Appendix 10-1: Updates to airborne noise guidance

Purpose of this appendix

This appendix determines if relevant airborne noise guidance documents have been revised in the interim, or if new guidance has been issued.

Environmental Noise Directive and Regulations

Directive 2002/49/EC of the European Parliament and of the Council Relating to the Assessment and Management of Environmental Noise (2002) was transposed into Irish law by the *European Communities (Environmental Noise) Regulations 2006* (SI No. 140/2006). The Directive introduced the L_{den} parameter, an aggregate parameter calculated from daytime, evening and night-time $L_{Aeq\,T}$ levels. The 2014 assessment used the L_{den} in the assessment of road, rail and construction noise. Application of the L_{den} parameter is somewhat unusual, and this was raised at RFI stage by An Bord Pleanála. The response submitted to the Board clarified the reasons for this approach.

The Directive remains in force, and has not been updated. However, SI No. 140/2006 has been replaced by the *European Communities (Environmental Noise) Regulations 2018* (SI No. 549/2018). The updated Regulations do not have any implications for the 2014 assessment, given that the Directive is not directly relevant to the proposed development.

Construction noise

The 2014 EIS referenced three noise guidance documents in the assessment of construction noise. The first of these was *Quarries and Ancillary Activities: Guidelines for Planning Authorities* (Department of the Environment, Heritage & Local Government, 2004). This document remains in force and valid.

The second document referenced was 'British Standard 5228'which is presumed to be a reference to the version in circulation at the time: *British Standard BS 5228-1:2009 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise* (2009). While a revised version of the standard was issued in 2014, titled *British Standard BS 5228-1:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise* (2014), revisions were minor, and guidance criteria set out in the standard did not change.

The third reference relates to National Roads Authority (NRA, now TII) guidance. The EIS did not present the full title, and it is assumed that the assessment used the 2004 version in force while the EIS was under preparation, titled *Guidelines for the Treatment of Noise and Vibration in National Road Schemes*. Construction noise limits presented in the 2004 document were referenced in the EIS. The NRA document was replaced in 2014, shortly after the EIS was issued, by *Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes*. Construction noise criteria were unchanged.

EPA and WHO guidance

Airborne noise criteria in the EIS were taken from Environmental Protection Agency (EPA) guidance, although the specific guidance document was not identified. The EIS noted that the EPA guidance was in turn drawn from World Health Organisation (WHO) guidance, although again the specific WHO document was not identified. On the basis of EPA and WHO guidance, the EIS applied a 55 dB daytime

criterion and a 45 dB night-time criterion. The EIS noted that the 45 dB external night-time criterion was ultimately informed by a 30 dB internal bedroom criterion recommended by the WHO.

The most recent EPA guidance is set out in their 2016 document *NG4 Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities*. The document recommends daytime and night-time criteria as above. However, the document also refers to an evening period, defined as 1900-2300 h, and recommends a corresponding $L_{Aeq\,T}$ criterion of 50 dB. The original 2012 version of NG4 was in existence at the time of preparation of the original EIS.

The decision to assess daytime and night-time periods in the 2014 EIS is understood to have been made in order to remain consistent with WHO guidance. The most authoritative WHO guidance document is their 1999 report *Guidelines on Community Noise*, which refers only to daytime and night-time periods. Updated WHO guidance in 2009 (*Night Noise Guidelines for Europe*) and 2018 (*Environmental Noise Guidelines for the European Region*) do not have any implications for these criteria. Thus the EIS conclusions in relation to the 55 and 45 dB criteria are considered valid in 2024.

Road noise

Road traffic noise impacts during the construction and operational phases were assessed by comparing predicted road traffic noise levels to baseline levels. This is an accepted methodology. Where a decision is taken to use this methodology to assess impact, current best practice is to refer to *Design Manual for Roads and Bridges – LA111: Noise and Vibration* (UK Highway Agency, 2020) (DMRB). The DMRB document includes separate methods to evaluate construction traffic and operational traffic. Corresponding impact assessment scales are presented in Tables A1-1 and A1-2.

Table A1-1: DMRB scale for offsite construction traffic noise impacts.

Noise level increase	DMRB impact	EPA impact
<1 dB	Negligible	Imperceptible
1—2.9 dB	Minor	Not significant to slight
3—4.9 dB	Moderate	Moderate to significant
≥5 dB	Major	Very significant to profound

Table A1-2: DMRB scale for offsite operational traffic noise impacts.

Noise level increase	DMRB impact	EPA impact
<3 dB	Negligible	Imperceptible
3—4.9 dB	Minor	Not significant to slight
5—9.9 dB	Moderate	Moderate to significant
≥10 dB	Major	Very significant to profound

Although Chapter 10 did not reference a scale such as the DMRB scale, the chapter concluded that road traffic noise impacts will be negligible, increasing to moderate at the Radisson Hotel (renamed the Galmont Hotel in the interim) during the construction phase. Reference to the DMRB tables above results in a similar conclusion, although the hotel impact reduces to minor, equivalent to not significant to slight.

Railway noise

Railway noise was assessed in Chapter 10 with reference to the L_{den} parameter. The chapter noted that rail traffic associated with the proposed development will be so low that any relevant limits are unlikely to be exceeded. Since the EIS was prepared, the WHO has issued their 2018 document *Environmental Noise Guidelines for the European Region*. The document recommends reducing railway noise below 54 dB L_{den}. This recommendation is classed as 'strong', which the WHO defines as advice that can be adopted as policy without further review. The output from predictive modelling shown in Figure 10.4.1 of the EIS suggests that L_{den} levels at a small number of dwellings along Lakeshore Drive and Hawthorn Drive may approach 55 dB. However, it should be noted that:

- Chapter 10 did not clarify if these levels will be due to port or non-port railway traffic. Given the low volume of the former, levels will most likely be dominated by non-port railway movements.
- Any exceedances of the 54 dB criterion are likely to be approximately 1 dB or less.
- The number of dwellings where levels will exceed 54 dB is estimated at less than 10.
- The purpose of the 2018 WHO document is to inform policy makers when devising national guidance. Criteria set out in the document are generally not applied in the assessment of impacts.

On this basis, it is considered that the absence of a more detailed railway noise assessment in the EIS was not a significant omission, and that a more detailed assessment was not warranted. No guidance has been issued in the interim which would precipitate a more detailed assessment, or which invalidates the railway assessment presented in the 2014 EIS.

Conclusions in relation to airborne noise guidance

- The Environmental Noise Directive and the corresponding Irish Regulations, although updated, remain unchanged, and there are no implications for the EIS.
- Two of the three documents used for the construction noise assessment have been updated since the 2014 EIS was prepared. However, criteria presented in the revisions are unchanged, and consequently there are no implications for the EIS.
- The 55 dB daytime and 45 dB night-time criteria remain valid and relevant in 2024.
- Road traffic noise changes are commonly assessed in 2024 with reference to DMRB guidance issued in 2020. Application of the guidance does not alter the EIS conclusions, apart from a slight reduction in impact category at the Radisson, now Galmont, Hotel, from moderate to minor.
- Railway noise was subject to a relatively light assessment in the EIS, most likely due to a partial scoping out as a result of the expected minimal impacts. No guidance has been issued since 2014 which would precipitate a more detailed assessment, and the conclusions of the 2014 EIS remain valid.

Appendix 10-2: Updates to underwater noise guidance

Purpose of this appendix

This appendix determines if relevant underwater noise guidance documents have been revised in the interim, or if new guidance has been issued.

Guidance documents

There is a paucity of guidance documents relating to the assessment of underwater noise impacts. In the underwater environment, impact assessment is confined to physical, hearing and behaviour effects on fish and marine mammals. No international standards have been issued in relation to such impacts. While organisations such as the International Standards Organisation and the British Standards Institution have issued standards relating to underwater noise measurement and hydrophone characteristics, none have issued standards with respect to marine fauna impacts.

In the absence of such standards, underwater noise assessments chiefly rely on peer reviewed papers published in scientific journals. A number of such papers were referenced in Chapter 10. Authors such as Southall and Finneran are recognised in this field, and reports by these and other authors were used in the Chapter 10 assessment.

One of the most authoritative guidance documents is *NOAA Technical Memorandum NMFS-OPR-59 Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0) – Underwater Thresholds for Onset of Permanent and Temporary Threshold Shifts* (US Department of Commerce, National Oceanic and Atmospheric Administration and National Marine Fisheries Service, 2018) (referenced NOAA in this appendix). The first version of this document was issued in 2014, shortly after the GHE EIS was submitted. Chapter 10 of the EIS referred to a draft version of the guidance document issued in 2013, although only in the context of assessing phocids (earless seal) and mustelids (otter) separately. With respect to actual threshold noise values for marine mammals, the EIS refers to reports issued by Southall *et al* (2007) and Finneran and Jenkins (2012). It should be noted that the NOAA document refers only to the issues of permanent threshold shift (PTS) and temporary threshold shift (TTS), and does not address behavioural impacts.

In 2014, the Department of Arts, Heritage and the Gaeltacht (DAHG) issued *Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters*. The document includes threshold noise levels relating to PTS, TTS and behavioural changes, drawn from the Southall *et al* 2007 paper. The DAHG document post-dates the 2014 EIS, although the Chapter 10 bibliography refers to a 2013 version of the document (most likely a consultation draft). The final 2014 version of the DAHG document includes guidance drawn from Southall *et al* (2007). Thus the 2014 EIS, which referenced Southall *et al* (2007), was consistent with DAHG guidance. This DAHG document remains in force in 2024, and it follows that the 2014 EIS applied current Irish guidance.

The 2014 EIS referred to criteria recommended by Popper *et al* (1997) in relation to fish. As before, no official guidance documents were in effect in 2014, and none have been issued in the meantime. Reference to authors such as Popper continues to represent best practice.

Commission Decision (EU) 2017/848

EU Directive 2008/56/EC of the European Parliament and of the Council establishing a Framework for Community Action in the Field of Marine Environmental Policy requires member states to develop marine strategies to achieve or maintain good environmental status of EU marine waters by 2020. *Commission Decision (EU) 2017/848 of laying down Criteria and Methodological Standards on Good Environmental Status of Marine Waters and Specifications and Standardised Methods for Monitoring and Assessment* provides criteria for various health indictors such as noise, and how these indicators may be assessed. Two anthropogenic underwater noise criteria are described: impulsive noise and continuous low-frequency noise. For both criteria, member states are required to establish threshold values for the levels of underwater noise that should not be exceeded.

In order to guide and advise member states on this issue, the Commission established a Technical Group on Underwater Noise. In 2022, this group issued a set of recommendations for member states in the setting of threshold values for continuous and impulsive sounds. The recommendations do not include actual threshold noise criteria, but rather describe a procedure to define and set threshold values which may be used by member states for species such as marine mammals and fish. The Technical Group also recommends the following overall criteria:

- Continuous noise: No more than 20% of a marine area can be exposed to continuous underwater noise over one year.
- Impulsive noise: No more than 20% of a marine habitat can be exposed to impulsive noise over one day, and no more than 10% over one year.

While initially published as a recommendation to member states, the Commission has now made the area threshold recommendations mandatory. Thus member states are required to have consideration of these recommendations in their national legislation.

No specific species threshold criteria have been established in Ireland to date, and thus the recommendations do not have any implications for the GHE project.

Conclusions in relation to underwater noise guidance

- No international, British or other standards have been issued to date, and the underwater standard landscape in 2024 remains as it was in 2014.
- The 2014 EIS assessed impacts on marine fauna by referring to scientific reports issued by several authors. This continues to represent best practice. Criteria given in some of these reports may have been updated in the interim, and this is assessed in Appendix 10-3.
- A 2013 draft version of the NOAA document is briefly referenced in the 2014 EIS. Since 2014, the NOAA document has become one of the most authoritative and respected guidance documents on the issue of marine mammal noise impacts. Possible implications for marine mammal noise thresholds resulting from the NOAA 2018 update are discussed in Appendix 10-3.
- The only Irish guidance issued in relation to underwater noise impacts on marine mammals was released by the DAHG in 2014, although the EIS referred to a 2013 draft version. Guidance included in the DAHG document was applied in the EIS, as both documents are informed by Southall *et al* (2007). Although Southall *et al* (2007) guidance was updated in 2019 (see Appendix 10-3), DAHG guidance remains unchanged, and thus the EIS continues to be consistent with current DAHG guidance.

Appendix 10-3: Updates to threshold criteria for marine fauna

Purpose of this appendix

This appendix determines if threshold criteria for marine fauna species have been revised in the interim, or if new evidence has emerged. The appendix addresses marine fauna in the context of underwater noise. Airborne noise effects on fauna are assessed in Appendix 10-4.

Criteria applied in EIS

Chapter 10 of the EIS made reference to a number of reports and peer reviewed papers in assessing permanent threshold shift (PTS), temporary threshold shift (TTS) and disturbance impacts on marine fauna. Threshold values, compiled in Tables 10.3.1 and 10.3.2 of the EIS, were ultimately drawn from three sources:

- Finneran, J. J., and Jenkins, A. K. (2012). *Criteria and Thresholds for US Navy Acoustic and Explosive Effects Analysis*. San Diego, CA: SPAWAR Systems Centre Pacific.
- Popper, A.N. and Edds-Walton, P.L. (1997). *Bioacoustics of Marine Vertebrates*. In M.J. Crocker (Ed.) *Encyclopaedia of Acoustics* (pp 1831-1836). New York: John Wiley & Sons.
- Southall, B.L., Bowles, A.E., Ellison, W.T., Finneran, J.J., Gentry, R.L., Greene, C.R. Jr., Kastak, D., Ketten, D.R., Miller, J.H., Nachtigall, P.E., Richardson, W.J., Thomas, J.A., Tyack, P. (2007). *Marine Mammal Noise Exposure Criteria: Initial Scientific Recommendations*. Aquatic Mammals 33: 411-521.

The Finneran and Jenkins document informed sound exposure level thresholds applied in the EIS in relation to cetaceans and pinnipeds. Sound pressure level thresholds for these groups were taken from Southall *et al*. The paper by Popper *et al* informed thresholds with respect to fish. No guidance was identified in relation to underwater noise effects on diving birds.

Updated criteria - Fish

Noise effects on fish have been subject to extensive research in the last two decades. The most authoritative document issued in recent years is *ASA S3/SC1.4 TR-2014 – Sound Exposure Guidelines for Fishes and Sea Turtles: A Technical Report prepared by ANSI-Accredited Standards Committee S3/SC1 and registered with ANSI*, issued by Popper *et al* in 2014 shortly after the original EIS was completed. Table A3-1 sets out fish criteria applied in the EIS, in addition to updates drawn from the 2014 paper.

From the table, it is evident that criteria applied in the EIS are lower than the 2014 Popper *et al* criteria widely applied at present. It follows that EIS criteria continue to incorporate a considerable safety margin, and the EIS findings continue to be valid.

Table A3-1: Fish sound exposure guidance applied in the EIS and recommended by Popper *et al* (2014) in relation to permanent threshold shift and behavioural disturbance.

Signal type	Source	Peak sound pressure level
Single pulse	EIS criterion	195-200 dB
	Popper *et al* (2014)	229-234 dB
Multiple pulse	EIS criterion	195-200 dB*
	Popper *et al* (2014)	203-216 dB
Non-pulse	EIS criterion	Various levels quoted in text
	Popper *et al* (2014)	170 dB
Disturbance	EIS criterion	187-192 dB
	Popper *et al* (2014)	No threshold quoted

* Table 10.5.3 of the EIS suggests that the 195-200 dB single pulse criterion was also applied with respect to multiple pulse sources such as pile driving.

