

IN THE MATTER OF AN APPLICATION TO
AN BORD PLEANÁLA

FOR APPROVAL OF (I) THE N6 GALWAY CITY RING ROAD
PURSUANT TO SECTION 51 OF THE ROADS ACT 1993 (AS
AMENDED); (II) THE N6 GALWAY CITY RING ROAD
MOTORWAY SCHEME 2018; and (III) THE N6 GALWAY CITY
RING ROAD PROTECTED ROAD SCHEME 2018

ABP Ref. ABP-302848-18 and ABP-302885-18

ORAL HEARING

STATEMENT of Evidence
Responses to Noise and Vibration
Objection/Submissions

by

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20 February 2020

1 Qualifications and Experience

- 1.1 My name is Jennifer Harmon, I hold a BSc (Hons) Degree in Environmental Science and a Diploma in Acoustics and Noise Control. I am a full member of the Institute of Acoustics (MIOA).
- 1.2 I am Principal Acoustic Consultant with AWN Consulting Ltd. and have over 19 years consulting experience working in the field of environmental noise impact assessment. My professional background includes the preparation of Noise Impact Assessments for various projects types including transport, industrial, commercial, leisure and residential developments throughout Ireland.

2 Role in Proposed Road Development

- 2.1 I have prepared the noise and vibration appraisal for the proposed road development within the Environmental Impact Assessment Report (EIAR).
- 2.2 This involved the selection and review of baseline studies, noise modelling of the proposed road development, impact assessment for the construction and operational phases, noise and vibration mitigation recommendations and residual impact assessments.
- 2.3 I prepared Chapter 17 Noise and Vibration of the EIAR for the proposed road development and the associated Appendices.

3 Executive Summary

- 3.1 An assessment of the potential noise and vibration impacts associated with the proposed road development has been undertaken within Chapter 17 of the EIAR. Information submitted in Chapter 17 and the Request for Further Information (RFI) Response are taken as read in their entirety and are not replicated here. Potential impacts have been assessed for the both the construction and operational phases of the proposed road development. To assist the Board in its consideration of the applications for approval, for the convenience of all participants at this oral hearing and to set the context for responding to the objections and submissions, the key items pertaining to noise and vibration assessment of the proposed road development are summarised briefly below.
- 3.2 The construction phase will involve extensive earthworks including rock breaking, blasting, excavation and fill, construction of structures, road works and landscaping. In order to control noise and vibration impacts during this phase, strict limit values and best practice control measures are included within Sections 17.2.2.1 and 17.6.2 respectively of Chapter 17 of the EIAR and form part of the Construction Environmental Management Plan (CEMP) in Appendix A.7.5 of the

EIAR. Limit values and control measures will be adhered to during all phases of the construction of the proposed road development.

- 3.3 Construction phase noise and vibration impacts are unavoidable during the construction of a large infrastructure project but impacts during this phase are short-term and transient in nature in the context of the overall construction period.
- 3.4 Construction traffic will be limited to the identified construction traffic haul routes (Illustrated in Figures 7.001 & 7.002 in Volume 3 of EIAR) and will make use of the corridor of the proposed road development once established to reduce vehicle movements along the local road network.
- 3.5 The operational phase will involve a new road alignment, junctions, overpasses, tunnels and bridges as part of the proposed road development. Operational noise impacts are long term and will result in changes to the noise environment broadly categorised into the following scenarios:
- the proposed road development will introduce traffic noise to areas which are not currently exposed to any significant level of road traffic, particularly at properties set back from existing local roads in rural and semi-rural settings. At these locations, increased noise levels will occur and the character of the noise environment will be altered
 - the proposed road development will increase traffic noise levels within areas currently exposed to existing road traffic noise, particularly along local, regional and national roads where the proposed road development will traverse
 - the proposed road development will introduce a new road to areas where road traffic dominates the existing noise environment and the contribution of the proposed road development will be neutral to slight
 - the proposed road development will divert traffic flows from sections of existing roads across the city and hence, will result in a reduction in traffic noise along sections of these roads once operational
- 3.6 Operational traffic noise levels have been calculated across all environments noted above and the impacts associated with each identified. It is acknowledged that increased noise levels will occur as a result of the proposed road development with highest potential impacts occurring in areas with existing low noise environments.
- 3.7 The number of properties along the route of the proposed road development is relatively low compared to those along existing roads across Galway City currently exposed to higher noise levels from passing road traffic. The reduction in traffic volumes traversing the city centre will result in a moderate to major positive noise impact to an extensive number of noise sensitive properties along the existing road network.

- 3.8 Noise mitigation measures are included along the proposed road development in order to control noise levels to within the prescribed traffic noise level discussed in the EIAR, i.e. 60dB L_{den} in line with the TII noise guidelines.
- 3.9 Noise mitigation includes a low noise road surface (LNRS) to the full extent of the proposed road development and the incorporation of extensive noise barriers along the proposed development boundary in noise sensitive areas. Details of the proposed mitigation measures are outlined in Section 17.6.3 and Table 17.14 of Chapter 17 of the EIAR and are illustrated in Figures 17.1.01 to 17.1.15 in Volume 3 of the EIAR. The predicted post mitigation noise levels at receptors requiring mitigation is presented in Table 17.15 of Chapter 17 of the EIAR.
- 3.10 The TII guidelines for noise are the appropriate relevant guidelines for national roads schemes in Ireland and the related design goal is appropriate for the protection of individual receptors such as residences. The WHO Environmental Noise Guidelines for Europe (2018) were issued after the completion of the EIAR and provide recommended levels of traffic noise across Europe. Whilst they provide useful information on potential health related impacts relating to populations across Europe from exposure to noise, it is not appropriate or indeed possible to meet these levels on an individual basis when considering new national road projects. These guidelines have not been adopted in any form in Ireland to date. Further discussion on these guidelines are discussed in the response to submissions in this Statement of Evidence and are also discussed in the Statement of Evidence of Dr Martin Hogan dealing with Human Health.
- 3.11 The proposed modification of the Parkmore Link Road as it traverses through Boston Scientific's lands has been reviewed in order to assess any potential noise impacts. The assessment has concluded that noise levels will be reduced at noise sensitive properties along Bóthar na Gréine with the proposed modification. The link road incorporates earth berms and noise barriers along the full extent of its eastern boundary. Noise levels calculated at Galway Racecourse with the proposed screening in place are below 60dB L_{den} and are comparable to those in the EIAR associated with the original design. The overall impact is neutral to positive.
- 3.12 The current National University of Ireland (NUI) planning permission application (Ref 19/373) to construct additional playing pitches and the two proposed strategic housing development applications which related to lands associated with (Ob_469 and S_003) do not change the conclusions of the cumulative impact assessment on Noise and Vibration contained in the EIAR.

4 Responses to Submissions/Objections

4.1 Overview

4.1.1 Approximately 150 of the 296 submissions made to An Bórd Pleanála (ABP) in respect of the N6 Galway City Ring Road (GCRR) Environmental Impact Assessment Report (EIAR), Natura Impact Statement (NIS), Motorway Scheme (MS) and Protected Road Scheme (PRS) include observations relevant to noise and vibration. Moreover, 4 of the 17 submissions made to ABP in respect of the Request for Further Information (RFI) Response submitted in August 2019 also raised issues relevant to noise and vibration. Responses have been grouped into categories to address the issues raised in the submissions as follows:

- Relevance and location of baseline noise studies
- Guidelines used to assess traffic noise impacts
- Extent of and type of noise mitigation measures being provided
- Increase in traffic noise levels at properties/loss of quiet enjoyment of property /introduction of traffic noise to quiet areas
- Noise levels at schools and childcare facilities impacted by the proposed road development
- Increased noise levels at Dangan sporting grounds/NUIG Sporting Campus
- Noise and vibration impacts during construction
- Concern relating to structural integrity of buildings as a result of excavation and blasting works

4.2 Relevance and Location of Baseline Noise Studies

Issues

4.2.1 A number of submissions have raised the following issues relating to baseline noise studies:

- Baseline noise locations not representative of properties
- Noise model under-estimating noise levels due to incorrect baseline data
- Baseline noise studies undertaken in 2016 are out of date

4.2.2 The following submissions raised these points which relate to properties within the Rosan Glas area, Ard na Gaoithe, the Heath and along the N84 Headford Road:

Ob_607,	Ob_521_O_517.14_01	S_029,	S_059	S_044,	S_056,	S_061	S_77
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Response

