



Technical Advice

To	Brenda O'Shaughnessy
From	George van Hout and Jon Jones
Date	10 August 2021
File/Ref	210810-5-WT696-M1-GvH-Equine impact annex
Subject	Acoustic review of potential equine noise impacts at Fraser Auret Racing

A proposed Plan Change (1165, 1151 and 1091 State Highway 1) was approved by Council in August 2020, to rezone land adjoining Makirikiri Road from Rural to Industrial. Fraser Auret Racing have appealed this decision, citing (along with other factors) adverse noise impacts associated with the proposals affecting horses at 73 Wings Line (Fraser Auret Racing stables).

Further to our operational noise Acoustic Report developed to support the Resource Consent application, we have provided a further assessment regarding the potential noise impacts at Fraser Auret Racing (73 Wings Lane). This analysis is based on the comments made by Professor Joe Mayhew, a former professor at Massey University who specialises in Equine neurology. This annex shall be read in conjunction with the WSP *Marton Rail Hub – Comprehensive Development Plan; Acoustic Assessment* Report (reference: 210810-6-WT696-GvH-R1-Comprehensive Development Plan, Marton), referred herein as the 'Acoustic Report'.

Noise criteria discussion

Professor Mayhew has provided an expert response to the WSP Acoustic Report specifically around the impact of noise on horses. The comments relate to *“particularly episodic, unpredictable [explosive] sounds”* as these can startle horses. Horses are *“fright and flight”* animals and the erratic behaviour following being startled can be unpredictable, and may sometimes be dangerous (both to humans near the horse or to the horse itself). A copy of the comments received is included in Appendix A.

Professor Mayhew commented that there is no objective audiology data to determine at what level a horse will be startled [1]. There is limited research on noise impacts on horses. Most research is based on infrastructure noise (road, rail and aircraft). Many of the references state that horses become habituated to continuous loud noise sources of many types [2].

Research on noise from infrastructure suggests that a sound exposure level (SEL, the total sound from an event) of 95 – 100 dBA at a listener, receiver or assessment location would have an “observable effect”. For animals, this might include nest abandonment for birds, reduction of milk production in cattle, or a startle/panic response in other mammals. However, several research studies also indicate animals habituate to noise after several repetitions of the noise [2] [3]. An SEL level is generally 7 to 12 dB higher than a maximum noise level (L_{AFmax}) for aircraft overflight or a train pass-by. Noise received at Fraser Auret Racing from the Marton Rail Hub development (approximately 1200 metres away) is predicted to be significantly lower than this threshold of impact, as described below.

The International League for the Protection of Horses in the UK issue advice for the UK High Speed Rail system which indicated that horses usually become habituated to repeated noise, but acknowledged that there may be a short period of adjustment [3].

Huybregts undertook an analysis of the noise impacts on horses on race days during a concert at Flemington Racecourse (home of the Melbourne Cup) [4]. An average noise level descriptor (L_{Aeq}) was used for ease of recording, although this study quotes a maximum noise level event (L_{AFmax}) may be a more appropriate acoustic criteria [4]. A 65 dB $L_{Aeq(15\ min)}$ noise limit was deemed acceptable. Measured noise was generally less than 65 dB L_{Aeq} at the stalls. Any reaction shown by the horses that was recorded by a veterinarian or stable-hand was from visual stimulus (a Ferris Wheel and slingshot ride), or when the structure vibrates due to large amounts of low frequency noise [4]. Therefore, it may be inferred that noise in excess of 65 dB L_{Aeq} may be required to noticeably impact horses. The predicted noise level at Fraser Auret Racing from Marton Rail Hub is significantly lower than 65 dB L_{Aeq} and therefore there will be less noise impacts. .

Professor Mayhew concluded his review of the Marton Rail Hub Acoustic Report by stating “as [most] horses are domesticated, extrapolation from human startle response curves may be the best we have” as a response to ‘frightening’ a horse.

The District Plan maximum noise limit, which has been set to prevent sleep disturbance for humans is 75 dB L_{AFmax} which only applies during the night time. This criteria could also be used to consider impacts on horses both during the daytime and night-time periods, and is consistent or more stringent than findings from the other research described above.

The WHO *Guidelines for Community Noise* document [5] summarises research on the impact of noise on humans. For a good nights sleep, this document states individual noise events exceeding 45 dB L_{AFmax} inside rooms for sleeping should be avoided to reduce sleep disturbance [5]. For steady-state noise, the WHO state that levels under 55 dB L_{Aeq} would result in few people being highly annoyed.

Predicted noise levels

Based on the equipment and processes that are to be undertaken at the Marton Rail Hub site, maximum noise levels up to 95 dB L_{AFmax} at 10 metres away may be generated from time-to-time, such as when a train is siding, a container is placed on another, or a log is dropped.