Updated criteria – Marine mammals underwater

In selecting underwater noise threshold criteria for mammals, the EIS drew on recommendations by Finneran and Jenkins (2012) and Southall *et al* (2007). These recommendations were updated in 2019 through publication of the widely quoted paper *Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects* (Southall *et al*, 2019), which was informed by the authoritative NOAA 2018 document identified in Appendix 10-2. Table A3-2 presents a comparison of TTS criteria applied in the EIS, and the updated 2019 criteria. SEL describes the sound exposure level.

Table A3-2: Marine mammal underwater noise criteria for TTS.

Mammal group*	Source	Pulse peak	Pulse SEL	Non-pulse SEL
High frequency cetaceans	EIS criterion	224 dB	183 dB	200 dB
	Southall *et al* (2019)	224 dB	170 dB	178 dB
Very high frequency cetaceans	EIS criterion	224 dB	183 dB	195 dB
	Southall *et al* (2019)	196 dB	140 dB	153 dB
Phocid seals	EIS criterion	212 dB	171 dB	188 dB
	Southall *et al* (2019)	212 dB	170 dB	181 dB
Otters	EIS criterion	212 dB	171 dB	188 dB
	Southall *et al* (2019)	226 dB	188 dB	199 dB

*Cetacean hearing groups were revised in Southall *et al* 2019 on the basis of recent marine mammal audiometric studies. The high frequency cetacean category correspond largely with the mid frequency category applied in the EIS, while the new very high frequency category largely corresponds with the EIS high frequency category.

Table A3-2 indicates that a number of TTS criteria have been revised downwards since the EIS was issued, with cetacean values reduced by as much as 43 dB. Some of this reduction results from the different methods in which the group-specific M-weighting is applied between the 2007 and 2019 Southall *et al* papers. Nonetheless, it is evident that TTS values for cetaceans and seals have been lowered since the original noise assessment was undertaken, reflecting new evidence published since the 2007 Southall *et al* and 2012 Finneran and Jenkins papers which informed the EIS.

On foot of predictive underwater noise modelling, the EIS proposed exclusion zones in relation to pile driving, dredging and blasting (64 m, 128 m and 1000 m respectively). Observation of marine mammals within these zones will require a temporary halt to construction operations. During the oral hearing, it was proposed that the exclusion zone for all species during pile driving, dredging and blasting will be set at 1000 m.

Modelling results were set out in Appendix 10.2 of the EIS, along with threshold values reported by Southall *et al* (2007) and Finneran and Jenkins (2012) above which disturbance, TTS and PTS are likely to occur. Appendix 10.2 plots have now been reviewed in light of the new values reported by Southall *et al* (2019). The purpose of the review was to identify if predicted noise levels at 1000 m will exceed the new values for any mammal group, 1,000 m being the exclusion radius proposed at the oral hearing. In most cases, the 1,000 m exclusion radius will be entirely sufficient. However, in light of the new 2019 criteria, a 1,000 m radius will be insufficient in the following cases:

- At 1000 m, the SEL will be 162 dB due to piling, and 152-154 dB due to blasting. These values will exceed the new 140 dB TTS criterion indicated for the very high frequency cetacean group, which includes porpoises. The 155 dB PTS criterion will also be exceeded. Both criteria were lowered considerably in the 2019 paper. Reviewing Figure 4 of EIS Appendix 10.2 indicates that the 140 dB TTS criterion may be exceeded out to a distance of 1,700m when impact piling, and approximately 1,300m when blasting.
- Blasting will give rise to a peak sound pressure level of 203-206 dB at 1,000 m. This will exceed the 2019 very high frequency cetacean 196 dB TTS and 203 dB PTS criteria. The TTS criterion will be exceeded out to 1,300 m. Criteria for other cetaceans will not be exceeded.
- Dredging operations will give rise to SEL values at 1,000 m which exceed the 153 dB TTS very high frequency cetacean criterion, and possibly the 173 dB PTS criterion. The TTS criterion will be exceeded out to 1,500m. This mammal group includes porpoises.

Updated criteria – Diving birds underwater

With respect to diving birds, little or no research has been undertaken on their vulnerability to underwater noise levels, and no guidance of note has been issued since the 2014 EIS was prepared.

Conclusions in relation to underwater fauna noise criteria

- Criteria applied in the EIS in relation to fish incorporated a considerable margin of safety, and continue to be lower than current guidance.
- Marine mammal criteria have been revised downward since the EIS was prepared, in some cases significantly. In most cases, the 1000 m exclusion radius proposed at the oral hearing will continue to provide sufficient protection throughout the construction works. The 1,000 m radius will be insufficient for the very high frequency cetacean group in cases listed in Table A3-3. The group includes porpoises, but not dolphins.

Table A3-3: Revised exclusion radii for certain construction activities, required to avoid TTS in the very high frequency cetacean group which includes porpoises. In order to allow for model uncertainty, radii incorporate an additional safety margin.

Activity	Minimum radius
Impact piling	1,900 m
Blasting	1,500 m
Dredging	1,700 m

Appendix 10-4: Updates to airborne noise disturbance criteria for fauna

Purpose of this appendix

This appendix determines if airborne noise disturbance criteria for fauna have been revised in the interim, or if new evidence has emerged.

Criteria applied in EIS

In Section 10.4.6 of the EIS, several conclusions were drawn, summarised as follows:

- Noise levels at nesting sites on Mutton Island and Hare Island will reach approximately 55 dB during impact pile driving, the loudest construction activity proposed. This level is unlikely to generate a startle response, as fauna are habituated to noise from road traffic, boats and aircraft.
- Pile driving will not be carried out during the period April-July inclusive, thus avoiding the seal and otter pupping season, and the bird nesting season.
- The airborne noise disturbance threshold for seal and otter is approximately 100 dB(M). Piling noise levels at Mutton and Hare Islands will be well below this threshold.
- Piling noise levels will also be lower than disturbance thresholds for ground nesting birds such as terns.

In relation to seal and otter, disturbance criteria used in drawing the above conclusions were informed by Finneran and Jenkins (2012).

Updated criteria – Marine mammals onshore

Southall *et al* (2019) updated criteria for marine mammals while onshore, including phocid seals and otters. Table A4-1 lists updated temporary threshold shift (TTS) criteria, in addition to criteria applied in the EIS.

Table A4-1: Marine mammal airborne noise TTS criteria. Noise levels include a group specific weighting (termed the M weighting in the EIS). SEL is the sound exposure level.

Mammal group	Source	Pulse peak	Pulse SEL	Non-pulse SEL
Phocid seals	EIS criterion	143 dB	129 dB	129 dB
	Southall *et al* (2019)	138 dB	123 dB	134 dB
Otters	EIS criterion	143 dB	129 dB	129 dB
	Southall *et al* (2019)	161 dB	146 dB	157 dB

The EIS predicted that noise levels due to constructions and operations will be considerably below TTS and disturbance thresholds. Even in cases where TTS criteria have been lowered in the more recent guidance, predicted noise levels continue to be lower than these criteria. It follows that no impacts will arise on seals or otters while outside the water.

Updated criteria – Nesting birds

The 'TIDE toolkit', a 2013 document prepared by Cutts *et al* under the EU-funded TIDE project, has seen increasing application to shoreline projects. The toolkit describes a procedure to determine the level of potential disturbance to waterbirds from a range of construction activities on or adjacent to wetland systems including Natura 2000 sites.

The toolkit sets out a series of threshold values for several estuarine bird species, above which various disturbance effects can be expected. Based on these values, two separate sound pressure level threshold values are considered applicable to this addendum, relevant to the birds' position:

- Short term or sudden events, relevant to construction works: 60 dB.
- Continuous operational noise, relevant to operational emissions: 55 dB.

A review of noise model contours presented in the EIS indicates that construction phase noise levels at ecological receptor points will not exceed the identified 60 dB criterion, taking into account a typical 6 dB conversion between L_{den} levels forecast in the EIS, and $L_{Aeq\,T}$ levels typically used in construction assessments. Similarly, operational noise emissions will not give rise to levels above 55 dB. Thus no impacts will arise on faunal receptors, and the original EIS conclusions remain valid.

Conclusions in relation to fauna airborne noise criteria

- Predicted construction phase and operational phase noise levels received at the locations used by fauna will be lower than updated criteria. The EIS concluded that no impacts will arise, and this conclusion remains valid.

Appendix 10-5: Updates to vibration guidance

Purpose of this appendix

This appendix determines if relevant vibration guidance documents have been revised in the interim, or if new guidance has been issued

Vibration guidance

Chapter 10 of the EIS referred to a single vibration criterion: the 12 mm/s peak particle velocity limit recommended by the EPA. Although the bibliography did not specify the EPA document in question, it is most likely their 2006 document *Environmental Management Guidelines: Environmental Management in the Extractive Industry (Non-Scheduled Minerals)*. The document remains in force and valid in 2024. A precursor to the 2006 document informed a similar 12 mm/s criterion included in *Quarries and Ancillary Activities: Guidelines for Planning Authorities* (Department of the Environment, Heritage and Local Government, 2004), which also remains valid in 2024. An 8 mm/s limit referenced in the EIS where blasting occurs more than once per week is most likely drawn from the Department document.

The 2006 EPA document was most likely informed by a number of vibration guidance documents available at the time, including two British Standards:

- *BS 7385-02: 1993 Evaluation and Measurement for Vibration in Buildings – Part 2: Guide to Damage Levels from Ground Borne Vibration* (1993).
- *BS 5228-2:2009 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 2: Vibration* (2009).

The second of these has been updated in the interim. However, the revised version, dated 2014, does not incorporate any revisions to peak particle velocity criteria. It follows that the 12 mm/s criterion recommended by the EPA still stands in 2024. The 8 mm/s criterion included in the Department guidance also remains valid.

Conclusions in relation to vibration guidance

- The 2006 EPA document which informed the 12 mm/s criterion applied in the EIS remains valid today, and thus the criterion still stands.
- A similar conclusion applies to the 8 mm/s criterion where blasting will arise more than once per week. The 2004 Department of the Environment, Heritage and Local Government document which most likely informed the EIS in this regard also remains valid.
- No vibration guidance has been issued in the interim which would result in a need to revise these peak particle velocity criteria downwards.

Appendix 10-6: New receptors in built environment

Purpose of this appendix

This appendix determines if new receptors have been built in proximity to the GHE site since 2014.

Noise receptors identified in EIS

Chapter 10 included several figures which show the built environment at 2014. An extract from one of these is shown in Figure A6-1.

Figure A6-1: Extract from EIS Figure 10.4.5.

The nearest receptors at that time were as follows:

- To the west, the closest receptors were located along Grattan Road and Claddagh Quay, with the nearest receptor here being a community hall 440 m west of Nimmo's Pier.
- A number of receptors around the southwest side of the existing docks, and a hotel and apartment complex on the eastern side, represented the nearest receptors to the northwest.
- To the north, the nearest receptors were located along Lough Atália Road, with the closest receptor here being the Radisson Hotel (now the Galmont).
- A large number of residential estates were located to the northeast, at Renmore. The nearest dwellings here were at Lakeshore Drive, 435 m northeast of the Galway Harbour Enterprise Park. An office building was located at 270 m.
- A small residential development, Mellows Park, represented the nearest receptor to the east, with the closest dwellings here located 200 m from the enterprise park.
- There were no receptors within several kilometres to the southeast, south, or southwest.

New noise receptors in closer proximity

A site inspection was undertaken, and mapping reviewed, to identify new receptors constructed since 2014 which are located closer to the GHE project. Any such receptors would shorten the separation distance from GHE noise sources, and would be exposed to higher noise levels than predicted in the original EIS. No new receptors were identified. While a development at Bonham Quay will introduce new receptors to the existing docks, these will not be located closer to the GHE development area than existing receptors. The proposed Ceannt Station redevelopment will not introduce new noise sensitive receptors in proximity to the development area.

The Galway City Council planning portal was accessed to identify any potential receptors (residential, school, or office developments) which are currently in the planning system, and which may be approved and built prior to commencement of the GHE project. No projects were identified in the hinterland between the port and existing receptors.

Vibration receptors

The EIS noted that there were no receptors in the surrounding area vulnerable to groundborne vibration from construction machinery or traffic. No new vibration sensitive buildings have been identified in the meantime which would alter this conclusion.

Three areas of potential concern were identified in the EIS in relation to underwater blasting vibration, as follows:

- Sensitive structures at the Galway Harbour Enterprise Park. The EIS noted that bitumen and fuel storage tanks here will require appropriate vibration mitigation, including monitoring during blast events.
- Commercial shellfish areas in Galway Bay. These are discussed in Appendix 10-7.
- Ground nesting birds in season. Chapter 10 noted that mitigation may be required during blasting for a short period each year. Mitigation was addressed in Chapter 7.

With respect to Galway Harbour Enterprise Park, the EIS proposed that vibration monitoring will be undertaken during underwater blasting events. Although no new vibration-sensitive structures have been identified in the enterprise park, the monitoring programme will be discussed with the park operator prior to blasting in order to confirm monitoring requirements and locations, taking into account any changes in site structures in the interim.

Conclusions in relation to receptors in the built environment

- No new noise or vibration receptors, built or proposed, have been identified in the area between the port and existing receptors.
- Noise receptors built at the time of the original assessment continue to be the nearest receptors to the proposed development area.
- It follows that there is no requirement to update the airborne noise prediction model in this regard.
- Vibration monitoring was proposed in the EIS at the Galway Harbour Enterprise Park to assess potential impacts on vibration-sensitive structures. When discussing the vibration monitoring programme with the park operator, account will be taken of any new structures in the interim.

Appendix 10-7: New ecological receptors

Purpose of this appendix

This appendix determines if new ecological receptors (terrestrial or aquatic) have been identified in the surrounding area. For the purposes of this task, an ecological receptor may be a faunal species, or a habitat area.

Ecological receptors assessed in EIS

Faunal species considered in Chapter 10 of the EIS consisted of the following:

- Mid frequency cetaceans (dolphin).
- High frequency cetaceans (porpoise).
- Fish, chiefly salmon and eel.
- Phocids (earless seal) in water and air.
- Mustelids (solely otter) in water and air.
- Diving birds in water, although no impacts were concluded due to unavailability of any threshold values.
- Ground nesting birds such as terns, in relation to airborne noise, although threshold values were not identified.
- Ground nesting birds in relation to vibration from underwater blasting. The EIS noted that some mitigation would be required if blasting was undertaken at certain times of the year.

Chapter 10 included a discussion of shellfish production areas between Mutton Island and Hare Island. Although the EIS noted that these areas, during underwater blasting events, would be likely to receive vibration levels below levels attributable to other sources, monitoring during blast events was nonetheless proposed.

New ecological receptors

Information compiled by the ecological team indicates that, since the EIS was prepared:

- No new terrestrial or aquatic species which require noise or vibration consideration have been identified.
- No changes in the ranges of existing species have been identified, which would require noise or vibration consideration.
- No new terrestrial or aquatic habitats which require noise or vibration consideration have been identified. While certain habitats have undergone transitioning in the interim, there are no implications for this addendum.

It follows that species and their ranges assessed in Chapter 10 remain valid. It is possible that shellfish production areas referenced in the chapter, between Mutton Island and Hare Island, may have changed slightly in the interim. Any such potential changes may be addressed through monitoring during the construction phase.

Conclusions in relation to ecological receptors

- No changes in ecological receptors have been identified since the 2014 EIS was prepared, and the Chapter 10 assessment remains valid in this regard.
- The underwater blasting vibration monitoring programme will be discussed with shellfish operators between Mutton and Hare Islands, in order to take account of any changes in shellfish production areas since 2014.