- 4.2.3 An extensive baseline noise survey has been undertaken as part of the EIAR to inform the baseline noise study and to categorise the baseline noise environment. The methodology and guidelines used for the baseline study are set out in Section 17.2.4 of Chapter 17 of the EIAR. The baseline study included noise surveys at 106 locations across the study area comprising 73 attended and 33 unattended noise monitoring locations. The locations were chosen to represent the different noise environments across the proposed road development, i.e. rural areas set back from trafficked roads, semi-rural environments, noise levels within residential estates and noise environments along existing roads etc.
- 4.2.4 The baseline noise monitoring forms part of the noise impact assessment to provide a broad understanding of the prevailing noise environment in the study area. It is not necessary, however, to undertake noise monitoring at each potentially affected location within the study area to inform the impact assessment.
- 4.2.5 The TII guidance document “Good Practice Guide for the Treatment of Noise during Planning of National Road Schemes” (2014) states the following relating to baseline noise studies *“The aim is to select sufficient locations to summarise the ambient noise climate rather than to measure the noise level at every individual property. Where a group of buildings is affected by the same noise source, and the buildings are all roughly the same distance from the source, then a single measurement point will suffice.”* The document also notes *“Many measurements will be made on private property, for which permission for access will need to be obtained. This can sometimes be difficult, and therefore some flexibility will be needed in the final choice of sites, which will have to be made by the survey team when on location”*.
- 4.2.6 The monitoring locations are clearly illustrated in Figures 17.1.01 to 17.1.14 in Volume 3 of the EIAR. The methodology undertaken for the surveys is fully in line with TII guidelines for the assessment of road traffic noise discussed in Section 17.2.4 of the EIAR.
- 4.2.7 The results of the baseline surveys are summarised in Table 17.8, Section 17.3.1 of the EIAR and the survey results and the baseline noise environment are discussed in Section 17.3.2.
- 4.2.8 In general, road traffic forms part of the prevailing noise environment across the full extent of the study area. To the west of the N59 Moycullen Road, the prevailing environment is more rural with a lower distribution of national and regional roads. As a result, the prevailing noise environment is characterised more by localised vehicle movements along local roads and environmental noise sources.
- 4.2.9 To the east of the N59 Moycullen Road, the proposed road development passes through a more built up environment crossing a number of main routes into Galway City, namely the N59 Moycullen Road, N84 Headford Road, N83 Tuam Road and the existing N6. Baseline noise levels in these areas are dominated by existing road traffic, particularly at properties directly accessed off these roads. At properties located between existing radial routes along the alignment of the proposed road

development, the existing noise environment is lower. Road traffic from surrounding roads, traffic on local roads and environmental sources all make up the prevailing noise environment in these areas.

- 4.2.10 In general, properties facing directly onto existing roads are dominated by road traffic and experience noise levels in excess of 60dB L_{den} . Properties in more rural settings or those not located along existing roads experience noise levels typically in the range of 42 to 55dB L_{den} depending on local sources in the vicinity.
- 4.2.11 It is important to differentiate between noise monitoring which is undertaken to provide a broad understanding of the noise climate in the study area and noise modelling which is used to calculate specific road traffic noise at individual locations.
- 4.2.12 Road traffic noise levels associated with a proposed road development are modelled using noise modelling software taking into account the relevant factors which contribute to road traffic noise. Input parameters include traffic volumes provided by the traffic specialists, traffic speeds, road alignments and earthworks, road surface types, road gradients, boundary treatments etc. These factors coupled with distance and ground attenuation and other factors affecting the propagation of sound form the basis of noise calculation. The noise survey results as measured are not an input parameter for noise modelling purposes.
- 4.2.13 The first stage of the model development is to undertake a validation exercise. As part of this exercise, road traffic flows for the baseline year are included in the noise model and the output (i.e. calculated road traffic noise levels) are then compared against those measured during the baseline study. This exercise is undertaken to validate the output of the noise model for the baseline year at locations directly influenced by road traffic. The results of this assessment are presented in Section 17.2.5.3 of Chapter 17 of the EIAR and confirm that a strong correlation (0 to 1dB) between noise monitoring results and those calculated from the noise model for the baseline year.
- 4.2.14 For the proposed road development, the future years assessed are 2024 and 2039 with and without the N6 Galway City Ring Road (GCRR) in place. A total of 299 modelled locations have been considered over the extent of the proposed road development.
- 4.2.15 The baseline noise survey results are used when reviewing the relative increases in noise to compare against those calculated for the “Do Minimum” scenarios (i.e. no N6 GCRR), particularly in areas where road traffic does not dominate the prevailing noise environment.
- 4.2.16 A number of submissions from residents within Rosan Glas have raised queries relating to the baseline noise data measured and the related impact assessment for this area. In response, noise levels measured at Location 8a represent properties which are set back from passing local traffic along the Bothar Diamuida whilst noise levels measured at Location 8b were recorded south of Bothar Diamuida close to the road edge which was influenced by passing traffic. Both sets of survey

data are relevant as the survey results at both locations represent two different environments within the residential area. The surveys are fully valid for the area in question. As discussed above, the survey results do not form the basis of the noise model but rather are used to provide a broad understanding of noise environments through which the proposed road development passes, as set out in the TII guidelines. Noise levels are calculated at representative noise sensitive locations within Rosan Glas taking account of the road alignment and future traffic flows.

- 4.2.17 Submissions from some residents of Ard na Gaoithe note that more representative baseline monitoring locations could have been chosen for this area. In response, baseline noise levels were measured specifically within the Ard Na Gaoithe residential development representative of the properties in this area, i.e. at baseline Location 7b. This monitoring location was positioned in the rear garden of a residential property within the cul de sac and is representative of the other properties in this residential development given the similar environment in which they are located.
- 4.2.18 Submission S_059 quotes baseline noise along the Ballymoneen Road at Locations 6c and 6d and suggests these are not representative of Ard na Gaoithe. In response, the EIAR does not infer that noise levels measured along the Ballymoneen Road (Locations 6c and 6d) are representative of this residential area. As noted above, baseline noise monitoring has been undertaken within Ard na Gaoithe at location 7b and is representative of residential properties in this area.
- 4.2.19 Baseline noise studies were undertaken during 2016 across the study area. The noise levels measured during this baseline year are influenced by road traffic and local noise sources. There are no significant alterations in the study area that would result in significant changes to the measured noise levels. For example, traffic flows between 2016 and those calculated for the year of opening of the N6 GCRR (2024) are increased by less than 20% along all existing roads. This would not result in measurable differences in noise levels. The survey results still remain a valid representation of baseline noise levels across the study area.
- 4.2.20 It is reiterated again that all calculated road traffic noise in the EIAR relate to future traffic flows and do not rely on input data from the baseline noise study.
- 4.2.21 Submission Ob_521_O_517.14_01 relates to a property at Ard na Locha, Dangan and includes a detailed submission on baseline noise levels measured by Searson Associates both within and external to the property. It is noted that the noise survey was undertaken at the property during an early morning period, however, it does not include any information relating to noise levels during the remaining day or night-time periods. It is therefore not possible to provide a direct comparison against baseline noise levels measured at or near this property included in the EIAR (i.e. at Location 9f or 9c). Notwithstanding this point, the measured noise levels presented by Searson Associates are not disputed and are in line with what would be expected for the measurement locations surveyed.

- 4.2.22 It should be emphasised that the results of the survey within the Searson Associates report confirm that existing noise levels at the residential property are dominated by road traffic along the N59 Moycullen Road. Attended baseline noise monitoring adjacent to this property (Location 9f) and unattended noise monitoring at a comparative adjacent property (Location 9c) also confirm that baseline noise levels are dominated by the N59 Road at this location. It is also clear that the existing noise levels measured within the bedroom of the property by Searson Associates with the window ajar, achieve low internal noise levels.
- 4.2.23 Submission S_061 relates to a property and lands at Keeraun, Ballymoneen Road and includes reference to results of a baseline noise survey undertaken by ICAN Acoustics at the rear of the residential property. The results of the survey are not disputed for this location and are in line with those measured at a comparative adjacent environment as part of the baseline study within the EIAR (i.e. Location 7a). The result of the baseline study therefore validates those included in the EIAR for this location.
- 4.2.24 Objection Ob_607 relates to properties along the N84 Headford Road, northeast of the proposed road development. At the request of this property owner, a noise survey was undertaken subsequent to the publication of the EIAR. The results of the noise survey have been provided to the landowner. The results confirm the baseline noise environment at the surveyed property are dominated by traffic along the N84 Headford Road. The measured noise levels align with those calculated within the EIAR for this property (R182).
- 4.2.25 In summary, the baseline study undertaken as part of the impact assessment has been undertaken based on best practice guidelines and had provided sufficient information in order to conduct the noise impact assessment. The extent, duration and dates of the survey are valid and are in line with best practice guidelines.