We have undertaken further 3D computational noise modelling using the existing base noise model developed in our Acoustic Report. The further noise modelling has been undertaken to determine the maximum noise level at Fraser Auret Racing. Based on the expected maximum noise levels generated by the site (presented in the Acoustic Report), Table 1 below outlines the predicted noise levels once they have propagated to Fraser Auret Racing:

Table 1 Predicted noise levels at Fraser Auret Racing

PROPERTY	AVERAGE NOISE LEVEL ($L_{Aeq, 15\ MIN}$)	MAXIMUM NOISE LEVEL (L_{AFMAX})
Fraser Auret Racing	42 dB	45 - 50 dB

Discussion

There is minimal research into the impact noise has on horses, and no objective audiology data to determine at what level a horse will be startled or impacted. In addition, much of the research concludes that horses can habituate to louder noise sources without observable impact.

Despite the limited research, we have indicated the potential impact, to the best of our knowledge, that noise generated at Marton Rail Hub may have on horses.

The predicted maximum noise level at Fraser Auret Racing is predicted to be significantly below the District Plan maximum noise level limit of 75 dB L_{AFmax} (which only applies at night in relation to assessment of resource consents, but which may be a reasonable level to assess startling during the day). The predicted maximum noise level (45 – 50 dB L_{AFmax}) is also well below the 83 – 93 dB L_{AFmax} noise levels that may lead to startling, discussed in the *noise criteria* discussion section above.

The average noise levels predicted to be generated by Marton Rail Hub are approximately 42 dB L_{Aeq} when a full site operation scenario is assessed (worst-case). This average noise level is likely similar to the existing ambient noise around Fraser Auret Racing during the daytime, however, may be higher at times during the night time period. This average noise level is below the District Plan noise limits during both the day and night-time periods. The predicted average noise level is below the 65 dB L_{Aeq} noise criteria for startling response developed for Flemington Racecourse.

Noise from locomotive movements on the existing North Island Main Trunk Line is predicted to be up to 45 dB $L_{Aeq,T}$ at Fraser Auret Racing. Therefore, ambient noise in the area of Fraser Auret Racing is higher than the noise received from Marton Rail Hub at Fraser Auret Racing from time-to-time from existing sources. The rail activity noise level from the existing rail movements is predicted to be higher than that from the proposed development. Therefore, in the context of the site and existing environment, impacts from the proposals are expected to be negligible.

When considering the research on noise levels that may impact horses, the predicted noise levels from Marton Rail Hub, when propagated to Fraser Auret Racing, are below any criteria that has been shown to cause a frightening response. Nevertheless, due to the limited research available, there may be a small risk that frightening occurs. However, when taking into consideration any habituation that may occur given the existing noise environment, any impact on horses from the operation of Marton Rail Hub is expected to be negligible.

Conclusion

The predicted maximum and average noise levels from Marton Rail Hub received at Fraser Auret Racing are predicted to be below any guidance limits from the research provided, along with discussions with Equine Neurology expert Professor Joe Mayhew.

Furthermore, noise emissions from the operation of the proposed site development are expected to be below the noise levels from the existing rail activities at Fraser Auret Racing. Therefore, it is expected that horses are unlikely to be startled from the proposed development activity, in the context of the existing environment. When taking this into consideration, along with any habituation that may occur as the development operates over an extended period of time, the effects on horses is predicted to be negligible.

Works cited

- [1] C. Torcivia and S. McDonnell, "Equine Discomfort Ethogram," *Animals*, vol. Vol 11, p. 580, 2021.
- [2] Department for Transport, "London-West Midlands Environmental Statement; Volume 5: Technical Appendices," High Speed two (HS2) Limited, London, 2013.
- [3] C. Hanson, "High Speed Train Noise Effects on Wildlife and Domestic Livestock," *Notes on Numerical Fluid Mechanics and*, vol. Vol 99, pp. pg26-32, 2008.
- [4] C. Huybregts, "Protecting horses from excessive music noise - a case study," in *Animals: 9th International Congress on Noise as a Public Health problem*, Foxwoods, CT, 2009.
- [5] World Health Organisation, "Guidelines for Community Noise," World Health Organisation, Geneva, Switzerland, 1999.

Appendix A – Professor Joe Mayhew expert response

WSP Report – Comments from Professor Joe Mayhew

My only comment of any relevance refers to the possible effect of noise on horses at any local site [for example at Fraser Auret Racing, 73 Wings Lane, Marton] concerning maximum sound levels, particularly episodic, unpredictable [explosive] sounds. It might be reasonable to conclude that any new, unpredictable burst of sound at say 90dB would be potentially frightening to many horses. Also, even explosive noise well below such levels may be supposed to startle some horses. As horses are ‘fright-and-flight’ animals, their erratic behaviour following a startle can be unpredictable and sometimes dangerous. I am not aware of objective audiology data on the use of say a newly described [equine discomfort ethogram](#) to record acceptable startle response curves for horses in response to such sound bursts. And to confound this issue further it seems to be routinely stated empirically that [horses become habituated](#) to loud noise of many types.

It seems that any conclusions drawn regarding noise levels possibly ‘frightening’ to horses – or to a particular horse – are conjectural. However, as [most] horses are domesticated, extrapolation from human startle response curves may be the best we have; on this I acquiesce to human audiologists.

Joe Mayhew

14 June 2021