Appendix 10-8: Terrestrial soundscape changes

Purpose of this appendix

This appendix determines if the terrestrial soundscape has changed in the interim.

Chapter 10 of the EIS referred to daytime and night-time. The WHO does not generally identify a separate evening period, and their current guidance refers only to L_{den} and L_{night} levels. Many Irish local authorities specify only daytime and night-time limits, typically applying a night-time start at 2000 or 2200 h. In order to remain as consistent as possible with the original assessment, this section refers only to daytime and night-time where necessary.

Soundscape at time of original assessment

The EIS described baseline noise surveys undertaken at five positions at various times over several years prior to EIS preparation. The stations used are shown in Figure A8-1. Noise data recorded are included in Tables A8-1 to A8-7 below.

Figure A8-1: Baseline noise stations used in original assessment, inferred from EIS Figure 10.2.1.

Data measured at N1 and N2 included averages of quarterly or biannual surveys undertaken over several years. Measured data suggest that the datasets relate to daytime.

Chapter 10 noted that noise levels at all positions were significantly influenced by transport noise, including road, rail and aircraft. Activities at the Galway Harbour Enterprise Park also influenced data. Chapter 10 summarises background noise levels as follows:

- At Mellows Park (N1), the daytime $L_{AF90\,T}$ level was consistently 40-45 dB, falling to 40 dB or lower at night.
- At the existing docks (N4), the daytime $L_{AF90\,T}$ level was 50-55 dB by day, with only a modest reduction at night.
- At Grattan Road (N5), the daytime $L_{AF90\,T}$ level was 50-55 dB by day, falling to around 35 dB at night.

The EIS adopted night-time assessment criteria of 40 dB at Mellows Park and 35 dB at Grattan Road, based on measured $L_{AF90\,T}$ levels, noting that these were the most critical receptors, particularly during the construction phase.

Noise mapping

Directive 2002/49/EC of the European Parliament and of the Council Relating to the Assessment and Management of Environmental Noise (2002) requires EU member states to carry out strategic noise mapping in relation to transport noise sources where traffic volumes exceed specified thresholds. Mapping is not directly relevant to the proposed GHE project. However, given that mapping has been undertaken at intervals since 2007, the maps provide an indication of trends in traffic-related L_{den} and L_{night} levels over time. Trends in these parameters in turn reflect trends in the local soundscape where road traffic noise dominates.

Noise mapping was undertaken in 2007, 2012, 2017 and 2022. With respect to the study site, only road traffic noise is relevant, as other transport noise is below mapping thresholds. 2012, 2017 and 2022 maps for the Galway Harbour area are shown in Figures A8-2 to A8-7 (2007 maps do not extend to this area). The maps suggest the following:

- Road traffic noise levels have increased slightly across the surrounding area over the period 2012-2022. This is most evident on the Lough Atália Road and the Old Dublin Road.
- Mapped contours have not extended to the five baseline noise stations, due to low traffic volumes or low noise levels locally.
- The maps do not provide any indication that road traffic noise levels have decreased over this period.

However, in drawing the above conclusions, consideration must be given to the following caveats:

- Noise contours shown in Figures A8-2 to A8-7 show modelled noise levels, determined using prediction software. The maps do not show actual measured levels.
- The absence of a contour in a particular area, for instance at Grattan Road, may indicate that local noise levels are below contour values. Alternatively, the absence may be a result of the exclusion of nearby roads from mapping. Taking Grattan Road as an example, it is likely that road traffic on Grattan Road was not included in the model due to low traffic volumes here, thus resulting in artificially low calculated noise levels along Grattan Road.
- Traffic noise modelling methodology changed between 2017 and 2022, and thus direct comparison between 2022 levels and earlier levels should be undertaken with caution.

The chief conclusion drawn from the strategic noise mapping is that there is no indication that road traffic noise levels have decreased across the Galway area since the 2014 EIS was prepared. Any such decrease would have implications for baseline noise levels quoted in the EIS. Moreover, the proposed development does not have any implications for the *Galway City Council Noise Action Plan 2019-2023* (Galway City Council, 2019), which formulates an action plan based on noise mapping.

Figure A8-2: Mapped road traffic noise levels – 2012 L_{den}.

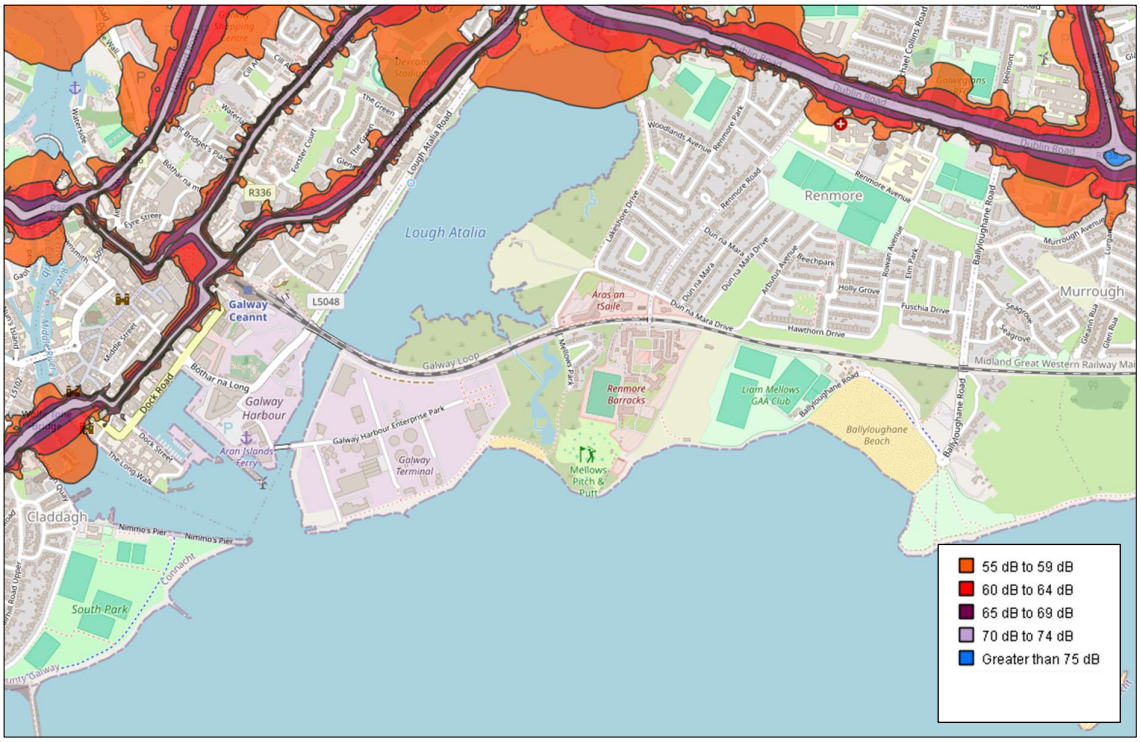


Figure A8-3: Mapped road traffic noise levels – 2012 L_{night}.

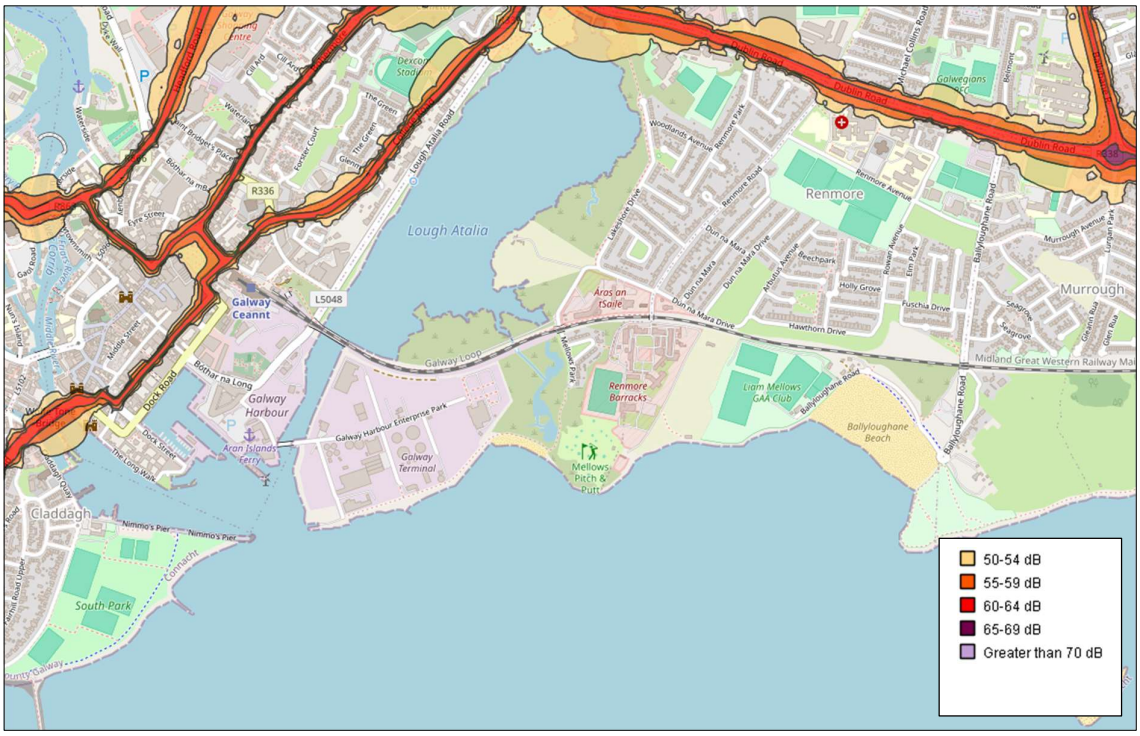


Figure A8-4: Mapped road traffic noise levels – 2017 L_{den}.

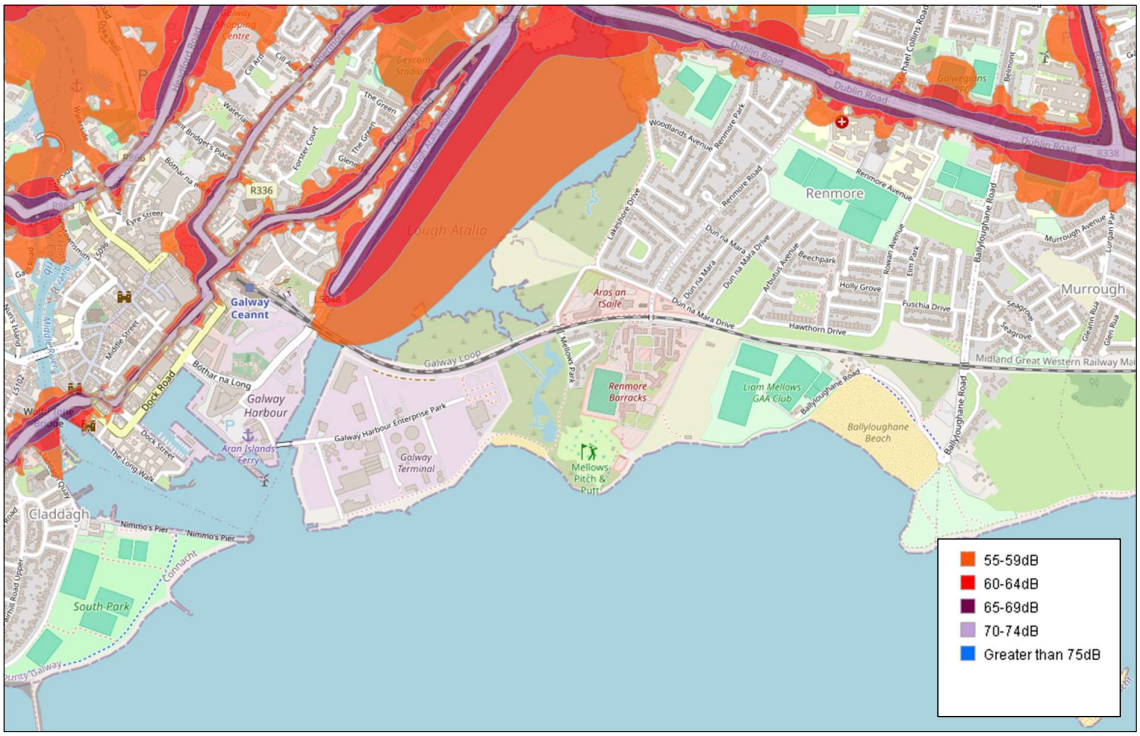


Figure A8-5: Mapped road traffic noise levels – 2017 L_{night}.

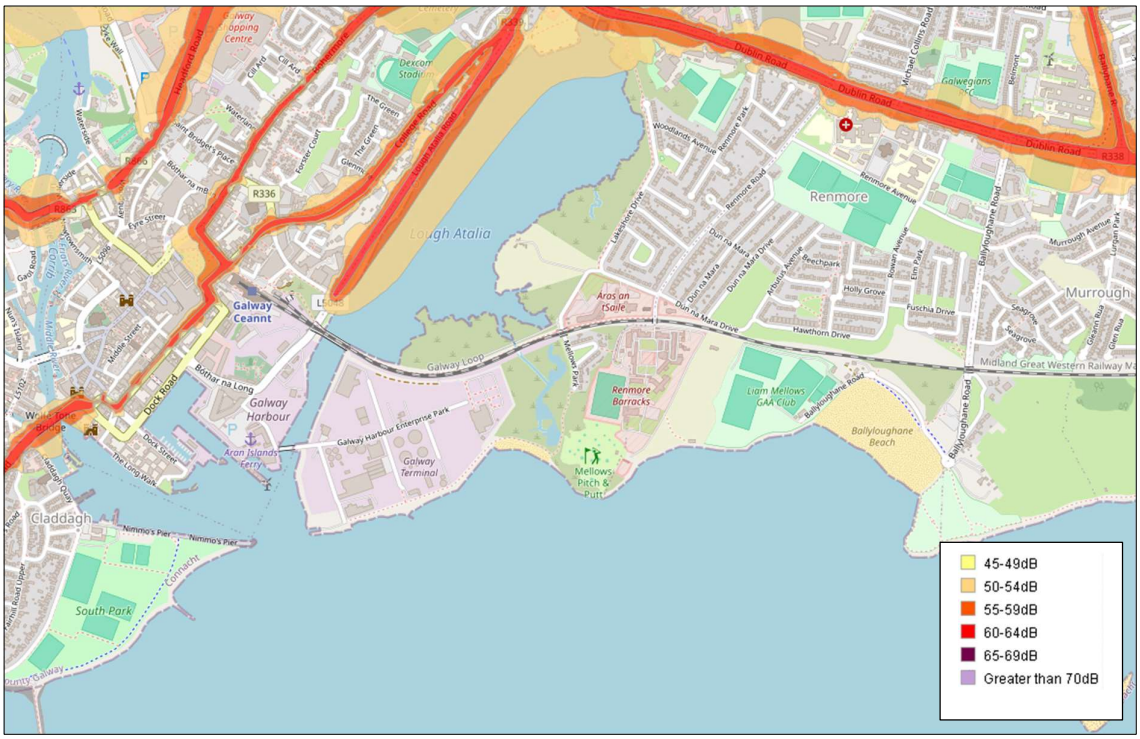


Figure A8-6: Mapped road traffic noise levels – 2022 L_{den}.