4.3 Guidelines Used to Assess Traffic Noise Impacts

Issues

- 4.3.1 A number of submissions have raised queries relating to the guidelines and standards used in the impact assessment. Issues raised related to use of World Health Organisation (WHO) noise guidelines, UK's Design Manual for Roads and Bridges (DMRB), BS 8233 and the EPA's NG4.
- 4.3.2 The following submissions include references to alternative guidance:

Ob_220,	Ob_505,	Ob_507,	Ob_523,	Ob_521_O_517.14_05		
Ob_521_O_517.14_02		S_061,	S_068,	S_067,	S_070,	S_077

Response

- 4.3.3 The guidelines used for the proposed road development for the appraisal of noise and vibration are the TII “Guidelines for the Treatment of Noise and Vibration in National Road Schemes” (2004) and the “Good Practice Guidance for the Treatment of Noise during the Planning of National Road Proposed Road Schemes” (TII, 2014).
- 4.3.4 These guidelines are used for the assessment of new national roads throughout Ireland and have formed the basis of noise control for all new road schemes since their publication in 2004.
- 4.3.5 The following three conditions must be satisfied under the TII guidelines in order for noise mitigation to be provided as discussed in Section 17.2.2 of Chapter 17 of the EIAR:
- (a) The combined expected maximum traffic noise level, i.e. the relevant noise level, from the proposed road development together with other traffic in the vicinity is greater than the design goal of 60dB L_{den}
 - (b) The relevant noise level is at least 1dB more than the expected traffic noise level without the proposed road development in place
 - (c) The contribution to the increase in the relevant noise level from the proposed road development is at least 1dB

The TII noise guidelines for national road projects are also specifically referred to within the second round of the Galway City and Galway County Noise Action Plans (2013 to 2018) and the third round Galway City and County Noise Action Plans (2018 to 2023) as the relevant noise design criterion for new national roads.

- 4.3.6 When assessing the requirement for noise mitigation in Ireland for new road schemes, the design goal of 60dB L_{den} is applied to all properties to ensure a uniform and national best practice approach across the country. This also ensures a uniform assessment is applied across the extent of the proposed road development.

WHO Environmental Noise Guidelines for Europe 2018

- 4.3.7 Commentary is made in the submissions listed above relating to the use of the WHO *Environmental Noise Guidelines for the European Union* (2018) for the proposed road development.
- 4.3.8 This document, published in November 2018, provides recommendations for protecting human health from exposure to environmental noise originating from various sources.
- 4.3.9 For road traffic, the document recommends limiting traffic noise to below 53dB L_{den} and below 45dB L_{night} . The recommended road traffic noise levels within the WHO guidance are set on the basis of limiting annoyance and sleep disturbance. Dr Martin Hogan in his Statement of Evidence on Human Health discusses the

application of these guidelines from a human health perspective. Their application is also discussed below in the context of the noise impact assessment for the proposed road development.

- 4.3.10 The WHO 2018 guideline values are recommended to serve as the basis for a policy-making process to allow public health orientated recommendations to control noise exposure at populations on a European and national level. The WHO document states the following regarding the implementation of the guidelines:

“The WHO guideline values are evidence-based public health-oriented recommendations. As such, they are recommended to serve as the basis for a policy-making process in which policy options are considered. In the policy decisions on reference values, such as noise limits for a possible standard or legislation, additional considerations – such as feasibility, costs, preferences and so on – feature in and can influence the ultimate value chosen as a noise limit. WHO acknowledges that implementing the guideline recommendations will require coordinated effort from ministries, public and private sectors and nongovernmental organizations, as well as possible input from international development and finance organizations..”

- 4.3.11 These guidelines are to be considered therefore in the context of national policy making to adopt and/or propose alternative noise limits for use, should they deem feasible, based on a range of factors which must be considered. In making these decisions, economic, physical, and social considerations all need to be factored in. The WHO guidelines themselves should not be viewed as limit values for specific individual properties, unlike the TII guidelines which are used for this purpose.

WHO Derivation of Recommendations for Road Traffic Noise - L_{den}

- 4.3.12 The recommended levels for road traffic noise is based on two factors; increased risk of incidence of Ischaemic Heart Disease (IHD) and the percentage of people being Highly Annoyed (HA) by road traffic noise. For risks relating to incidence of IHD, a benchmark of 5% increase of relevant risk (RR) was set. On the basis of this benchmark, the corresponding road traffic noise level is 59dB L_{den} , based on a strong body of evidence to support the relationship.
- 4.3.13 For risks relating to perceived annoyance, a benchmark of 10% of the population being HA by road traffic noise was set. On the basis of this benchmark (10% HA), the corresponding road traffic noise level is 53dB L_{den} . This was set based on a compilation of varying community response studies relating to road traffic noise from European and International sources. The WHO guidelines note the body of evidence supporting this benchmark is of moderate quality.
- 4.3.14 The recommended traffic noise level of 53dB L_{den} within the WHO Guidelines is therefore based on a level which 10% of the population are estimated to be HA by road traffic noise. This level is 6dB below the noise level determined for increased risks relating to incidence of IHD, i.e. 59dB L_{den} .

WHO Guidelines in Context of TII/ EIAR Noise design goal

- 4.3.15 The TII traffic noise design goal is set as an absolute noise level of 60dB L_{den}. This is 1dB above the value noted in the WHO 2018 guidelines for increased risks relating to incidence of IHD.
- 4.3.16 In relation to perceived annoyance, Chapter 17 the EIAR provides information on the percentage of people HA by road traffic noise which is based on the 2010 European Environmental Agency (EEA) “Good Practice Guide on Noise Exposure and Potential Health Effects” (END Technical Report 11/2010). This document reviews published data from European studies relating to community response of environmental noise. On the basis of this report, a road traffic noise level of 60dB L_{den} equates to 10% of people being HA by road traffic noise.
- 4.3.17 Based on the community response studies in the WHO 2018 guidelines, a road traffic noise level of 60dB L_{den} equates to 15% of people being HA by road traffic noise.
- 4.3.18 In summary, the TII noise design goal is 1dB above the benchmark used in the WHO guidelines for the increased risks relating to incidence of IHD (i.e. 59dB L_{den}). The WHO document assigns a higher percentage of people being highly annoyed by road traffic noise at 60dB L_{den} (15% HA) compared to the EEA document referred to within the EIAR (10% HA at 60dB L_{den}).

Application of the WHO Noise Guidance

- 4.3.19 The WHO guidelines discuss a number of possible interventions to be considered with respect to controlling and reducing road traffic noise. These include:
- changes in infrastructure
 - reduction in road traffic flows
 - pathway interventions (barriers)
 - quieter road surfaces
- 4.3.20 In the context of Galway City and County, both the city council and county council’s second round Noise Action Plans (2013 – 2018) and third round (2018 – 2023) Noise Action Plans discuss mitigation or intervention options to reduce traffic noise at exposed populations. These are noted to include transport strategies, reducing traffic speeds, limiting vehicle numbers, using low noise road surfaces and using noise barriers. These measures broadly align with the recommended interventions for traffic noise reduction discussed in the WHO guidelines.
- 4.3.21 Galway City and County Council, in partnership with the NTA and TII have developed the Galway Transport Strategy (GTS). The Galway Noise Action Plans note the implementation of the proposals set out in the GTS will aid in the reduction of environmental noise from the major roads by traffic reduction, re-distribution and diversion of traffic volumes.

- 4.3.22 The N6 Galway City Ring Road is a key element of the GTS. Through its implementation, traffic volumes will be reduced across the city and a positive impact will be experienced at noise sensitive buildings along existing roads, as discussed in the Noise Action Plans.
- 4.3.23 Notwithstanding the above, it is important to put the WHO recommended traffic noise levels into context with respect to the existing roads in Galway City and its environs. For the existing road network across Galway City, the most recent noise mapping prepared as part of the third round of Noise Action Plans (2018 to 2023), notes that approximately 16,000 people are exposed to road traffic noise levels above 55dB L_{den} . This relates to population counts along sections of roads which were mapped as part of the study (N6, N83, N59, N84, R336, R337, R338, R339, R446, R863, R864, R865, R866 and R921). The existing road network therefore already contributes to road traffic noise above the recommended levels within the WHO 2018 guidelines. Even with a reduction in traffic flows along the existing road network as a result of the proposed road development, a traffic noise level of 53dB L_{den} will not be achieved due to residual traffic volumes, proximity of properties to road edges and minimal opportunities for physical mitigation along existing roads.
- 4.3.24 With respect to the proposed road development, the percentage of modelled locations are calculated to meet or exceed 53dB L_{den} is 88% with the extensive suite of noise mitigation already in place. In order to reduce traffic noise levels to below 53dB L_{den} with the current alignment and the current noise mitigation, traffic flows along the proposed road development would need to be reduced by 80%.
- 4.3.25 Reducing the operational capacity of the road by this magnitude would render the project as void and would not achieve any of the project objectives. This does not present a feasible option for a new national road scheme in any setting and hence is not possible to achieve.
- 4.3.26 It is important, therefore, to highlight that both the TII noise guidelines for national roads and the WHO 2018 noise guidelines for Europe serve different purposes. The WHO guidelines should be considered across populations as a whole and used to review and manage health related noise exposure across national and European populations. They are not achievable on an individual receptor basis. The TII guidelines are however achievable design goals on an individual receptor basis.
- 4.3.27 It is important to highlight the design goal used in the TII guidelines is, however, comparable to those associated with the prevention of the more significant health effects of environmental noise such as cardiovascular effects as set out in the WHO guidelines and also protect the majority of the population being HA by road traffic noise.
- 4.3.28 Dr Martin Hogan's Statement of Evidence on Human Health also discusses the potential related health impacts associated with the operational traffic noise levels and the WHO noise guidance document including sleep disturbance. In summary, this concludes that at a noise level of 45dB L_{night} , the percentage of the population

self-reporting highly sleep disturbance is 3%. For the assessment criteria used in the EIAR of 55dB L_{night} , the percentage of people self-reporting sleep disturbance is still only 6%. This represents a low percentage of an exposed population.

