB.

Taking the average of Tritax's spread of values to be 54dB, this indicates that the Road Noise levels Tritax claim in their Update Note are in error by 9.6dB.

Calculation of Rail Noise and Ambient Noise at Billington Lakes using "Calculation of Railway Noise" (CRN).

In this Section I first calculate the Rail Noise at Billington Lakes over the 24-Hour period during which the Noise Measurements were performed using the "Calculation of Railway Noise" procedure and with reference the Real Time Trains record of the Rail Movements that occurred over that same 24-Hour period.

In the Worksheet ***Billington Rail and Road*** I have calculated the Rail Noise contributions generated at the Noise Monitoring Position at Billington Lakes by a single Passenger Train per hour and also by a single Freight Train per hour. In this calculation, I have taken into consideration that slightly different Noise Propagations apply to the Nearside and Farside tracks, and so have considered each track separately.

Referring to the Real Time Trains record of the Rail Movements that occurred over the 24-Hour period between 12:00:00 on Friday the 16th February 2024 and 12:00:00 on Saturday the 17th February 2024, I have then gone on to predict the L_{Aeq} Rail Noise level at Billington Lakes over that 24-Hour period to be 46.4dB.

After logarithmically adding to this the 44.4dB contribution previously calculated for the L_{Aeq} Road Noise at Billington Lakes over that same 24-Hour period, we arrive at an L_{Aeq} Ambient Noise level of 48.5dB for Billington Lakes over the 24-Hour period.

This agrees closely with the L_{Aeq} Ambient Noise level of 47.7dB that was measured at the Noise Monitoring Position at Billington Lakes over that same 24-Hour period.

This nicely rounds off the Examination of the Billington Lakes Noise Measurements, and demonstrates once again the accuracy of the "Calculation of Railway Noise" method.

Conclusion.

The Billington Lakes Noise Measurements demonstrate conclusively that Tritax's "Written Statement of Oral Case ISH3 [Appendix F - Noise Assessment Update Note] is in very serious error, and should be withdrawn.

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David Moore is a Chartered Engineer, and a Fellow of the Institution of Mechanical Engineers. He has some 25 years experience in Industrial Design Consultancy. Clients have included 3M, Procter & Gamble, GSK, London Underground, Johnson & Johnson, Ricardo, Monsanto, DePuy, AstraZeneca, BAE Systems, Unilever, Reckitt, Sanofi and Alstom. Now retired, his technical interests include Mechanical Design, Mathematical Modelling, Computational Fluid Dynamics and Digital Signal Processing.