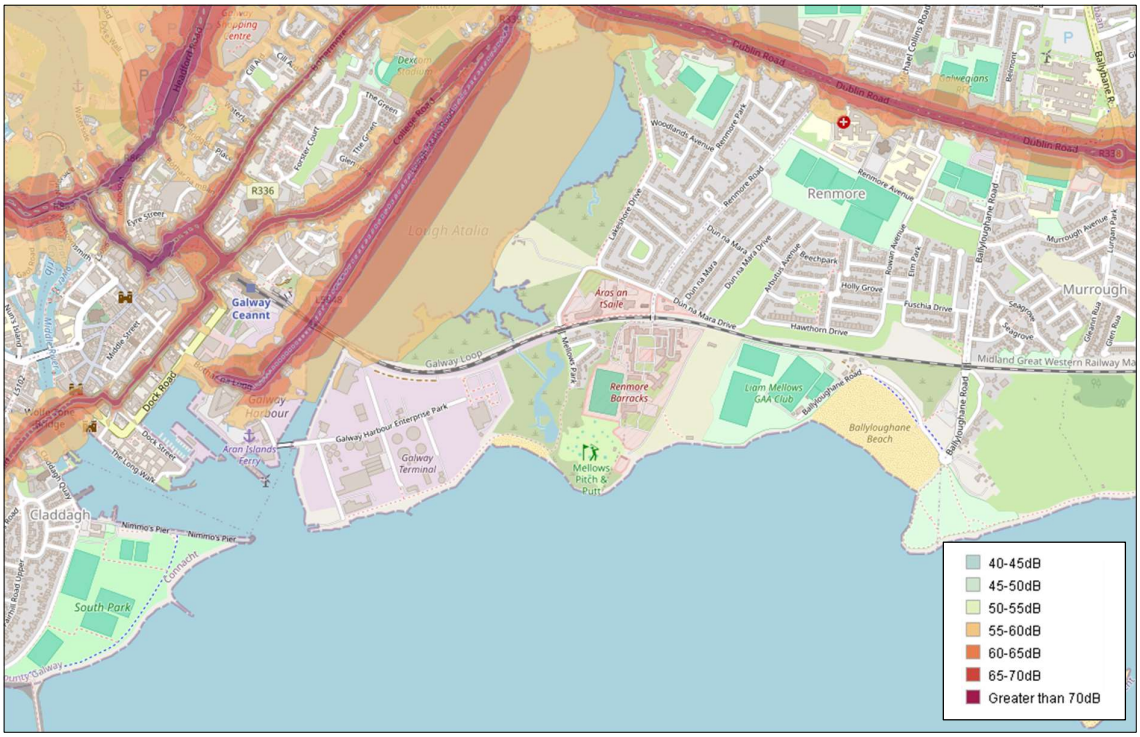
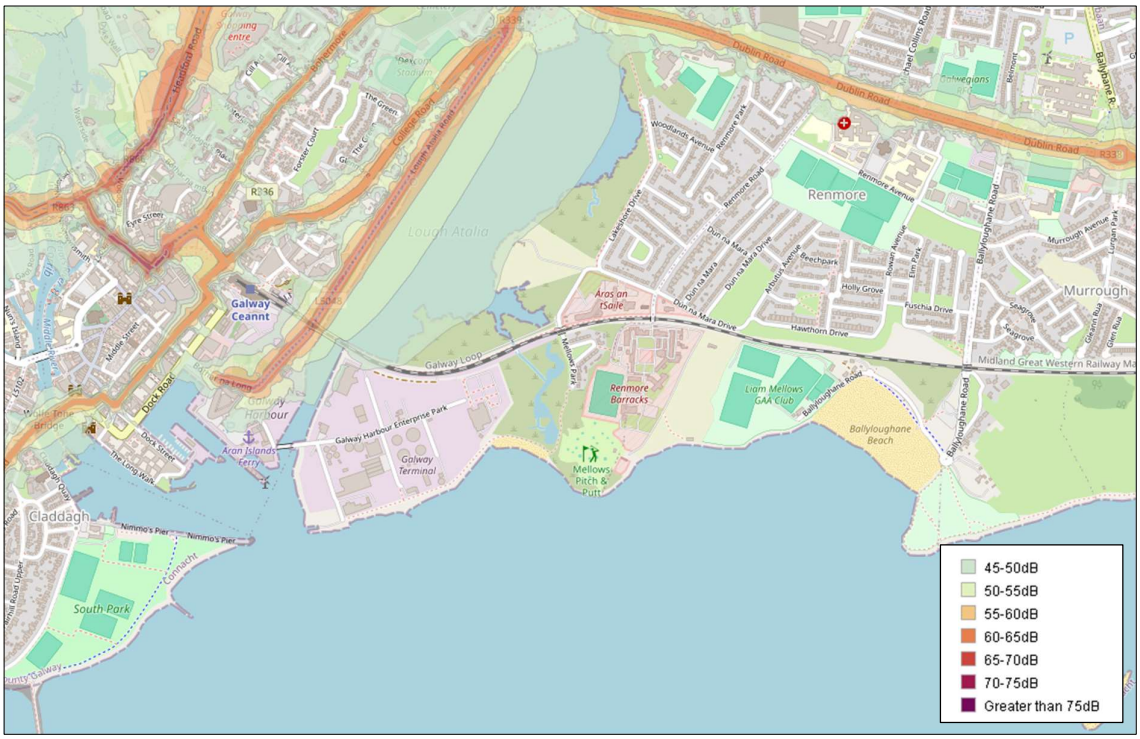


Figure A8-7: Mapped road traffic noise levels – 2022 L_{night}.



2024 noise levels

In order to obtain up to date noise levels, noise monitoring was carried out at the five noise stations shown in Figure A8-1 above on 10.07.24—11.07.24. The survey consisted of daytime monitoring, and night-time monitoring after 2230 h to allow comparison with 2011 and 2013 baseline data. Monitoring stations are shown in Photographs A8-1 to A8-5. Survey details are set out in Table A-1. $L_{Aeq\ 1\ s}$ profiles are shown in Figures A8-8 to A8-22. Measured data are presented in Table A8-2.

The daytime soundscape at all five stations was dominated by local and distant road traffic. Pedestrian voices and bird calls were also audible. Station N2 was influenced by activity at the nearby enterprise park, while station N4 was influenced in the afternoon by activity at the existing docks. Night-time levels were again dominated by local and distant road traffic, with commercial activity also audible at N2.

Photograph A8-1: N1, looking S.

Photograph A8-2: N2, looking N.

Photograph A8-3: N3, looking NW.

Photograph A8-4: N4, looking NE.

Photograph A8-5: N5, looking NE.

Table A8-1: Baseline survey details 10.07.24—11.07.24.

Factor	Details
Cloud cover	Daytime: 60 % clearing to 20 %; Night-time: 20 %
Temperature	Daytime: 15 °C rising to 20 °C; Night-time: 14 °C
Precipitation	0 mm throughout
Wind direction	NW throughout
Wind speed	Varying 0-4 m/s throughout
Wind speed meas.	Handheld anemometer at 2 m height
Survey operator	Sinead Fagan
SLM details	Type: NTi XL2; Serial: A2A-15392-E0; Microphone: A16340; Verification: 11.05.23
Calibration day	Date: 10.07.24; Time: 0834; Sensitivity: 42.3 mV/Pa; Post survey drift check: <0.2 dB
Calibration night	Date: 10.07.24; Time: 2205; Sensitivity: 41.6 mV/Pa; Post survey drift check: <0.2 dB
Calibrator	Type: Bruel & Kjaer Type 4231; Serial: 3017723; Verification: 06.03.24

Figure A8-8: $L_{Aeq\ 1\ s}$ profile at N1 1000-1030 h.

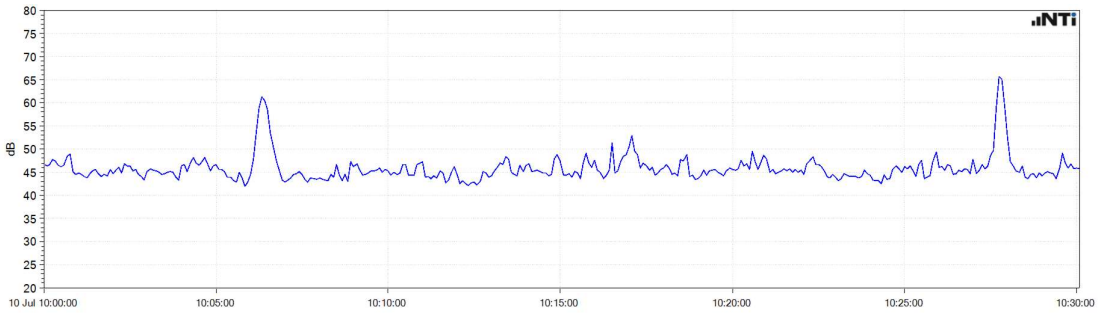


Figure A8-9: $L_{Aeq\ 1\ s}$ profile at N1 1345-1415 h.

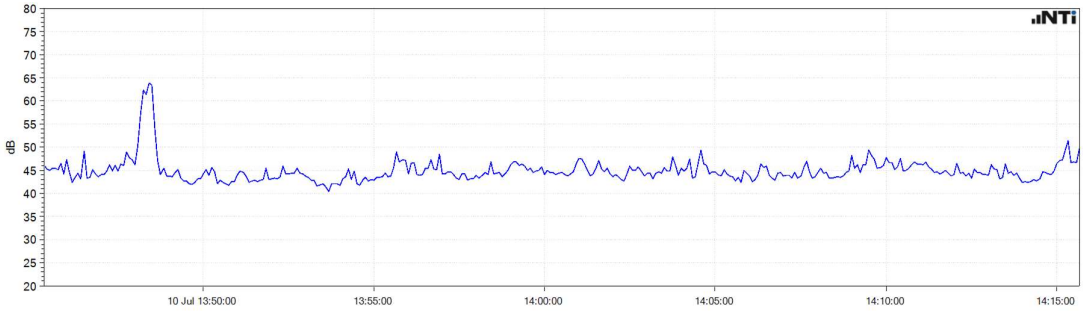


Figure A8-10: $L_{Aeq\ 1\ s}$ profile at N2 1148-1218 h.

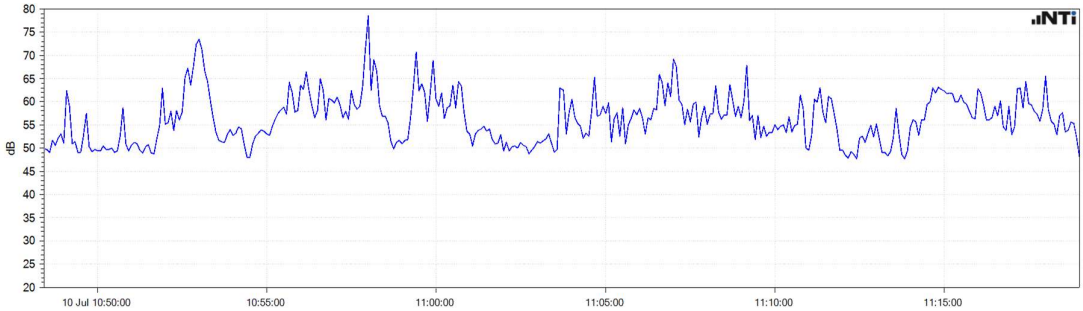


Figure A8-11: $L_{Aeq\,1\,s}$ profile at N2 1430-1500 h.

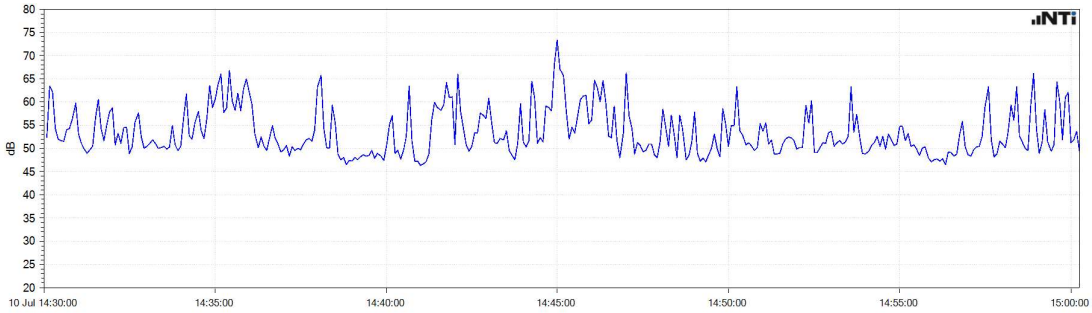


Figure A8-12: $L_{Aeq\,1\,s}$ profile at N3 0836-0906 h.

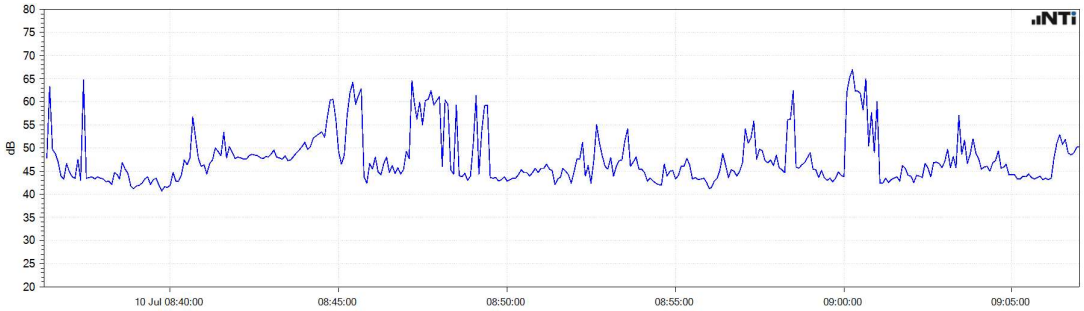


Figure A8-13: $L_{Aeq\,1\,s}$ profile at N3 1304-1334 h.

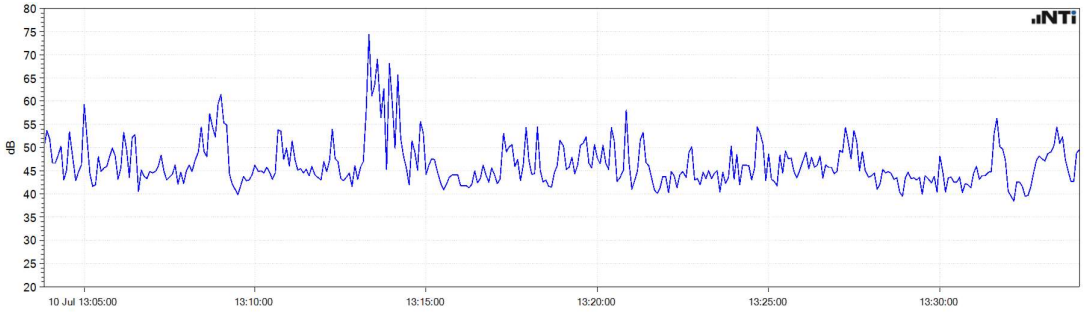


Figure A8-14: $L_{Aeq\,1\,s}$ profile at N4 1128-1158 h.