- 4.3.29 In summary, the WHO guidelines have not been adopted in any form in Ireland to date. Whilst they provide a valuable peer review of potential health based indicators, it is not appropriate to design or operate a new national road network to comply with the noise levels included within its recommendations. The recommendations are made primarily in the context of strategic policy-making as opposed to environmental impact assessment. In conclusion, the TII guidance remains the current best practice standard for road traffic noise in Ireland.
- 4.3.30 Submission S_061 suggests that no assessment of the increase in the noise environment has been assessed within the EIAR and reference to the DMRB should be used. However, in response, it should be noted that the significance of change relating to the noise environment is considered within Chapter 17 of the EIAR. This was determined based on the magnitude of change ratings included within the UK's Design Manual for Roads and Bridges (DMRB, 2011) short term table (Year of Opening) and long-term table (Design Year), in the absence of Irish guidelines for assigning a magnitude of change relating to road traffic noise. This assessment is summarised in Table 17.16 within Section 17.7.3.2 of Chapter 17 of the EIAR.
- 4.3.31 Submission S_077 discusses the use of guidance documents BS 8233 (2014) Guidance on Sound Insulation and Noise Reduction for Buildings and queries if external noise levels have been considered as part of the noise assessment. The submission also refers to the EPA's document Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4 2016). In response, the Board should note that noise levels are calculated as external free field, L_{den} noise levels as part of the impact assessment. The relevant noise guidelines used for the assessment of road traffic noise for new national road schemes is the TII documents referred to above and discussed in Section 17.2.2 of Chapter 17 of the EIAR.
- 4.3.32 The TII noise guidelines for national road projects are also specifically referred to within the Galway City and Galway County Noise Action Plans as the relevant noise design criterion for new national roads. The EPA's NG4 document relates specifically to industrial noise from EPA licensed sites and does not contain any guidance relating to road traffic noise. This document is therefore not relevant to the assessment of a national road development. The BS 8233 Standard relates to the control of noise within buildings does not contain any guidance relating to external road traffic noise. The two standards quoted in submission S_077 are not therefore used for the assessment of new national roads in Ireland and the TII noise guidelines for national roads are the relevant guidelines for the proposed road development.

4.4 Extent and type of Noise Mitigation Being Provided

Issues

4.4.1 A number of submissions have raised queries relating to the adequacy of information on noise mitigation measures, the adequacy of noise mitigation being provided, a request for a low noise road surface and requests for further noise mitigation.

4.4.2 The following submissions raised these points:

Ob_108	Ob_209	Ob_311	Ob_531.01	Ob_O_651	S_059
Ob_111	Ob_213	Ob_457	Ob_571	Ob_677	S_061
Ob_117	Ob_222	Ob_461	Ob_579	Ob_678	S_062
Ob_135	Ob_229	Ob_462	Ob_592	Ob_688	S_071
Ob_134	Ob_230	Ob_484	Ob_600	Ob_705	S_078
Ob_151	Ob_223	Ob_486	Ob_603	Ob_757	
Ob_152	Ob_239	Ob_498	Ob_628	Ob_761	
Ob_155	Ob_251	Ob_511	Ob_631	S_008	
Ob_159	Ob_252	Ob_512	Ob_634	S_009	
Ob_195	Ob_261	Ob_O_517	Ob_635	S_015	
Ob_199	Ob_273	Ob_O_511.18	Ob_639	S_053	

Response

4.4.3 Section 17.2.2 of Chapter 17 of the EIAR sets the relevant criteria for determining the requirement for noise mitigation. The relevant criteria are also summarised in 4.3.5 of this Statement of Evidence. The criteria are those set for road schemes throughout Ireland as specified in the TII noise guidance documents.

4.4.4 The impact assessment has calculated operational road traffic noise levels at each of the 299 modelled locations along the extent of the proposed road development. At each location, the three conditions for noise mitigation were reviewed in accordance with the TII guidelines in order to determine if noise mitigation is required.

4.4.5 Traffic noise levels are calculated for both the opening year (2024) and the design year of the proposed road development (2039). Noise mitigation is designed against the future design year which relates to the higher potential future traffic flows.

4.4.6 Where the modelled locations were determined to meet the three conditions for noise mitigation, the specific noise mitigation for each property was assessed and modelled to reduce traffic noise levels to within the design goal. For each of the

submissions noted above, the requirement for noise mitigation was assessed for each property on this basis.

- 4.4.7 Noise mitigation along the proposed road development includes the use of a Low Noise Road Surface (LNRS) along the full extent of the mainline of the proposed road development and the main junction slip roads accessing the N59 Moycullen Road, N84 Headford Road, N83 Tuam Road, existing N6 in addition to the N59 Link Road North and South. In addition, a total of 59 noise barrier structures are included along the length of the proposed road development ranging in height between 1.5m to 4m.
- 4.4.8 Detailed information relating to the type, extent and location of noise mitigation for the operational phase is included in full in Section 17.6.3 and Table 17.14 of Chapter 17 of the EIAR and illustrated in Figures 17.1.01 to 17.1.15 in Volume 3 of the EIAR.
- 4.4.9 For assessment locations where noise mitigation is provided for, the residual traffic noise levels are presented in Table 17.15 of Chapter 17 of the EIAR. The full set of calculated residual noise levels for all assessment locations is included in Appendix 17.3, Volume 4 of the EIAR.
- 4.4.10 The approach used in the EIAR and prescribed by TII ensures that the same level of protection is provided to all noise sensitive areas across the proposed road development in relation to operational noise levels.
- 4.4.11 A number of submissions have requested assurances relating to the provision of the noise mitigation measures within the EIAR to be included. It is confirmed that the noise mitigation within the EIAR will form part of the Schedule of Environment Commitments for the proposed road development.
- 4.4.12 In response to a Request for Further Information (RFI) from An Bord Pleanála, traffic forecasts have been prepared to take account of The National Planning Framework (NPF) and any enhanced population growth in Galway above that assessed within the EIAR. A traffic modelling exercise has been undertaken of the N6 GCRR for the NPF Growth Forecast and comparisons made to the 2039 “TII Central Case” Do-Something scenario which is presented in the EIAR. This assessment is included in Section 8 of the *N6 Galway City Ring Road, Request for Further Information Response, Volume 1 – Report*.
- 4.4.13 In order to account for this potential traffic increase, noise levels at all assessment locations included in the EIAR have been calculated based on these traffic scenarios. The results of this assessment are summarised in Section 8.2.2.5 of the *N6 Galway City Ring Road, Request for Further Information Response, Volume 1 – Report* and within Appendix A.8.2 *Noise Sensitivity Test*.
- 4.4.14 At the majority of assessment locations along the proposed road development, the calculated difference in traffic noise levels between the RFI sensitivity test and those within the EIAR is between 0.2 and 0.6dB. The calculated difference in noise level at the majority of properties remains below the traffic noise design goal of

60dB L_{den} or experience a neutral or positive noise impact with current mitigation proposals. A difference in noise level of this magnitude is negligible.

- 4.4.15 Noise barrier NB12/05 will be extended west to Chainage 12+550 to reduce noise levels at assessment location R188 below the TII design goal taking account of the RFI sensitivity analysis. This has been included in the Schedule of Environmental Commitments.
- 4.4.16 Submission/objection Ob_521_O_517.14_05 suggests that the noise impact assessment within the EIAR and the RFI Response is flawed based on the traffic flows used which are asserted to be incorrect. In response, all matters dealing with traffic modelling and traffic flows were addressed in Andrew Archer's Statement of Evidence on Traffic and Transpiration. Andrew Archer's Statement of Evidence confirms the modelling approach, the validity of the traffic model and the related calculated traffic flows. On this basis, the traffic flows used in the noise impact assessment within the EIAR and those associated with the sensitivity analysis in the RFI are fully valid. All calculated traffic noise levels within both the EIAR and included in the RFI are therefore fully valid for the scenarios assessed.
- 4.4.17 Submission S_078 from the HSE notes that residual noise levels at 7 properties are between 61 and 62dB L_{den} . The submission requests that *no occupied properties should be excluded and recommends that mitigation measures should be applied to ensure compliance, as this is a health protection standard*. In response to this submission, the Board's attention is drawn to Section 17.7.3.1, in Chapter 17 of the EIAR dealing with Residual Noise Levels. This section notes the following with respect to assessment locations that remain above 60dB L_{den} .

“There are a small number of instances where a residual noise level of 1 to 2dB above the design goal remains. These locations primarily relate to properties which are to be acquired (R195, R198a), remain dominated by traffic along the local road network which falls outside the proposed development boundary (R79, R206), or where access onto the local road restricts physical additional mitigation (R63a, R80a). There are a small number of properties along the proposed road development where a residual noise level of 61 to 62dB L_{den} is calculated (R140, 151a, 155, 170, 173, 208 and 212). Whilst these exceedances are strictly above the design goal, reducing traffic noise levels to at or below 60dB L_{den} at these properties will require substantial additional barrier lengths and heights over and above those in place in order to achieve an insignificant change to the overall noise level at a property.

The 2004 TII noise guidance document notes the following with respect to achievement of the noise design goal:

“The Authority accepts that it may not always be sustainable to provide adequate mitigation in order to achieve the design goal. Therefore, a structured approach should be taken in order to ameliorate as far as practicable.”

The 2014 noise guidance document notes that:

“in some cases the attainment of the design goal may not be possible by sustainable means”.

This guidance document also notes that caution should be exercised specifying substantial screening where small benefits (<3dB) are only achieved, given a change of 3dB(A) is the smallest change that would give a reliable difference in public response. Specifically, the TII 2014 document goes on to note that:

“It may be unsustainable to increase barrier dimensions significantly where the result would be a reduction of 1dB or less, as such a reduction would be close to imperceptible in a laboratory situation, and would not result in a difference in public response in the real world environment.”

In this instance, the extent of screening deemed feasible to achieve the target design goal at the relevant properties has been assessed, taking into account a level of proportionality with respect to changes in noise levels.

- 4.4.18 It is important to note, therefore, that the assessment locations noted above have been fully considered and have not been excluded from assessment or mitigation. Extensive noise mitigation has been provided where it is feasible and sustainable to do so which achieves the objectives of the TII noise guidelines. Dr Martin Hogan in his Statement of Evidence has addressed the health related impacts associated with the proposed road development including road traffic noise exposure.
- 4.4.19 Taking into account the calculated traffic noise levels across the proposed road development and the negligible difference between the EIAR traffic noise levels and those associated with NPF traffic growth forecasts, the extent and scale of noise barriers included within the EIAR are considered to provide a suitable and proportionate level of noise mitigation for the noise sensitive locations along the proposed road development.
- 4.4.20 The following submissions/objections request the incorporation of noise mitigation along the proposed road development in order to control noise levels at retained lands or areas of residential zoned lands in proximity to the proposed road development in order to protect against potential future development.

Ob_145	Ob_223	Ob_251	Ob_484	Ob_684	S_061
Ob_108	Ob_229	Ob_261	Ob_485	Ob_688	
Ob_199	Ob_238	Ob_273	Ob_626	Ob_705	
Ob_209	Ob_230	Ob_461	Ob_629	S_009	

- 4.4.21 In response, noise mitigation has been provided for all existing noise sensitive locations where the relevant noise criteria have been met as discussed in the paragraphs above. It is noted, however that a low noise road surface is included the full extent of the proposed road development as standard. It is not, however, proposed to extend noise barriers over the full extent of zoned or retained lands in the event that future development may occur.
- 4.4.22 It is important to note that the presence of the proposed road development does not preclude new development within adjacent lands. As part of the planning application of any new development, consideration will be given to the requirement of any localised boundary treatments within the development sites to reduce noise, where this is deemed necessary.
- 4.4.23 One submission/objection, Ob_521_O_517.14_05, comments on the ESB substation located on lands across from the landowners property at Ard na locha, Dangan. A submission from Searson Associates raises concerns regarding potential noise impacts from this installation. In response, operational noise levels from modern sub-stations are low and are well controlled through the sub-station structure. Once the structure is well sealed and designed to control tonal noise emissions, operational noise levels from these structures are low and do not give rise to any significant noise levels beyond their immediate structure. Given the prevailing noise environment at the relevant property is dominated by road traffic, as confirmed within the baseline survey undertaken by Searson Associates and also confirmed within the EIAR, the operation of this substation will not contribute to the ambient noise environment and will be imperceptible. The submission requests that a solid 2m high gate and acoustic vents to the bedroom windows are required to reduce noise from this source. The noise mitigation requested in this submission is not required. It is highlighted that substantial noise barriers ranging in height between 3 and 3.5m are included along the edge of the proposed road development in proximity to this property.

4.5 Increase in Noise Environment / Loss of Quiet Enjoyment of Property / Introduction of New Noise Source into a Quiet Area

Issues

4.5.1 A number of submissions/objections refer to the change in the noise environment at their property with the proposed road development in place. Observations refer to the impact the increased noise levels will have at their property and raise concerns over the change in the noise environment the proposed road development will bring.

4.5.2 The following submissions raised these points:

Ob_111	Ob_O_511.07	S_003	S_044	S_070
Ob_131_132	Ob_512	S_004	S_046	S_071
Ob_135	Ob_521.03	S_008	S_051	S_077
Ob_136	Ob_521_O_517.14_02	S_011	S_055	
Ob_141.2	Ob_531.02	S_015	S_056	
Ob_141.3	Ob_569	S_029	S_059	
Ob_155	Ob_662	S_037	S_061	
Ob_216	Ob_633	S_038	S_063	
Ob_298	Ob_666	S_040	S_065	
Ob_312	Ob_679	S_041	S_066	
Ob_486	Ob_668	S_042	S_067	

Response

4.5.3 Operational traffic noise levels associated with the proposed road development have been fully considered within Chapter 17, Volume 2 of the EIAR.

4.5.4 It is fully acknowledged that once operational, an increase in the noise environment will be experienced at properties located in proximity to the proposed road development, particularly at locations set back from existing heavily trafficked roads at present. A reduction in traffic noise level will, however, also be experienced at properties located along sections of the existing road network where traffic volumes will be diverted from.

4.5.5 In order to determine the operational noise levels associated with the proposed road development at affected noise sensitive locations, an acoustic model was prepared. Full details of the noise modelling process are described in Section 17.2.5.3 of Chapter 17 of the EIAR and are further discussed in Section 4.2 of this Statement of Evidence. A total of 299 receiver locations have been considered in the noise model. Road traffic noise levels were modelled for the opening year (2024) and design year (2039), with and without the proposed road development in place.

- 4.5.6 The results of the modelled scenarios without noise mitigation are included in Table 17.13, Section 17.5.4.1 of Chapter 17 of the EIAR. Section 17.7.3.1 of Chapter 17 of the EIAR presents the residual calculated operational traffic noise levels once noise mitigation has been included along the length of the proposed road development. Noise mitigation includes a low noise road surface (LNRS) and an extensive number of acoustic barriers along the road boundary. With the inclusion of the noise mitigation measures, noise levels are at or below the TII operational noise design goal of 60dB L_{den} at the majority of assessment locations (residents, schools, churches etc.) or have been reduced to within or below the pre-existing noise level.
- 4.5.7 For each assessment location, calculated Do-Minimum (i.e. no N6 GCRR) or, where relevant, the measured baseline noise levels were compared against the calculated Do-Something noise levels to determine the increase in road traffic noise levels.
- 4.5.8 The significance of change in road traffic noise was determined based on the magnitude of change ratings included within the UK's Design Manual for Roads and Bridges (DMRB, 2011). The magnitude of change was assessed for both the for the year of opening and the design year using the relevant 'short-term' and 'long-term' impact tables. This guidance document was used in the absence of Irish guidelines for assigning a magnitude of change relating to road traffic noise. This assessment is summarised in Table 17.16 within Section 17.7.3.2 of Chapter 17 of the EIAR.
- 4.5.9 The assessment has concluded that During the Year of Opening (2024), 45% of the modelled locations will experience a magnitude of change categorised as 'Major', which relates to a traffic noise increase above 5dB. A 'Moderate' noise impact (an increase between 3 and 5dB) is calculated at 10% of the modelled locations. At the remaining locations, the impacts are categorised as 'Minor' (17% of modelled locations), 'Negligible' (18% of modelled locations) and 'No Change/Reduction' (33% of modelled locations).
- 4.5.10 During the Design Year of 2039, 18% of the modelled locations will experience a magnitude of change categorised as 'Major', which relates to a traffic noise increase above 10dB. A 'Moderate' noise impact (an increase between 5 and 10dB) is calculated at 30% of the modelled locations. At the remaining locations, the impacts are categorised as 'Minor' (9% of modelled locations), 'Negligible' (15% of modelled locations) and 'No Change/Reduction' (28% of modelled locations).
- 4.5.11 During the design year (2039), the number of properties determined to experience a 'Major' change in noise levels is significantly reduced compared to the opening year (2024) due to an acknowledged habituation of road traffic noise over time. This is reflected in the threshold values for impact ratings in the long-term period within the DMRB.
- 4.5.12 Where a change in the noise environment was assigned a 'Moderate' or 'Major' magnitude rating, the specific traffic noise levels were reviewed in order to provide

a full overview of the potential impacts at the assessment locations. This assessment is included in Tables 17.17 to 17.20 within Section 17.7.3.2 of Chapter 17 of the EIAR.