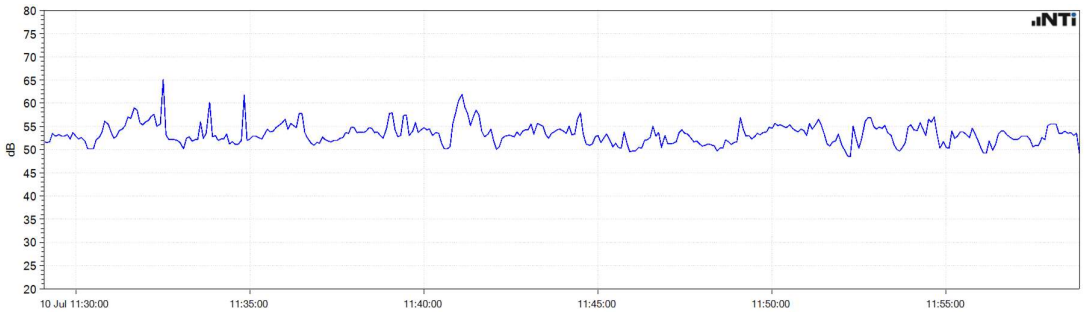


Figure A8-15: $L_{Aeq\,1\,s}$ profile at N4 1521-1551 h.

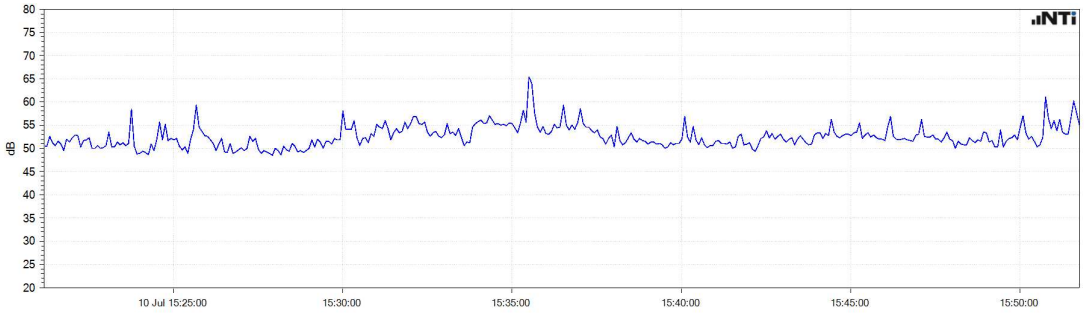


Figure A8-16: $L_{Aeq\,1\,s}$ profile at N5 1209-1239 h.

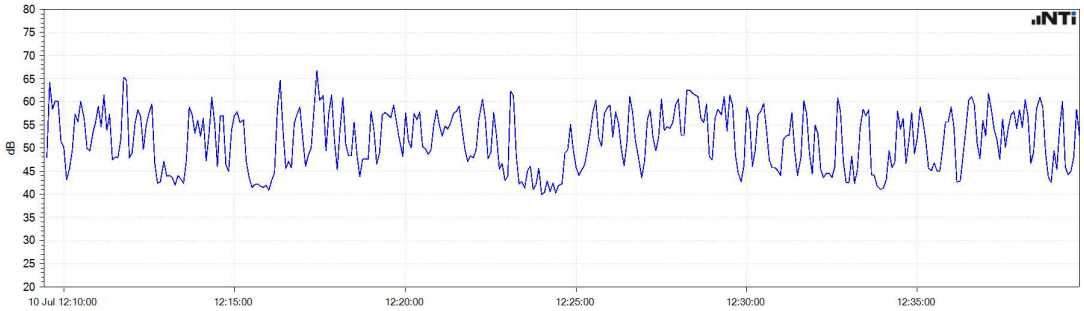


Figure A8-17: $L_{Aeq\,1\,s}$ profile at N5 1620-1650 h.

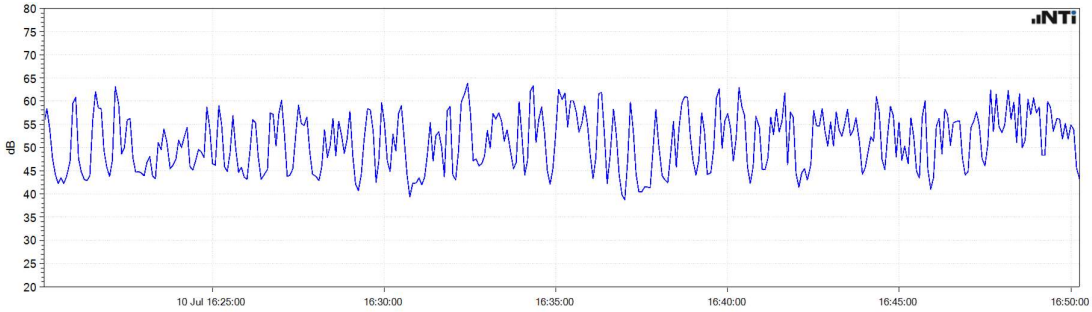


Figure A8-18: $L_{Aeq\,1\,s}$ profile at N1 2315-2345 h.

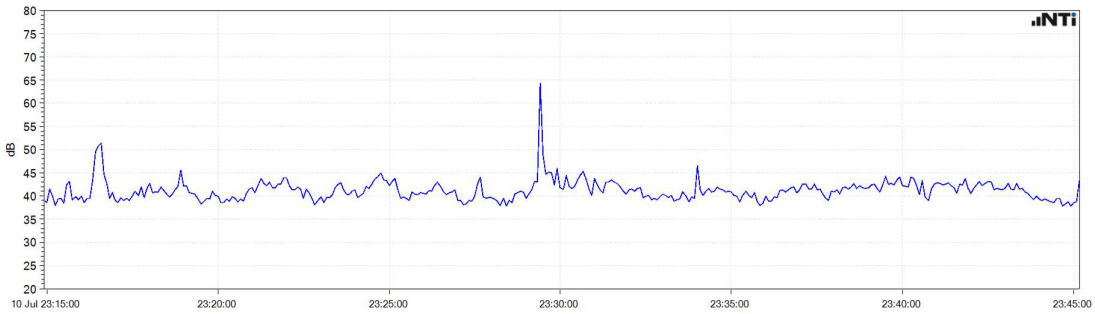


Figure A8-19: $L_{Aeq\,1\,s}$ profile at N2 0000-0030 h.

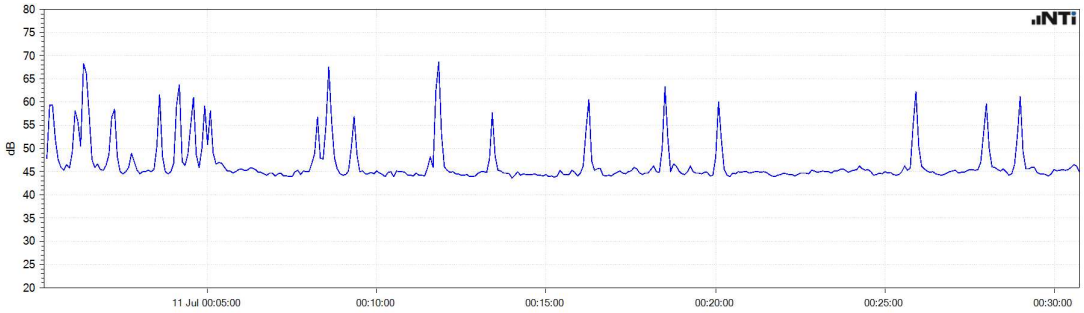


Figure A8-20: $L_{Aeq\,1\,s}$ profile at N3 2230-2300 h.

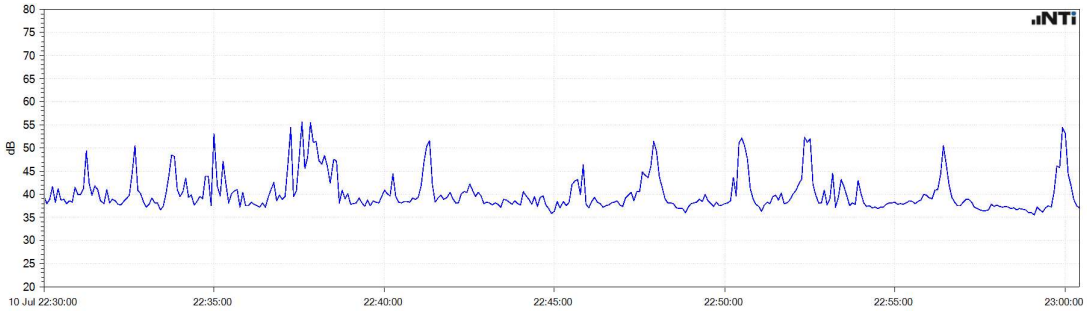


Figure A8-21: $L_{Aeq\,1\,s}$ profile at N4 0008-0038 h.

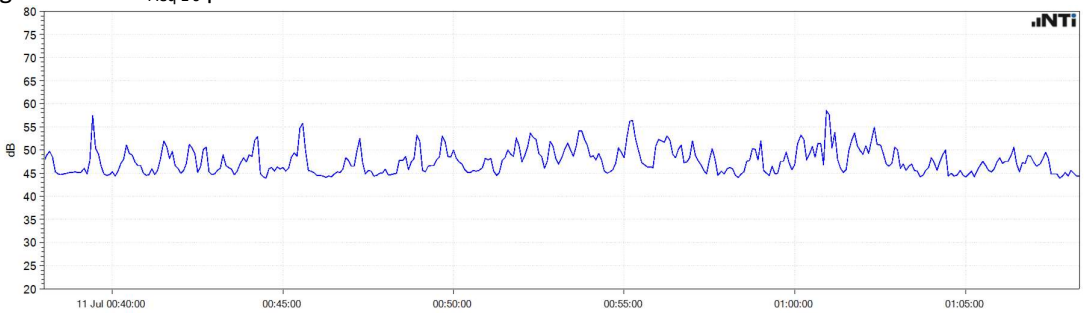


Figure A8-22: $L_{Aeq\,1\,s}$ profile at N5 0115-0145 h.

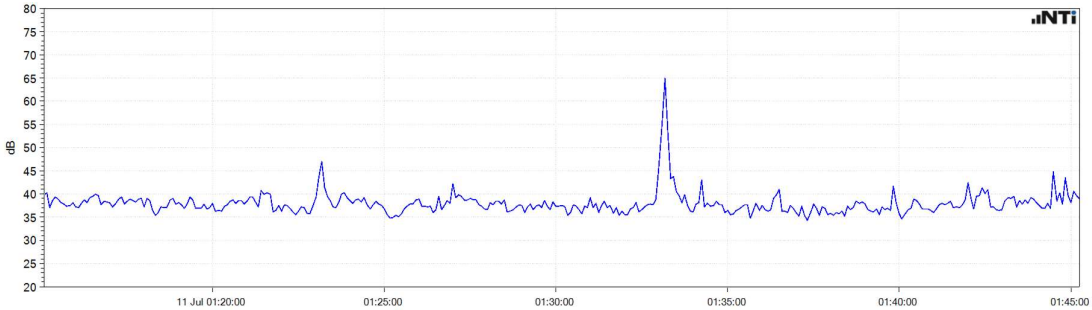


Table A8-2: Noise levels measured 10.07.24—11.07.24 (dB). Daytime intervals were 30 minutes, while night-time intervals were 15 minutes.

Station	Time	$L_{Aeq\,T}$	$L_{AF10\,T}$	$L_{AF90\,T}$
N1	1000-1030	49	48	43
	1345-1415	47	47	43
N2	1148-1218	61	63	49
	1430-1500	57	60	48
N3	0836-0906	53	53	43
	1304-1334	54	52	41
N4	1128-1158	54	56	51
	1521-1551	53	55	50
N5	1209-1239	56	60	43
	1620-1650	55	60	43
N1	2315-2330	45	44	39
	2330-2345	42	43	39
N2	0000-0015	54	54	44
	0015-0030	49	47	44
N3	2230-2245	44	46	37
	2245-2300	43	44	37
N4	0008-0023	48	51	45
	0023-0038	49	52	45
N5	0115-0130	38	40	36
	0130-0145	44	40	36

Comparison between 2024 and EIS data

Noise levels measured during the 2024 survey may be compared to levels presented in the original EIS. Tables A8-3 to A8-7 list both sets of data. Prior to drawing any conclusions, it is important to note that changes in noise levels may result from localised or brief events which can sporadically occur from time to time at a position, such as a nearby lawnmower present during one survey but absent during the next. Other changes may arise due to random conditions present during a survey, such as a road diversion, construction noise, etc. Other factors such as breeze direction, time of day, and time of year may also influence data, complicating any attempt to draw conclusions. In this regard, the 2024 survey, carried out in July, may have encountered similar conditions to the 2013 survey (May), but not the 2011 survey (December).

Notwithstanding the above, a comparison of the data indicates that noise levels measured during the 2024 survey are similar to those measured during previous surveys, and in particular are similar to those measured during the 2013 survey. This applies to daytime and night-time data, apart from a slight reduction in $L_{AF90\,T}$ levels at N5 between 2013 and 2014. While this may suggest a fall in distant traffic noise, it may also be simply a result of differing breeze directions during the surveys.

The chief application of the earlier noise data, and of the 2013 data in particular, was the use of night-time $L_{AF90\,T}$ levels to quantify impacts at Mellows Park (N1) and Grattan Road (N5). Criteria applied at these locations were 40 dB and 35 dB respectively. These criteria are remarkably consistent with $L_{AF90\,T}$ levels measured during the 2024 survey. It follows that the findings of the EIS remain valid.

Table A8-3: Baseline noise levels at N1 (dB).

Date	Daytime				Night-time			
	Time	$L_{Aeq\,T}$	$L_{AF10\,T}$	$L_{AF90\,T}$	Time	$L_{Aeq\,T}$	$L_{AF10\,T}$	$L_{AF90\,T}$
August 2004	c.1230	37	36	30	c.2130	34	36	30
2005 average*	-	49	49	43	-	-	-	-
2006 average*	-	50	52	44	-	-	-	-
April 2007	c.1545	55	43	39	c.2300	43	44	36
2007 average*	-	50	51	44	-	-	-	-
2008 average*	-	52	53	48	-	-	-	-
2009 average*	-	48	51	46	-	-	-	-
2010 average*	-	47	46	40	-	-	-	-
December 2011	c.1200	48	49	44	c.0100	44	45	42
2011 average*	-	48	49	44	-	-	-	-
2012 average*	-	49	49	40	-	-	-	-
May 2013	c.1030	48	49	42	c.0045	41	43	38
2013 average*	-	50	49	43	-	-	-	-
July 2024	c.1000	49	48	43	c.2315	45	44	39
July 2024	c.1400	47	47	43	c.2330	42	43	39

*Average of values measured during quarterly surveys.

Table A8-4: Baseline noise levels at N2 (dB).

Date	Daytime				Night-time			
	Time	$L_{Aeq\,T}$	$L_{AF10\,T}$	$L_{AF90\,T}$	Time	$L_{Aeq\,T}$	$L_{AF10\,T}$	$L_{AF90\,T}$
August 2004	c.1100	46	48	37	c.2130	44	-	-
2005 average*	-	57	59	54	-	-	-	-
2006 average*	-	57	59	52	-	-	-	-
April 2007	-	-	-	-	-	-	-	-
2007 average*	-	64	64	55	-	-	-	-
2008 average*	-	64	67	53	-	-	-	-
2009 average*	-	59	62	53	-	-	-	-
2010 average*	-	54	55	41	-	-	-	-
December 2011	c.1400	63	61	49	c.0115	59	61	45
2011 average*	-	63	61	49	-	-	-	-
2012 average*	-	63	63	53	-	-	-	-
May 2013	c.1230	62	62	47	-	-	-	-
2013 average*	-	64	63	48	-	-	-	-
July 2024	c.1200	61	63	49	c.0000	54	54	44
July 2024	c.1430	57	60	48	c.0015	49	47	44

*Average of values measured during quarterly surveys.

Table A8-5: Baseline noise levels at N3 (dB).