- 4.5.13 As discussed in Section 4.3 of this Statement of Evidence, a review of the potential level of annoyance relating to the residual road traffic noise levels was undertaken based on population response studies from available and relevant published data.
- 4.5.14 In accordance with the European Environmental Agency (EEA) document ‘Good Practice Guide on Noise Exposure and Potential Health Effects’ (EEA Technical Report 11/2010), 10% of the population are defined as being ‘highly annoyed’ by road traffic noise at an exposure level of 60dB L_{den}. This is based on the exposure response studies compiled and analysed by the EEA across a European wide study.
- 4.5.15 The evaluation of residual impacts discussed in Section 17.7.3.2 of the EIAR concludes that specific traffic noise levels associated with ‘Moderate’ changes in noise levels are in the range of 48 to 62dB L_{den}. In accordance with the published data referred to within the EIAR, the percentage of the population likely to be highly annoyed by road traffic noise in this range is 3 to 12% respectively.
- 4.5.16 Absolute noise levels associated with ‘Major’ changes in noise levels are in the range of 49 to 60dB L_{den} at noise sensitive properties not being demolished or acquired. In accordance with the published data referred to within the EIAR, the percentage of the population likely to be highly annoyed by road traffic noise in this range is 3 to 10% respectively.
- 4.5.17 Whilst a higher number of locations are determined to experience a ‘Major’ change in noise levels during the opening year, the range of absolute noise level under consideration would not pose high levels of annoyance to the majority (~90%) of a typical population in accordance with the EEA published data.
- 4.5.18 Referring to the WHO 2018 guidelines discussed in Section 4.3 of this Statement of Evidence, the percentage of people likely to be highly annoyed (HA) by road traffic in the range of 49 to 60dB L_{den} is 8% and 15% respectively in accordance with the road traffic noise response studies reviewed and analysed in the WHO guidelines. Traffic noise levels across the development are therefore concluded to protect the majority of the population being HA in accordance with both studies.
- 4.5.19 In summary, it is acknowledged that increases in noise will be experienced once the proposed road development becomes operational and the prevailing noise environment will be altered. This predicted change in the noise environment has been assessed within Chapter 17 of the EIAR. However, it should be emphasised that the proposed road development has been designed to reduce operational noise levels to within national design guidelines through the incorporation of detailed noise mitigation measures.

4.6 Impact on Schools and Childcare Facilities

Issues

- 4.6.1 A small number of submissions have raised concerns relating to the potential noise impact of the proposed road development on schools and childcare facilities in the area. Specifically, Bushypark National School, Castlegar National School and Montessori and creche facilities within Rosan Glas.
- 4.6.2 The following submissions raised this point: Ob_510, Ob_523, S_031, S_044 & S_056.

Response

- 4.6.3 There are two schools located in proximity to the proposed road development, St. James' National School in Bushypark and Castlegar School off School Road. Both schools have been assessed in terms of their noise impacts. Calculated noise levels at St James' National School are 56dB L_{den} taking account of noise mitigation in this area (i.e. the low noise road surface and noise barriers along the road embankment). The change in the noise environment calculated at this location represents a minor increase above the pre-existing noise environment and is an acceptable external noise levels for school buildings.
- 4.6.4 Calculated noise levels at Castlegar school are made along the southern façade and rear facades facing the proposed road development. Taking account of the screening provided by the extensive cutting in this area, the proposed low noise road surface and noise barrier along the road boundary, residual noise levels are calculated in the range of 56 to 58dB L_{den} . Taking account of baseline noise levels measured at the school and adjacent properties along School Road, this represents a minor change in the noise environment and is an acceptable external noise levels for school buildings.
- 4.6.5 The closest calculated assessment location to the Montessori facility within Rosan Glas is R115. Noise levels at this assessment location are calculated as 56dB L_{den} . In order to address the specific concern relating to this facility, noise levels have been calculated at the closest façade of the Montessori building facing towards the proposed N59 Link Road for the design year 2039, using the RFI traffic forecasts to include the NPF and N6 GCRR. The calculated noise levels at the most exposed façade of this property are in the range of 54dB L_{den} at ground level to 57dB L_{den} at first floor level. The calculated noise levels do not pose a significant noise impact for a childcare facility and is in line with the range of noise levels for the national schools noted above and also in line with the baseline noise environment measured in the area.

4.7 Noise Impact on NUIG

Issues

- 4.7.1 Submission/objection Ob_528_541_543_557 from NUIG has raised concerns relating to the potential noise impact of the proposed road development on the sporting pitches within the NUIG Sporting Campus. This submission includes a report prepared by Allegro Acoustics on the potential impact of the proposed road development on the playing pitches of the NUIG sporting campus. The report suggest that operational noise levels would lead to communication issues during training sessions and games at the sporting pitch areas.
- 4.7.2 Submission/objection Ob_534 also includes reference to the potential noise impact of the proposed road development within this area.

Response

- 4.7.3 Noise levels associated with the proposed road development within the NUIG Sporting Campus have been assessed within Chapter 17 of the EIAR. Two assessment locations R158 and R160 are calculated at the closest edges of the two main sport pitch areas within the campus south of the proposed road development. The assessment locations are illustrated in Figure 17.1.06 and 17.01.07, Volume 3 of the EIAR. Acoustic barriers of 2m in height in addition to a low noise road surface are included in this area to reduce operational noise levels from the proposed road development. Residual noise levels of 58 and 60dB L_{den} are calculated at the two assessment locations which are closest to the proposed road development.
- 4.7.4 It is acknowledged that the operation of proposed road development will result in increased noise levels within the grounds of the NUIG Sporting Campus over and above the prevailing noise climate. There are a number of items raised within submission/objection Ob_528_541_543_557 relating to noise, that are addressed in the following paragraphs.
- 4.7.5 Firstly the submission makes reference to WHO Guidelines for Community Noise (2000) document and quotes a noise level of 55dB L_{Aeq} that is set for playing pitches. The noise level quoted in the WHO community guidelines document relates to playgrounds and outdoor amenity areas in order to avoid potential annoyance. This guidance level, however, is not set on the basis of playing pitches and sports areas and does not infer that noise levels above the recommended noise level for outdoor amenity spaces would pose significant negative impacts upon communication during training sessions and/ or competitive events.
- 4.7.6 The report contained within the submission also refers to prescribed noise levels of 45 and 50dB L_{Aeq} for high performing pitches and generic pitches respectively, however there is no guidance or evidence available in the submission to support these prescribed noise levels. The report also refers to the TII Noise guidelines for

national roads and quote the design goal of 60dB L_{den} for noise sensitive areas which the proposed road development should be designed against.

- 4.7.7 The submission includes a range of calculated noise levels across the sports pitches with the inclusion of the proposed road development. Table 4 of the report contained within the includes calculated noise levels at 5 assessment locations (N1 to N5) representing playing pitches across the sporting campus. Locations N1 and N2 are broadly at the same assessment locations as R158 and R160 within the EIAR respectively, which are located at the closest edge of the two playing pitches south of the proposed road development within the sporting campus. The calculated noise levels at these locations are 68dB L_{den} at Location N1 and 66dB L_{den} at Location N2 at ground floor level, representing the height of people using the sports pitches. The calculated levels align with those in the EIAR for Locations R158 and R160 in the absence of noise mitigation (Table 17.13, Section 17.5.4.1 of Chapter 17 of the EIAR).
- 4.7.8 It is asserted in the submission that the traffic noise design goal of 60dB L_{den} is not achieved within the site with the inclusion of noise mitigation. Referring to Table 17.15 in Section 17.7.3 of Chapter 17 of the EIAR, however, residual noise levels calculated at NUIG playing pitches are reduced to 58 and 60dB L_{den} with the inclusion of low noise road surface and a 2m high noise barrier along the full extent of the alignment of the proposed road development through the NUIG Sporting Campus.
- 4.7.9 The results of the EIAR confirm that the TII noise design goal of 60dB L_{den} is achieved at the closest playing pitches to the proposed road development with noise mitigation in place.
- 4.7.10 Noise levels have been calculated across the full extent of the sports pitch areas for the purposes of responding further to this submission. Noise levels are calculated using the L_{Aeq} parameter for day and evening periods in order to compared against the same parameters discussed in the submission. The results are summarised in Table 4.7.1 below. The results confirm that during day and evening periods, road traffic noise levels are highest at the sports pitch to the south-west of the facility and reduce moving east within the campus.

Table 4.7.1: Calculated Noise Levels across Sports Grounds within NUIG

Location	Calculated dB L _{den}	Calculated daytime dB L _{Aeq,12hr} (0700-19:00hrs)	Calculated Evening dB L _{Aeq,4hr} (19:00-23:00hrs)
Sports Pitch - South west	58 – 60	57 - 59	54 – 56
Sports Pitch – Mid south	57 – 58	55 – 57	53 – 54
Sports Pitch – South east	55 – 56	54 – 56	51 – 53
Sports Pitch – North	54 – 58	53 – 57	50 – 53
Sports Pitch – North east	54 – 56	52 – 55	52 – 54

4.7.11 The range of noise levels calculated across the sports pitches are typical of a suburban environment and would not preclude the use of any of the pitches to be used for training and competitive games.

4.7.12 For the purposes of comparison, a review of road traffic noise levels experienced at a range of existing GAA, Rugby and Football clubs within Galway city were reviewed using the published strategic noise maps from the EPA (<https://gis.epa.ie/EPAMaps/>). These maps relate to road traffic flows along roads within the city centre. A summary of sporting grounds located in Galway City and the mapped road traffic noise levels are summarised in the Table 4.7.2 below.

Table 4.7.2: Review of Mapped L_{den} noise levels across sporting grounds within Galway City

Sporting Grounds	Road	Mapped L _{den} Noise levels, dB
Castlegar GAA club	R921 Dublin road	55 - 64
East united FC	N6 Bothair na dTreadbh	55 - 59
GMIT Dublin road sports grounds	R338 Dublin Road	55 - 64
Galwegians RFC	R338 Dublin Road	55 - 69
Connacht Rugby Pitch	R339 College Road	55 - 64
Westside playing Fields/St Michaels GAA Club house	Seamus Quirke Road	55 - 69
Bohermore Pitch/Galway Hibernian FC	R338 Sean Molvoy Road	60 - 69
Eamonn Deacy Park/Galway United FC	N6/Quincentenary Bridge Upper	55 - 59

- 4.7.13 The mapped noise levels are in the range of 55 to 69dB L_{den}. All of the sporting grounds listed in Table 4.7.2 require communication for training and interaction between players as standard. The range of noise levels are similar to or above those calculated across the sporting grounds within NUIG with the proposed road development.
- 4.7.14 In summary, it is fully acknowledged that the proposed road development will result in an increased noise environment across the NUIG sporting campus once operational. The residual noise levels at the various sporting areas within the campus have been assessed taking into account the proposed noise mitigation. The assessment has determined that the TII design goal of 60dB L_{den} is achieved at the closest sports pitches with the campus and noise levels are further reduced across the campus moving west to east towards the River Dangan. The calculated noise levels across the campus grounds are not out of line with a suburban environment and the range of noise levels are comparable to or lower than those experienced across a range of existing sporting pitches across Galway City.
- 4.7.15 In response to observation Ob_534, it is acknowledged an increase in noise levels will be experienced across the Dangan Lands with the proposed road development in place. Calculated traffic noise levels are, however, highest in the immediate vicinity of the viaduct structure and are reduced moving further from the road source. Calculated noise levels within the NUIG Sporting Campus are lowest within the eastern portion of lands both north and south of the proposed road development along the river. The range of calculated traffic noise levels in these areas are below a level which would cause disturbance to normal amenity use of the area.

4.8 Noise and Vibration Impacts during Construction Phase

Issues

- 4.8.1 Issues were raised in relation to noise and vibration impacts due to the construction of the proposed road development.
- 4.8.2 A total of 24 submissions include a general observation in relation to noise arising during building works.

Ob_102.2	Ob_167	Ob_211	Ob_575
Ob_105	Ob_168	Ob_212	Ob_589
Ob_115	Ob_177	Ob_217	Ob_632
Ob_139	Ob_187	Ob_499	Ob_663.01
Ob_141.1	Ob_205	Ob_545_565	Ob_O_666.01
Ob_156	Ob_208	Ob_O_550_583.04	Ob_750

- 4.8.3 The following submissions raised issued relating to construction phase noise and vibration impacts. Concerns raised relate to general construction impacts on individual properties or lands, construction traffic, construction monitoring and adherence to limit values.

Ob_111	Ob_298	Ob_584	Ob_O_696.13_14	S_046
Ob_136	Ob_496	Ob_603	Ob_O_696.21	S_055
Ob_159	O_511.05	Ob_641	Ob_717_720_721	S_062
Ob_201	Ob_511.06	Ob_654	Ob_757	S_063
Ob_207	Ob_O_511.07	Ob_668	S_020	S_063
Ob_222	Ob_O_511.18	Ob_677	S_038	S_066
Ob_252	Ob_512	Ob_678	S_044	S_068
			S_078	S_074

Response

- 4.8.4 During the construction phase of the proposed road development, noise will be increased in proximity to noise sensitive areas for the duration of works occurring at that location. High levels construction noise are unavoidable during the construction of a large infrastructure project due to the nature of activities involved.
- 4.8.5 Given the linear nature of the works, noise emissions related to the construction phase will, however, be of short-term impact at any one area as the works progress along the length of the proposed road development. In other words, there will be extended periods during the overall construction programme when there will be no construction noise impacts at a particular location.
- 4.8.6 In order to assess the potential impacts during this phase, indicative noise calculations were undertaken assuming a range of typical plant items for construction activities included in Tables 17.9 of Chapter 17 of the EIAR. The potential for noise impacts associated with major earthworks, structures, and site compounds across the proposed road development are also discussed in Section 17.5.3 of Chapter 17 of the EIAR.
- 4.8.7 The locations and distances from construction works are identified where noise mitigation is required in Section 17.5.3.1 of Chapter 17 of the EIAR.
- 4.8.8 It is clear from Table 17.1 of Chapter 17 of the EIAR that the limits are set as 70 dB $L_{Aeq,1hr}$ for daytime periods during week days, 65 dB $L_{Aeq,1hr}$ for daytime periods on Saturdays and 60dB L_{Aeq} for Sundays and bank holidays.

- 4.8.9 Vibration limits for general construction works are included Table 17.3 of Chapter 17 of the EIAR. The limits are set as 8mm/s Peak Particle Velocity (PPV) at frequencies below 10Hz rising to 20mm/s at frequencies of 50Hz and above.
- 4.8.10 In response to those submissions which have sought assurances relating to the control and management of noise and vibration impacts during the construction phase, it is confirmed that the construction noise limit values will be implemented during construction.
- 4.8.11 The construction of the works will be undertaken implementing the specific noise abatement measures identified in the application documentation and in compliance with the recommendations of *BS 5228-1:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites - Noise* and the European Communities (Noise Emission by Equipment for Use Outdoors) Regulations, 2001.
- 4.8.12 The noise and vibration mitigation measures for each work area will be determined taking account of the various control measures included and assessed within Section 17.6.2 of Chapter 17 of the EIAR, Appendix A.17.3 of the EIAR and the CEMP in Appendix A.7.5 of the EIAR.
- 4.8.13 *BS 5228 -1:2009+A1 2014* includes guidance on several aspects of construction site practices, which include, but are not limited to selection of quiet plant, control of noise sources, screening of noisy plant and works areas, controlling hours of work, ongoing liaison with the public through a dedicated public liaison officer in addition to compliance monitoring. Submission S_078 from the HSE acknowledges and welcomes the inclusion of a public liaison officer and emphasises the importance of compliance with this measure. In response, a dedicated public liaison will be appointed as part of the project. This is clearly included both with Chapter 17 of the EIAR and also within the CEMP in Appendix A.7.5 of the EIAR. The HSE submission also specifically requests that sensitive receptors are informed in advance of the date, time and duration of noisy operations likely to cause significant impacts, that regular updates are provided to the wider community and any works undertaken outside normal working hours are agreed with the planning authority. In response, these measures all form part of the noise mitigation and management control measures included in Section 17.6.2 in Chapter 17 of the EIAR and will be complied with.
- 4.8.14 Once the various mitigation measures are put in place and the limit values complied with, noise impacts associated with the construction phase will be of moderate to significant, short term impact. Highest noise impacts will occur during periods of excavation, particularly in areas where sections of hard rock are to be excavated. The use of drill and blast methods will likely be chosen in these areas. Further discussion on the control of noise and vibration during blasting is included in Section 4.9 of this Statement of Evidence.