Date	Daytime				Night-time			
	Time	$L_{Aeq\,T}$	$L_{AF10\,T}$	$L_{AF90\,T}$	Time	$L_{Aeq\,T}$	$L_{AF10\,T}$	$L_{AF90\,T}$
August 2004	c.1200	50	51	33	c.2100	46	47	36
April 2007	c.1500	53	53	41	c.2230	48	48	39
December 2011	c.1130	52	55	47	c.0130	39	40	37
May 2013	c.1000	48	47	40	c.0015	40	41	38
July 2024	c.0900	53	53	43	c.2230	44	46	37
July 2024	c.1330	54	52	41	c.2245	43	44	37

Table A8-6: Baseline noise levels at N4 (dB).

Date	Daytime				Night-time			
	Time	$L_{Aeq\,T}$	$L_{AF10\,T}$	$L_{AF90\,T}$	Time	$L_{Aeq\,T}$	$L_{AF10\,T}$	$L_{AF90\,T}$
August 2004	c.1330	60	60	55	c.2200	56	57	48
August 2004	-	-	-	-	c.0115	48	48	43
April 2007	c.1630	60	62	55	c.2330	63	64	55
December 2011	c.1600	57	56	46	c.0130	48	50	47
May 2013	c.1530	53	56	47	c.0100	48	48	44
July 2024	c.1130	54	56	51	c.0115	48	51	45
July 2024	c.1530	53	55	50	c.0030	49	52	45

Table A8-7: Baseline noise levels at N5 (dB).

Date	Daytime				Night-time			
	Time	$L_{Aeq\,T}$	$L_{AF10\,T}$	$L_{AF90\,T}$	Time	$L_{Aeq\,T}$	$L_{AF10\,T}$	$L_{AF90\,T}$
August 2004	c.1700	60	64	53	c.2230	65	68	37
April 2007	c.1700	70	74	49	c.2345	61	57	41
December 2011	c.1700	68	73	52	c.0145	57	54	33
May 2013	c.1700	57	60	48	c.0130	49	47	39
July 2024	c.1230	56	60	43	c.0115	38	40	36
July 2024	c.1630	55	60	43	c.0130	44	40	36

Future soundscape trends

In assessing noise impacts, emerging best practice entails the inclusion of a commentary on likely future trends in the soundscape, in the absence of the proposed development. Receptors in the vicinity of the GHE site are located in an urban area. The predominant noise sources, and expected trends in same, are as follows:

- Road traffic: Traffic noise influences all receptors in the surrounding area, arising from nearby roads, and distant roads across the city. Data suggest that traffic noise levels have increased slightly over the last decade. This trend may reverse in future years, due to four reasons:

  - The increasing provision of public transport is designed to reduce reliance on private vehicles.

  - Similarly, active travel is being promoted in urban areas to reduce vehicle use.

  - Construction of the mooted Galway City ring road is a step closer now than at the time the original EIS was prepared. If completed, traffic volumes on certain roads through the city centre are expected to reduce.

  - At the time the original EIS was prepared, the proportion of electric vehicles on Irish roads was negligible. This proportion has increased in the interim, and is likely to continue rising, resulting in a gradual reduction of traffic noise levels in areas where traffic speeds are lower then 50 km/h, such as city centre streets, the area around the existing docks, and residential estate roadways such as Mellows Park. Above 50 km/h, tyre rolling noise dominates, regardless of power source. The 2024 survey indicates that $L_{AF90\,T}$ levels at receptors tend to be dominated by distant tyre rolling noise, and thus the increasing proportion of electric vehicles is unlikely to affect $L_{AF90\,T}$ levels. $L_{Aeq\,T}$ levels may, however, reduce.

- Rail traffic: There are currently approximately 30 passenger train passes per day on the railway line adjacent to the port, during daytime and evening hours. These movements chiefly affect receptors at Mellows Park and Renmore. Transport for Ireland and Irish Rail propose to increase the number of scheduled trains between Galway and Dublin in the future, and to increase commuter rail movements. Any such increases are likely to increase $L_{Aeq\ T}$ and L_{den} levels at these receptors. Night-time rail movements are unlikely to arise in the foreseeable future.
- Aircraft: Galway Airport is currently closed to commercial traffic. Aircraft noise occurs from time to time over the city from light aircraft used by a flying club. In the event that commercial activity resumes, $L_{Aeq\ T}$ and L_{den} levels across the city may increase. Coast Guard helicopter movements may arise in the Galway area at intervals.
- Vessel noise: Noise arises at intervals from small angling and leisure craft accessing the existing docks, trawlers using the port, and larger vessels such as tankers and bulk carriers. In the absence of the proposed development, noise emissions from these will continue to arise. However, the EIS notes that, should the proposed development not proceed, the port is likely to be left behind by other Irish ports, resulting in a possible reduction in noise from larger vessels due to existing port constraints.
- Industrial/commercial noise: Industrial and commercial noise arises from premises at the Galway Harbour Enterprise Park, as well as activities around the existing docks. No major changes are expected in these emissions, other than a possible reduction in noise from activities associated with larger vessels should they decide to use other ports in the absence of the GHE development.
- Wind: Local receptors, particularly those at Grattan Road and Mellows Park, are exposed to wind associated noise due to their location in an exposed coastal area. Wind noise (wind noise itself, and rustling vegetation) may be elevated from time to time. The current consensus is that climate change is likely to increase the occurrence of strong winds in Ireland, resulting in increased wind noise. This may particularly influence the soundscape in coastal areas such as the Galway Harbour area.

Conclusions in relation to the terrestrial soundscape

- Noise mapping suggests a slight increase in traffic related noise levels since 2012, although this conclusion is not definitive.
- There is no indication that noise levels across the local area have fallen since the EIS was prepared. This is confirmed by recently measured noise data.
- The local soundscape is likely to experience a reduction in traffic noise levels in the long term. This is unlikely to cause an appreciable difference in noise levels at receptors during the GHE construction period.
- Noise data reported in the EIS were chiefly used to inform night-time criteria of 40 dB at Mellows Park and 35 dB at Grattan Road, and these levels were used in assessing airborne construction noise impacts in particular. Measured night-time $L_{AF90\ T}$ levels at these locations are consistent with these values, and thus the findings of the EIS remain valid.

Appendix 10-9: Underwater noise level changes

Purpose of this appendix

This appendix determines if underwater noise levels may have changed in the interim.

Underwater noise levels at time of assessment

Chapter 10 of the EIS states that:

> *…the ambient noise level in Galway Harbour (as determined in this study) is consistent with the Wenz curve.*

The Wenz curve, proposed by Wenz (1962), describes the typical noise levels and frequencies which may be expected in underwater environments. Wenz and other authors note that underwater noise levels arise from natural sources such as wind-derived turbulence, surface motion, wave interactions and fauna noise, as well as man-made noise, chiefly local and distant vessels. Ambient noise is typically defined as noise from prevailing sources i.e. sources continuously present in the background. Imposed over ambient noise levels is noise from transient localised sources such as vessel noise or construction activity.

Potential underwater noise levels changes

Given that ambient underwater noise levels are not required for the assessment of impacts on marine fauna, measurement of up to date levels in 2024 is not required. In order to determine if the underwater soundscape has potentially changed in the interim, a more practical method is to identify any changes which may have occurred in the chief sources which influence ambient underwater noise levels in Galway Bay. Based on Wenz, such sources are natural and artificial.

Natural sources described by Wenz consist of seismic background noise, fluctuations in turbulence and pressure, surface agitation, molecular agitation, surface waves, earthquakes, precipitation, sea ice, and biological sources. Wind noise above the surface is also described by other authors. There is no indication that the contribution arising from any of these sources has changed since 2014, and it is considered that ambient noise levels resulting from prevailing sources are unlikely to have altered within this timeframe.

Ambient underwater noise levels are affected by distant shipping noise. It is therefore possible that changes in the volume of vessel activity on distant Atlantic shipping routes may have resulted in an altered underwater soundscape. However, Urick (1984) notes that in shallow water environments such as the bay area in the vicinity of the GHE project, distant shipping noise tends to be absent due to unfavourable conditions for its propagation, and in such areas locally generated wind noise tends to dominate. It is therefore unlikely that any changes in marine traffic activity have given rise to ambient underwater noise level changed in the local area.

On the basis of the foregoing, the only potential source of change, if any, in underwater noise levels in the local bay would be change arising from altered vessel activity locally, including ships, trawlers, island ferries and leisure craft. In order to quantify changes in vessel activity, the volume of traffic accessing the port may be compared between 2013 (the year of the initial assessment) and 2023 (the most recent year for which data are available. Table A9-1 presents this comparison, taken from data provided by the applicant.

Table A9-1: Port vessel traffic. Significant changes are shaded.

Vessel type	2013	2024
Tanker (petroleum)	104	38
Tanker (bitumen)	6	5
Bulk carrier (refuse derived fuel)	1	39
Bulk carrier (limestone)	17	21
Bulk carrier (scrap metal)	15	6
Specialised cargo (wind turbines)	1	21
Cruise liner	4	13
Naval vessel	12	4
Research vessel	7	24
Island cargo vessel	160	168
Island ferry	0	169
Inshore fishing	5	5
Fishing vessels	3	3
Leisure craft (visitor)	62	54
Leisure craft (local)	40	40
Sub-total – ships	**160**	**147**
Sub-total – small vessels	**175**	**369**
Sub-total – craft	**102**	**94**
Total	**437**	**610**

The following conclusions may be drawn from the table:

- 2013 vessel traffic figures are consistent with evidence presented at the oral hearing. Paragraph 4.62 of the Statement of Evidence provided by the author of Chapter 10 stated that approximately 180 large vessels typically accessed the port annually at that time (most likely based on 2013 data).
- The Statement of Evidence added that large vessel traffic peaked in 2005, with 432 ships. Current large vessel traffic activity is considerably lower than this.
- It was also stated that the forecasted volume of large vessels by 2035 is 239 ships, which is again lower than the 2005 peak.
- Between 2013 and 2023, the overall increase in vessel traffic was 40 %, chiefly due to the introduction of island ferry activity, as well as commencement of wind turbine and refuse derived fuel import. The increase was offset by a reduction in petroleum tanker movements.
- A doubling of vessel noise emissions would give rise to a 3 dB increase in long term noise levels. The increase due to a 40 % rise in marine traffic is lower than 2 dB, and therefore not significant.
- Large vessels represent the biggest generator of underwater noise levels arising from vessels. The number of large vessel movements in 2013 and 2023 were reasonably similar. It follows that ambient underwater noise levels attributable to this source are unlikely to have changed appreciably since the EIS was submitted.
- On this basis, current vessel-derived underwater noise levels are expected to be similar to levels prevailing in 2013-2014 when the original EIS was prepared and submitted.

Conclusions in relation to underwater noise levels

- Sources of prevailing ambient noise in the local harbour area, most or all of which are typically naturally derived, are unlikely to have changed since the 2014 EIS was prepared. Distant marine traffic noise is unlikely to contribute significantly to harbour noise levels.
- Outside of local natural sources such as wind derived noise, the chief noise source of note in the harbour area is local vessel activity.
- Large vessel activity, the chief source of man-made underwater noise levels, has not changed significantly between 2013 and 2024.
- It follows that ambient underwater noise levels in the harbour area are unlikely to have changed since the 2014 EIS was submitted.
- Regardless of any changes in ambient underwater noise levels, such levels are not a factor in the assessment of impacts on marine fauna, as such assessment relies on absolute criteria unaffected by ambient noise levels.

Appendix 10-10: Changes in GHE project details

Purpose of this appendix

This appendix identifies any changes to the proposed GHE project, both in relation to construction and operation.

Original GHE project proposal

Project details are set out in Chapter 4 of the EIS. In summary, the following construction elements are proposed:

- Lagoon wall construction and revetment placement.
- Channel dredging, lagoon filling and land reclamation.
- Breakwater construction.
- Construction of quay walls, fishing pier and slipway.
- Installation of marine berths.
- Installation of utilities and services.
- Construction of rail transport link.
- Site development.

The above will be constructed using a combination of construction methods and plant. A relatively long construction timescale is proposed, extending to eight years. Following completion of construction, Galway port will continue to be used as at present, with several changes:

- The number of large vessels accessing Galway port is expected to decrease, as increased vessel size catered for will result in a requirement for fewer vessel numbers.
- The number of deep-sea fishing vessels and fishing boats which access Galway port may increase.
- Shipping activity will be undertaken at the new GHE facilities and will no longer be undertaken at the existing port's city centre docks.

GHE project revisions

Any new changes to construction works or operational activities since the 2014 EIS was prepared may have implications for the findings of the EIS. The current project details were therefore reviewed, and the design team consulted, in order to identify any changes now proposed. It is confirmed that no changes are proposed, and project details as set out in Chapter 4 of the EIS, and assumed in Chapter 10, remain unchanged.

Conclusions in relation to project details

- No changes in construction or operational details are proposed, and project details set out in the EIS still stand.

Appendix 10-11: Source noise data updates

Purpose of this appendix

This appendix determines if texts used for source noise data have been revised since the EIS was prepared.

2014 EIS noise data sources

With respect to source noise levels used for modelling and associated objectives, Chapter 10 drew noise data from several texts, as listed in Table A11-1.

Table A11-1: Sources of noise data used in 2014 assessment.

Discipline	Activity	Data source
Airborne noise	Lagoon construction	The EIS refers to BS 5228. The version in effect in 2014 was *BS 5228-1:2009 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise* (2009). The EIS also refers to 'our database of construction equipment'.
	Dredging	Source sound power levels are not listed.
	Piling	Source sound power levels are not listed.
	Road traffic	Traffic noise levels were most likely provided by the Predictor software used for traffic noise modelling.
	Rail traffic	Train noise levels were most likely provided by the RMR modelling method applied by the Predictor software.
	Shipping noise	It is likely that sound power levels are derived from a plot of shipping tonnage versus sound power level.
Underwater noise	Dredging	Typical source noise levels are reported, taken from Robinson *et al* (2011), de Jong (2011) and a New York harbour project
	Piling	Typical source noise levels are reported, taken from Reyff (2007), and a Darwin harbour project
	Vessels	Typical source noise levels are drawn from reports by Urick (1983), Collier (1987), Richardson *et al* (1995), Arveson & Vendittis (2000), Wales and Heitmeyer (2002). Reference is also made to Bies and Hansen (2003).
	Smaller craft	Typical source noise levels are taken from Evans *et al* (1992) for fishing boats and leisure craft, although the actual levels used are not indicated.

Updates to 2014 EIS airborne noise data sources

BS 5228:2009, referenced in relation to lagoon construction sources, was revised in 2014. However, the revision consisted chiefly of minor edits, and there were no updates to noise source data presented in annexes C and D of the standard. The data used in the EIS are therefore still valid in 2024.

In relation to airborne noise levels from dredging and piling, it is likely that this data was also drawn from BS 5228:2009, which is the most widely used source in Irish construction phase assessments. It is thus also likely that the data remains valid. Regardless of source, it is worth adding here that no changes or trends are apparent in source noise level texts in general in the last decade.

It is inferred from Chapter 10 that road traffic source noise levels were provided by the modelling software. Like all proprietary modelling software, the Predictor programme used is gradually updated at intervals, with iterative revisions and improvements. The road traffic noise source database used in the model may have undergone minor edits since the release of the model version used during the

original assessment (the model version is not identified). We are not aware of any changes to the Predictor noise source database since 2014. It follows that the model output, if rerun in 2014 using the same algorithm, would be identical to that reported in the 2014 EIS.

From the EIS text, it is inferred that rail traffic noise source data were provided by the software (most likely Predictor) based on the 2006 update to the Dutch RMR 1996 algorithm. The 1996 model remains relatively unchanged in relation to source data, although application of the model is being gradually reduced due to increasing take up of the EU developed CNOSSUS method. It follows that railway source data applied in the 2014 EIS remains valid in 2024. Chapter 10 notes that the chief railway noise source of significance affecting the nearest receptors, at Mellows Park, is low speed noise from braking and wheel-track interface squeal, two sources which do not lend themselves to modelling. Thus the value of railway noise modelling to the EIS is limited, and intervening updates in railway source data, if any had been issued, would be of limited relevance.

In relation to Figure 10.4.12 in the EIS, describing shipping noise levels versus tonnage, the trendlines plotted in Figure 10.4.12 are markedly similar to those presented in *Noise from Moored Ships* (Witte, 2010), suggesting that the figure was informed by the latter. The author, Rob Witte, is a consultant with DGMR, an engineering consultancy which developed the iNoise prediction software used by MKO. iNoise includes a database of noise emissions from marine vessels of varying tonnage. Emissions data have not been updated since iNoise was first introduced in 2017, indicating that vessel source noise levels have not changed since 2017. Changes prior to 2017, after preparation of the EIS, are unlikely to have occurred, given that most marine vessels typically operate over a lifespan extending to two to four decades.

It is also worth adding here that, due to increasing restrictions in port noise emission levels, the long term trend in vessel noise emissions is downwards. Thus noise levels from future vessels accessing the proposed GHE are likely to be similar to, or lower than, levels used in the EIS from Figure 10.4.12, and therefore predicted noise levels are highly unlikely to be higher than those described in the EIS. An increase in vessel noise emissions is not expected, and it follows that increased noise impacts are not expected.

Updates to 2014 EIS underwater noise data sources

Texts by de Jong and Reyff, as referenced above, continue to be widely used in marine construction assessments, and both papers are respected in the field of underwater acoustics. Assessments undertaken in Ireland and the UK in recent years continue to refer to these texts. No updates to these documents have been issued.

Underwater noise levels from ships are drawn from a range of documents as indicated in Table A11-1. Those by Urick, Richardson *et al*, and Arveson and Vendittis in particular are still widely referenced, and continue to be cited in papers and reports issued since 2014. In a review of vessel noise emission trends between 2014 and 2020, Jalkanen *et al* (2022) note that changes in marine traffic noise levels result chiefly from increased traffic volume and geographic spread. Changes in noise emissions from individual vessels are related to changes in vessel speeds on ocean shipping lanes, rather than to changes in engine noise or propeller noise directly. Given that ship speed in the Galway Harbour area will continue to be determined by harbour conditions, geography and channel depth, rather than vessel top speed, it is considered that no changes have occurred between 2014 and 2024 in relation to vessel noise levels described in the EIS.

The EIS cited Evans *et al* (1992) in relation to underwater noise from smaller vessels such as fishing boats and leisure craft. From Appendix 10.2 of the EIS, it is inferred that the following source levels at 1 m were applied:

Table A11-2: Small craft source levels applied in EIS modelling.

Craft	Sound exposure level	Sound pressure level
'Fisher'	167-170 dB	165 dB
Rigid inflatable	165-167 dB	168 dB

In order to determine if the above values remain relevant in 2024, a review of three more recent reports was conducted, particularly papers by Erbe *et al* (2016), Picciulin *et al* (2022) and Smith *et al* (2024), in addition to a 2015 report by the Marine Management Organisation. The review indicates that noise levels reported in the more recent papers in relation to rigid inflatable boats are markedly similar to those applied in the EIS. Fishing boat noise levels quoted in more recent papers are also similar, although tend to be lower than those applied in the EIS – in this regard it is thus evident that fishing boat noise levels applied in the EIS represent a worst case scenario.

Conclusions in relation to source noise data

- There have been no updates of relevance with respect to noise emissions data applied in respect of airborne noise sources assessed in the EIS. Source data used remain valid in 2024.
- Similarly, there have been no changes of significance in relation to underwater noise sources assessed in the EIS. Slightly lower noise levels quoted in more recent papers for fishing boats suggest that worst case scenario levels were applied in the 2014 EIS.

Appendix 10-12: Updates to noise modelling methods

Purpose of this appendix

This appendix determines if noise modelling methodology has been revised in the interim.

Modelling methodology applied in 2014 EIS

Three modelling methods were applied in the EIS, as listed in Table A12-1.

Table A12-1: Noise modelling methods applied in EIS.

Method	Sources to which applied
International Standard ISO 9613-2:1996 Acoustics – Attenuation of Sound during Propagation Outdoors, Part 2: General Method of Calculation (1996)	Road traffic (construction and operational); Airborne noise from docked vessels and unloading operations
Reken en Meetvoorschrift Railverkeerslawaai 1996, Ministerie Volkshuisvesting, Ruimtelijke Ordening en Milieubeheer (Dutch Ministry for Housing, Spatial Planning and the Environment, 1996)	Rail traffic
Simplified 35log[R] relationship	Underwater noise from all sources

The 35log[R] function used with respect to underwater sources was validated through site measurements. The function is similar to those applied in other assessments relating to port projects.

Updates to modelling methodology since 2014

There have been no updates to ISO 9613 since its introduction in 1996, and it continues to be the model of choice for sources such as construction works and operational activities. ISO 9613 is also used regularly for road traffic noise on impact assessment pro, although other methods such as CRTN (1988) and CNOSSUS-EU (2012) are also used.

The Dutch rail modelling method, commonly known as RMR 1996, is one of several methods used across Europe to model railway noise. Other methods include CRN (1995) and CNOSSOS-EU (2012). The RMR 1996 has been the most commonly applied method in Ireland, having been used on several national railway projects including the Dart extension project. While the RMR model received minor updates in 2006 and 2012, these relate chiefly to alignment with the CNOSSUS-EU method, and the fundamental algorithm remains unchanged.

Underwater noise modelling in shallow waters is notoriously difficult due to interaction effects between the surface and the seabed. Column height, seabed composition, seabed roughness, incident angle, sea state, and other factors influence propagation of the sound wave. While a number of models have been developed for underwater noise modelling, uncertainty margins for shallow water remain high. For this reason, the approach adopted in the 2014 EIS continues to be commonly applied, namely application of a simplified mathematical function based on distance, validated through noise tests in the vicinity of the study site.

Conclusions in relation to modelling methods

- The three modelling methods applied in the EIS remain valid in 2024, and there have been no modelling changes of significance in the interim. The results of modelling presented in the 2014 EIS therefore remain valid.

Appendix 10-13: Updates to mitigation requirements

Purpose of this appendix

This appendix determines if proposed mitigation measures are still valid and relevant

Mitigation proposed in EIS

The following mitigation measures were proposed in Chapter 10 of the original EIS:

- No blasting or pile driving will be undertaken during the period April to July inclusive.
- Trial blasting will be initially undertaken, so as to refine the blasting process.
- A number of measures were proposed in relation to blast design, procedure and charge sizing.
- A method statement will be prepared prior to commencement of drilling and blasting.
- Blasting will be confined to daylight hours and sea states 0—3, and preferably undertaken at low tide.
- Details of the blast exclusion zone to be used for marine mammal observation will be agreed with the National Parks and Wildlife Service prior to commencement of blasting.
- Underwater noise levels will be monitored by agreement with the National Parks and Wildlife Service.
- Vibration levels during blasting will be monitored at two locations (Galway Harbour Enterprise Park and Mutton Island).
- The dredging management plan 'must be revised' to minimise the requirement for backhoe dredging in inshore waters during night-time hours.
- Pile driving will not be undertaken 2300-0700 h.
- A 'comprehensive environmental monitoring and management programme is proposed'.

All of the above measures relate to construction works. No measures were proposed in relation to operational activities, although it is noted that no requirement for such measures was identified.

A number of other measures were described in Chapter 10. These were:

- It is planned (other than in exceptional circumstances) to limit blasting to one blast per day.
- The chapter refers to the benefit gained from installing a noise barrier adjacent to the railway line 'on the eastern side of the track from where it separates from the mainline to where it joins the new port development at grade, i.e. for the full incline'.
- Exclusion zones of 64 m are recommended in relation to pile driving, 128 m for dredging, and 1000 m for blasting.

Chapter 15 of the original EIS collated all mitigation proposed throughout the EIS. This section included details of the marine mammal observation protocol to be applied during construction. It was stated that underwater noise monitoring will be undertaken before and during construction works. Included in Chapter 15 of the original EIS was the following measure, the only acoustic measure specifically relating to operational noise emissions:

The port will be equipped with infrastructure to support the installation of shore-side electricity for vessels using the port. This will provide essential services for the vessels and eliminate the requirement for ships engines to run continuously while in port.

Mitigation subsequently proposed

The RFI response submission of October 2014, and the oral hearing documents of January 2015, were reviewed to identify additional mitigation measures proposed, or updates to the mitigation proposed previously. Only one update was identified: In the oral hearing response to queries document, it was proposed that the exclusion zone for marine mammal observation during pile driving, dredging and blasting will be set at 1,000 m.

Requirement to update mitigation

In relation to construction works, the mitigation measures listed in the EIS represented best practice in 2014. The measures, including the setting of marine mammal exclusion zones, continue to represent best practice at present, although the actual exclusion distance requires revision as discussed below.

Current best practice with respect to exclusion zones and marine mammal observation is set out in the Department of Arts Heritage and the Gaeltacht (DAHG) 2014 document *Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters*. This document was referenced in the EIS. The document was again referenced in the 2015 oral hearing documents.

The 2014 DAHG document was informed by marine mammal noise threshold criteria described by Southall *et al* (2007). These criteria were updated by Southall *et al* in 2019. The DAHG document has not been updated. It is considered that the 2019 paper represents best practice in 2024. The updated Southall *et al* criteria do not have any implication for the mitigation measures proposed in the EIS, apart from a requirement to enlarge the exclusion zone radius with respect to porpoise observations during certain construction works. Table A13-1 lists these works, in addition to the minimum radii required to avoid temporary threshold shift ("TTS") impacts.

Table A13-1: Revised exclusion radii for certain construction activities, required to avoid TTS in the very high frequency cetacean group which includes porpoises. In order to allow for model uncertainty, radii incorporate an additional safety margin.

Activity	2015 proposal	New proposal
Impact piling	1,000 m	1,900 m
Blasting	1,000 m	1,500 m
Dredging	1,000 m	1,700 m

Measures proposed in the EIS in relation to underwater blasting were informed by *British Standard BS 5607:1998 Code of Practice for the Safe Use of Explosives in the Construction Industry*. The standard was revised in 2017. Current best practice is to require that all blasts be designed taking the updated guidance into account.

Chapter 15 of the original EIS made reference to provision of onshore electrical power for berthed vessels. While onshore power has been used for several decades for small vessels, it has only seen rollout to larger vessels in recent years. Many ports do not yet have onshore power capability, and a considerable proportion of ocean-going vessels are unable to avail of it when present. Nonetheless, the next two decades are expected to see a significant increase in use of onshore power, resulting in the elimination of noise emissions from auxiliary engines and generators on docked vessels. This will give rise to positive impacts at all ports where implemented with the degree of impact dependent on receptor proximity.

At the GHE development, there are no receptors in immediate proximity, and thus the benefits accruing from onshore power will be reduced. In this regard, Chapter 10 concluded that docked vessel

noise impacts at receptors will be negligible. Nonetheless, the proposed provision of onshore electrical power at the proposed port is noteworthy, as it will further reduce operational noise emissions.

Conclusions in relation to mitigation

The mitigation originally proposed remain broadly valid and relevant. The use of marine mammal exclusion zones during construction works continues to represent best practice. Two updates are required, as follows:

- Exclusion zone radii in relation to porpoises require an increase during certain construction works, as listed in Table A13-1 above.
- All underwater blasts will be designed taking into account the updated document *BS British Standard BS 5607:1998 Code of Practice for the Safe Use of Explosives in the Construction Industry*.

In addition to the above, it is noted that the response to item 7 of the RFI in 2014 included a proposal to undertake noise monitoring at receptors during the construction phase.

It is therefore concluded that, apart from some minor exceptions, the findings of the EIS remain valid and relevant. While several guidance documents referenced in Chapter 10 have been updated in the interim, the EIS findings continue to remain valid in the context of these updates, again apart from a small number of exceptions. For completeness, these exceptions are as follows:

- Marine mammal noise threshold criteria have been revised downward since the EIS was prepared, in some cases, significantly. For instance, the non-pulse sound exposure level recommended with respect to high frequency cetaceans has reduced from 200 dB to 178 dB in the interim, while the pulse sound exposure level recommendation for very high frequency cetaceans has decreased from 183 dB to 140 dB. In most cases, the 1,000 m exclusion radius proposed at the oral hearing will continue to provide sufficient protection during construction works. However, increased radii will be required for the very high frequency cetacean group, which includes porpoises, during dredging, blasting and impact piling operations. The respective radii are required to be 1,700 m, 1,500 m and 1,900 m at a minimum. This mitigation measure has been included in Chapter 7 of the EIS and the NIS.
- Chapter 10 proposed that vibration monitoring will be undertaken at certain vibration-sensitive structures at Galway Harbour Enterprise Park during underwater blasting. In order to cater for changes in park structures in the interim, it is proposed to discuss an updated monitoring programme with the Galway Harbour Enterprise Park operators prior to commencement of blasting.
- Similarly, the updated monitoring programme will be discussed with shellfish operators between Mutton and Hare Islands, in order to take account of any changes in shellfish production areas since 2014.
- Underwater blasts will be designed taking into account the updated document *British Standard BS 5607:1998 Code of Practice for the Safe Use of Explosives in the Construction Industry*.

Appendix 10-14: Updates to impact qualification

Purpose of this appendix

This appendix identifies updates to impact assessment guidance, specifically in relation to assigning impact categories (minor, major, etc.).

Impact categories used in 2014 EIS

Table A14-1 describes the noise impact categories applied in the EIS. Such categories apply only to the human soundscape.

Table A14-1: Impact categories applied in EIS in relation to airborne noise effects on humans.

Impact	Description in EIS
Negligible	'No change on noise levels at sensitive locations.'
Minor	'Noise levels in excess of 'Do-Nothing' but unlikely to cause disturbance or cause any changes to current perception are considered as Minor Negative and Minor Positive respectively.'
Moderate	'Noise levels likely to cause disturbance at sensitive locations is considered to be a Moderate negative Impact. A reduction on current impact is considered to be Moderate Positive.'
Major	'Noise levels in excess of a statutory/standard/guideline limit value is considered to be a Major Negative Impact. A significant reduction in the current impact on sensitive receptors is considered to be a Major Positive Impact.'

Road traffic noise impacts in the EIS were assessed by comparing predicted traffic noise levels with baseline levels. For instance, the EIS reported that a negligible impact will arise in relation to road traffic noise increases resulting from the GHE development when operational, on the basis that the increase will be approximately 1 dB. With respect to the assessment of residual impacts, the EIS concluded that port noise reductions at the existing docks will reduce, and describes this as 'beneficial'. The EIS described the noise impact at Renmore and Southpark residential areas as 'minor adverse'.

The EIS concluded that underwater noise impacts will be 'localised minor adverse' at the new port due to shipping, although 'not on a biologically significant scale'.

Updated impact assessment guidance

Current impact assessment guidance is set out in *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports* (EPA, 2022). Table A14-2 describes the EPA scale of impacts, which represents the most current and relevant guidance.

Table A14-2: EPA impact assessment scheme.

Factor	Effect	Description
Quality	Positive	Improves quality of environment
	Neutral	No effects or imperceptible effects
	Adverse	Reduces quality of environment
Significance	Imperceptible	Capable of measurement, but without significant consequences
	Not significant	Causes noticeable changes to soundscape, but without significant consequences
	Slight	Causes noticeable changes to soundscape without affecting its sensitivities
	Moderate	Alters soundscape in manner consistent with existing and emerging baseline trends
	Significant	Alters soundscape due to source character, magnitude, duration or intensity
	Very significant	Significantly alters soundscape due to source character, magnitude, duration or intensity
	Profound	Obliterates soundscape
Duration	Brief	<1 day
	Temporary	<1 year
	Short term	1-7 years
	Medium term	7-15 years
	Long term	15-60 years
	Permanent	>60 years
Extent & Context	Extent	Size of area and population affected by an effect
	Context	Degree to which project conforms or contrasts with baseline soundscape
Impact type	Indirect	Secondary impacts not directly caused by project, often occurring at some distance
	Cumulative	Combined impacts attributable to project in tandem with other projects
	Worst case	Impacts where mitigation measures substantially fail
	Indeterminable	Where full consequences of change in soundscape cannot be described
	Irreversible	Impacts to soundscape which are permanent and cannot be undone
	Residual	Degree of soundscape change which will arise after implementation of mitigation
	Synergistic	Where resultant effect exceeds sum of individual component effects

The EPA scale of impacts set out above does not specify noise levels which may be used as a guide to determine impacts. Reference may be made here to *Guidelines for Environmental Noise Impact Assessment* (Institute of Environmental Management and Assessment, 2014) (IEMA) which sets out guidance on impacts by comparison with ambient levels. The IEMA guidelines are commonly used in the assessment of operational phase noise impacts. Table A14-3 sets out a scale adapted from IEMA and EPA guidance. The table is considered relevant to total external ambient $L_{Aeq\,T}$ levels i.e. $L_{Aeq\,T}$ levels attributable to the proposed development may be compared to existing $L_{Aeq\,T}$ levels.

Table A14-3: Assessment of impact by reference to existing noise levels.

Change	Impact	Effect
<2 dB	Imperceptible	Capable of measurement, but without significant consequences
2-4 dB	Not significant	Causes noticeable changes to soundscape, but without significant consequences
4-6 dB	Slight	Causes noticeable changes to soundscape without affecting its sensitivities
6-10 dB	Moderate	Alters soundscape in manner consistent with existing and emerging baseline trends
10-15 dB	Significant	Alters soundscape due to source character, magnitude, duration or intensity
15-20 dB	Very significant	Significantly alters soundscape due to source character, magnitude, duration or intensity
>20 dB	Profound	Obliterates soundscape

The IEMA scale presented in Table A14-3 is unsuitable for the assessment of construction phase noise impacts, which tend to be shorter in duration and therefore more tolerable to listeners. Construction phase impacts are therefore assessed separately. A commonly used scale is that described in *Design Manual for Roads and Bridges – LA111: Noise and Vibration* (UK Highway Agency, 2020) (DMRB), which is based on a combination of BS 5228:2914 guidance and external baseline $L_{Aeq\ T}$ levels. The DMRB scale of impacts based on commonly applied BS 5228:2014 criteria is set out in Table A14-4. The table includes EPA impact categories drawn from Table A14-2 – the seven EPA categories do not correspond exactly with the four categories listed in the DMRB scheme, and the correlation presented in Table A14-4 is therefore an approximation.

Table A14-4: DMRB construction noise impact assessment scale for daytime working hours.

Change	Impact	Effect
Below baseline $L_{Aeq\ T}$	Negligible	Imperceptible
Baseline $L_{Aeq\ T}$ to criterion	Minor	Not significant to slight
Criterion to criterion+5 dB	Moderate	Moderate to significant
≥Criterion+5 dB	Major	Very significant to profound

Criteria relevant to the DMRB scheme, taken from BS 5228:2014, are as follows:

- M-F 0700—1900 h and Sa 0700—1300 h: 65 dB.
- M-F 1900—2300 h, Sa 1300-2300 h, Su 0700-2300 h: 55 dB.
- M-Su 2300—0700 h: 45 dB.

Road traffic noise is typically assessed using scales separate to those described above. The DMRB document includes a scale of impacts relating to construction phase traffic noise. Unlike the scale presented in Table A14-4, which is based on absolute noise levels, the DMRB construction traffic scale is based on the magnitude of noise level increase. Table A14-5 sets out this scale. EPA impact categories are again included – as before, different impact scales are used by the EPA and the DMRB, and the table attempts to correlate these as closely as possible.

Table A14-5: DMRB offsite construction traffic noise impact assessment scale.

Noise level increase	DMRB impact	EPA impact
<1 dB	Negligible	Imperceptible
1—2.9 dB	Minor	Not significant to slight
3—4.9 dB	Moderate	Moderate to significant
≥5 dB	Major	Very significant to profound

Operational road traffic noise is subject to separate DMRB guidance, which applies to long term traffic noise increases rather than the short term increases associated with construction traffic. Table A14-6 sets out this scheme. As before, the EPA scale is included and correlated as closely as possible. Although the DMRB scale applies to the $L_{AF10\,18\,h}$ parameter, it is also of some pertinence to $L_{Aeq\,T}$ levels.

Table A14-6: DMRB scale for offsite operational traffic noise impact.

Noise level increase	DMRB impact	EPA impact
<3 dB	Negligible	Imperceptible
3—4.9 dB	Minor	Not significant to slight
5—9.9 dB	Moderate	Moderate to significant
≥10 dB	Major	Very significant to profound

Updated impacts – Human soundscape

Impacts assessed in the original EIS may be updated to take into account the guidance set out above. The updates are presented in Table A14-7 below.

The original EIS assessed noise levels with reference to the L_{den} parameter. For the purposes of the assessment of impacts in Table A14-7, an approximate correction factor of 6 dB is applied in converting to $L_{Aeq\,T}$ levels, considered a more suitable parameter for impact assessment. The 6 dB correction is based on MKO experience, and is also referenced on p21 of the GHE RFI response of October 2014.

In addition to an assessment in the context of quality, significance and duration, EPA EIAR guidance also refers to impacts in the context of several additional factors. These are assessed in Table A14-8.

Table A14-7: Updated impacts on the human soundscape, relevant to the nearest receptors (Mellows Park and Grattan Road).

No.	Factor	Impact
1	Activity	Construction phase – Lagoon construction (daytime only)
	EIS impact	Negligible (p10-32)
	Updated impact	Quality: Neutral to adverse; Significance: Imperceptible; Duration: Temporary
2	Activity	Construction phase – Trailer suction hopper dredging (daytime)
	EIS impact	Not described
	Updated impact	Quality: Neutral to adverse; Significance: Imperceptible; Duration: Temporary
3	Activity	Construction phase – Trailer suction hopper dredging (night-time)
	EIS impact	Minor (p10-34)
	Updated impact	Quality: Neutral to adverse; Significance: Imperceptible; Duration: Temporary
4	Activity	Construction phase – Backhoe dredging (daytime)
	EIS impact	'Does not present any difficulty' (p10-36)
	Updated impact	Quality: Neutral to adverse; Significance: Imperceptible; Duration: Temporary
5	Activity	Construction phase – Backhoe dredging (night-time)
	EIS impact	Moderate (p10-36)
	Updated impact	Quality: Adverse; Significance: Not significant to slight; Duration: Temporary
6	Activity	Construction phase – Piling (daytime only, night-time not proposed)
	EIS impact	Moderate (p10-36)
	Updated impact	Quality: Adverse; Significance: Not significant to slight; Duration: Temporary
7	Activity	Construction phase – Offsite road traffic
	EIS impact	Moderate at Galmont Hotel, less at other properties (p10-41)
	Updated impact	Quality: Neutral to adverse; Significance: Not significant to slight at hotel, imperceptible to not significant at other properties; Duration: Short term
8	Activity	Operational phase – Offsite road traffic
	EIS impact	Negligible (p10-45 and p10-48)
	Updated impact	Quality: Neutral; Significance: Imperceptible; Duration: Long term
9	Activity	Operational phase – Rail traffic
	EIS impact	Not described
	Updated impact	Quality: Neutral to adverse; Significance: Imperceptible to not significant; Duration: Long term
10	Activity	Operational phase – Docked vessels (daytime) – Impacts near existing docks
	EIS impact	Major positive (p10-53)
	Updated impact	Quality: Positive; Significance: Profound; Duration: Long term
11	Activity	Operational phase – Docked vessels (daytime) – Impacts at other receptors
	EIS impact	Negligible (p10-54)
	Updated impact	Quality: Neutral to adverse; Significance: Imperceptible; Duration: Long term
12	Activity	Operational phase – Docked vessels (night-time) – Impacts near existing docks
	EIS impact	Major positive (p10-53)
	Updated impact	Quality: Positive; Significance: Profound; Duration: Long term
13	Activity	Operational phase – Docked vessels (night-time) – Impacts at other receptors
	EIS impact	Not described
	Updated impact	Quality: Neutral to adverse; Significance: Imperceptible to not significant; Duration: Long term
14	Activity	Construction phase – Vibration
	EIS impact	Not described
	Updated impact	Quality: Neutral; Significance: Imperceptible; Duration: Temporary
15	Activity	Operational phase – Vibration
	EIS impact	Not described
	Updated impact	Quality: Neutral; Significance: Imperceptible; Duration: Long term

Table A14-8: Assessment of additional impact categories.

Category	Assessment
Extent	The area of potential airborne acoustic impacts extends out to an estimated radius of 1000 m. A large number of receptors are located in this radius, with potentially over 1000 people in this zone.
Context	Galway Harbour has been associated with port activities for centuries. The proposed development is entirely consistent with the current and historic soundscape.
Indirect effects	None identified
Worst case effects	None identified
Indeterminable effects	None expected
Irreversible effects	None identified
Synergistic effects	None identified
Cumulative effects	Discussed in Appendix 10-15

Updated impacts – Ecological receptors

Impacts on ecological receptors are assessed in the Chapter 7 addendum and NIS addendum.

Conclusions in relation to impacts

- Following publication of the original EIS, several guidance documents have issued which clearly set out, for the first time, how impacts may be assessed in the human soundscape. The chief documents here are the IEMA document (2014), the DMRB document (2020), and the EPA EIAR guidance document (2022).
- Using these documents, noise impacts in the human soundscape have been reassessed.
- Construction phase impacts will be imperceptible in most cases. Piling impacts, and night-time backhoe dredging impacts will be not significant to slight at the nearest receptors.
- Road traffic noise impacts will be imperceptible, potentially increasing to not significant at some receptors during the construction phase.
- Rail traffic impacts will be imperceptible to not significant.
- Noise impacts due to berthed vessels will be imperceptible to not significant, contrasting with a profound positive impact at the existing docks.
- Vibration impacts will be imperceptible.
- The assessment of impacts on ecological receptors within European Sites is included in the NIS addendum.

Appendix 10-15: Cumulative impact updates

Purpose of this appendix

This appendix identifies updates to potential cumulative impacts due to noise and vibration emissions from the GHE project in combination with emissions from other developments in the surrounding area which have been built or approved since the EIS was submitted. The EPA defines a cumulative effect as:

> *The addition of many minor or insignificant effects, including effects of other projects, to create larger, more significant effects.*

Cumulative impacts identified in EIS

While potential cumulative construction noise impacts were raised in the An Bord Pleanála RFI request of 27.05.14 (raised in RFI noise item 7), this requested related solely to potential cumulative impacts arising from simultaneous onsite construction activities which had been assessed separately in the EIS.

Cumulative assessment area

Current best practice initially involves identifying the cumulative assessment area. This area encompasses:

- All receptors in potential audible range of the proposed development, and receptors which may experience potential noise or vibration impacts.
- Other developments which are in potential audible range of these receptors, including existing developments, developments under construction, and projects previously permitted but not yet built. Mooted projects which are widely recognised, or due to enter the planning process shortly, may also require consideration.

The size of this assessment area varies with discipline. In relation to acoustics, the area typically extends out to 1 km for a project such as the GHE proposal. Taking into account the characteristics of the project, the characteristics of the local soundscape, and the likely nature of other potential projects in the local area, the 1 km assessment radius is considered appropriate here.

Projects identified in assessment area

The project team identified an exhaustive list of development projects approved by various authorities in the Galway area since the 2014 EIS was submitted. Projects within a 1 km assessment radius of the GHE boundary have been reviewed to determine if:

- Any new receptors have been constructed since 2014 in closer proximity to the GHE site than receptors assessed in the 2014 EIS.
- Any new receptors have been permitted in proximity to the GHE site in recent years but which have not yet built.
- Any new noise sources of note have been approved within 1 km of the GHE site since 2014, which might increase ambient noise levels.
- Any new noise sources within 1 km have received permission, but have not yet been built, and may thus result in construction or operational noise of note in future years.

Table A15-1 summarises a review of identified projects listed in the project databases searched. The review indicates that there are no projects of potential cumulative significance, and therefore cumulative noise or vibration impacts are not expected.

Table A15-1: Projects of potential cumulative significance.

Database	**Analysis**
Part 8 applications	No new receptors constructed or proposed since 2014 nearer to the GHE boundary than receptors assessed in the 2014 EIS, or which might themselves influence ambient noise levels.
An Bord Pleanála cases 2014-2016	No new receptors constructed or proposed since 2014 nearer to the GHE boundary than receptors assessed in the 2014 EIS, or which might themselves influence ambient noise levels.
An Bord Pleanála cases 2016-2024	84 projects listed within 1 km of the GHE boundary. None of these are, or will be, nearer to the GHE boundary than receptors assessed in the 2014 EIS, and none currently, or will in future, influence ambient noise levels.
Waste databases	Permission granted for four projects within 1 km (Colas oil depot, Topaz oil depot, Hazel Mountain Chocolate, wastewater treatment plant). The 2024 baseline survey indicates that none of these influences the soundscape at receptors.
EPA licensed waste facilities	There are no facilities within 1 km.
EPA licensed IPC facilities	There are no facilities within 1 km.
EIA location point	Most identified points relate to the proposed N6 Galway Bypass, and the proposed Bus Connects scheme. The bypass project may slightly reduce ambient noise levels in the long term if constructed, due to reduced traffic through the city centre. This does not have any implications for the proposed GHE development. The Bus Connects scheme may also slightly alter local traffic noise levels in the area near the Galway Harbour Enterprise Park. Again, this will not have any implications for the proposed project.
Seveso points	The Circle K oil depot at the Galway Harbour Enterprise Park is the only site in proximity. The 2024 baseline survey indicates that this facility does not influence the soundscape at receptors.
Local authority planning applications 2014-2024	115 projects located within 1 km of the GHE boundary. None of these are, or will be, nearer to the GHE boundary than receptors assessed in the 2014 EIS. Three projects have potential to generate noise emissions: - Planning reference 173: Bitumen storage facility at Galway Harbour Enterprise Park. The facility does not include any noise sources of significance. - Planning reference 1785: New playing pitch and walkway/cycleway at Ballyloughnane, Renmore. While this development may increase sound levels at certain times near local receptors, the development is unlikely to result in an overall change in the soundscape. No impacts attributable to this development were noted during the 2024 baseline noise survey. - Planning reference 18402: Improvements to sportsground facilities at College Road. Facilities have been located here for many years previously, and thus the development has not resulted in soundscape changes.

Conclusions in relation to impacts

No projects of cumulative noise or vibration significance have been constructed since the original EIS was submitted in 2014, and there are no permitted but unbuilt projects of potential cumulative significance.