- 4.8.15 The assessment has indicated that the use of standard construction activities can operate within the recommended vibration limits for standard residential and other light-framed buildings. With the adoption of best practice methodologies for the control of vibration from blasting, potential vibration impacts at the most sensitive premises can be adequately mitigated to within acceptable levels.
- 4.8.16 Submissions OB_222, Ob_O_511.07, Ob_584 and S_044 raise issues relating to construction traffic and the potential noise impact associated with increased HGV's. In response, the potential impact of additional construction traffic is assessed within Section 17.5.3.2 of Chapter 17 Of the EIAR. The assessment has reviewed expected construction traffic volumes required to transport the materials extracted and delivered to site. A total of 16 public roads have been identified as required haul routes where construction traffic will be permitted to travel along. The identified haul routes are illustrated in Figures 7.001 & 7.002 in Volume 3 of EIAR.
- 4.8.17 The assessment has determined that the volume of additional construction traffic along the majority of the haul routes is negligible (<1dB) due to the existing volume of traffic along these roads and the relatively low additional HGV and LGV traffic per day forecast. The greatest increase in noise levels is calculated along the Bearna to Moycullen Road (L1321), the Cappagh Road and along Bóthar Nua. The overall impact along these roads is determined to be moderate short-term as a result of construction traffic.

4.9 Impacts of blasting during construction

Issues

- 4.9.1 A number of submissions raise issues relating to blasting during construction, in particular concerns relating to potential for structural damage, assurances relating to control measures during this phase including structural surveys of buildings and vibration monitoring. The following submissions raised these issues:

Ob_111	Ob_298	Ob_584	S_046
Ob_136	Ob_496	Ob_654	S_055
Ob_159	Ob_511.06	Ob_678	S_062
Ob_201	Ob_O_511.18	Ob_O_696.21	S_063
Ob_207	Ob_512	Ob_717_720_721	S_066
Ob_252	Ob_603	S_038	S_074

Response

- 4.9.2 Blasting will be required at a number of locations along the route of the proposed road development and in proximity to access roads, stream diversions and attenuation ponds. Areas where blasting is likely to occur are identified in Figures 7.3.1 and 7.3.2 in Volume 3 of the EIAR. The extent of blasting will depend on the rock type and depth in the individual locations and the depth of the cutting involved. For the majority of identified locations, a relatively shallow blast depth is required. There are a number of locations along the route of the proposed road development where a cut depth of greater than 10m will be required as part of the construction of the proposed road development.
- 4.9.3 The Statement of Evidence for Soils and Geology by Juli Crowley discusses the potential geological impacts relating to blasting. The statement notes that blasting will only be undertaken in locations that are deemed suitable for blasting. A blast exclusion zone, where blasting is not permitted, will be implemented where a location is not suitable. The blast design uses site specific information to define the extent (radius) of the exclusion zone from the receptor (including dwellings).
- 4.9.4 For the proposed road development where a significant portion of hard rock is required to be excavated, the use of drill and blast will enable extraction works to be undertaken at a significantly faster rate compared to traditional rock breaking techniques.
- 4.9.5 Whilst drill and blast methods generates clearly perceptible noise and ground vibration levels during an event, the duration is momentary and effects and impacts can be well controlled through the use of the limit values discussed in Section 17.2.2.1 of Chapter 17 of the EIAR.
- 4.9.6 The limit values are set in terms of Air Over Pressure (AOP) and Peak Particle Velocity (PPV). These are the two key parameters used for assessing noise and vibration from blast events. The vibration limits for blast events within the EIAR are set in accordance with best practice national and international guidance documents for this activity. These limit values are set in order to prevent any cosmetic or structural damage to properties adjacent to the works.
- 4.9.7 In order to control any potential impacts to structures in proximity to blasting, specific blast control techniques will be undertaken in line with those prescribed within *BS 5228-2:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Vibration* in addition to experienced blast control techniques used by the contractor.

4.9.8 Best practice control measures are outlined in Section 17.6.2.2 of Chapter 17 of the EIAR in order to ensure the relevant limits values are not exceeded. These will include some or all of the following:

- All blasting will be undertaken by professionally trained blast contractors
- Restriction of hours within which blasting can be conducted (09:00 – 18:00hrs)
- Trial blasts will be tested in less sensitive areas to assist in blast designs and identify potential zones of influence
- Explosive charges will be properly confined by a sufficient amount of stemming
- Blasting contractors will ensure that the minimum amount of primer cord is used, and that no primer cord is located above ground
- Profiling will be carried out after each blast in order to ensure the geometry of the rock face can be established, enabling the optimum burden and spacing to be applied for subsequent blasts
- The design, execution and completion of any blasting within 150metres of any existing structure shall require special considerations. This will include the use of pre and post condition structural surveys by a competent structural engineer
- Ground vibration and air over pressure (AOP) will be recorded simultaneously for each blast at the most sensitive locations, depending on the works area being blasted
- When blasting moves into a new area, an initial low level blast will be carried out (i.e. a low Maximum Instantaneous Charge (MIC)) and monitoring will be carried out simultaneously at a number of sensitive properties in different directions in order to generate specific scaled distance graphs
- The scaled distance graphs will be used to determine the optimum MIC for subsequent blasts area in order control vibration and AOP limits below the relevant limit values (as set out in Section 17.2.1 of Chapter 17 of the EIAR) at the nearest sensitive buildings

4.9.9 A Public Communications Strategy will be implemented prior to the commencement of any blast works. This will include the following:

- Relevant nearby residents will be notified before any work and blasting starts (e.g. a minimum of 24-hour written notification)
- The firing of blasts will be undertaken, where possible, at similar times to reduce the ‘startle’ effect

- Ongoing circulars will be issued informing people of the progress of the blasting works
- The implementation of an onsite documented complaints procedure will be maintained by the contractor
- The use of independent monitoring will be undertaken by external bodies for verification of results

Property Condition Surveys

- 4.9.10 Property condition surveys will be offered for all buildings within 50m of the proposed development boundary and those within 150m of proposed blasting works along the proposed road development. Property condition surveys will also be carried out at buildings and structures considered appropriate relative to their proximity to the works. Such property condition surveys shall be carried out by a Chartered Surveyor or Chartered Structural Engineer. Such property condition surveys, subject to the written agreement of relevant property owners, shall be carried out in two stages as the follows:
- the first stage shall consist of pre-construction condition surveys including photographic records which shall be carried out prior to the commencement of construction
 - the second stage shall consist of post-construction condition surveys which shall include photographic records
- 4.9.11 Submissions S_046 and S_055 have requested that properties extending out to 250m from a blast event are included in the structural surveys. In response, the 150m distance from the works are set in order to capture the closest potentially affected properties. Surveys of sensitive buildings at this distance will ensure that sufficient controls are in place to prevent any damage at those closest to the works such that those further away will be protected. Surveys will be carried out at buildings and structures considered appropriate relative to their proximity to the works as noted in Section 4.9.9 above and stated in Section 17.6.2.3 of the EIAR.
- 4.9.12 In summary, it is acknowledged that blasting by its nature generates high noise levels during a blast event and will result in perceptible noise and vibration levels when detonated. Whilst drill and blast methods generate intermittent high noise levels when taking place, the time period over which impacts are experienced are significantly shorter compared to other extraction methods. The control measures outlined in the EIAR and summarised above are included in order to ensure properties are fully protected from any damage relating to blasting during the construction phase of the proposed road development.

5 Conclusion

- 5.1 An assessment of the potential noise and vibration impacts of the proposed road development has been carried out for both the construction phase and the operational phase within Chapter 17 of the EIAR.
- 5.2 Many of the issues raised in the submissions and objections to the proposed road development, as discussed in Section 4, are addressed in detail in Chapter 17 of the EIAR.
- 5.3 During the construction phase, the use of best practice noise control measures, hours of operation, scheduling of works within appropriate time periods, strict construction noise limits and noise monitoring during this phase will ensure impacts are controlled to within the adopted criteria.
- 5.4 Vibration impacts during the construction phase will be well controlled through the use of low impact equipment and adherence to strict limit values which will be subject to monitoring at the nearest sensitive buildings.
- 5.5 Blasting will be designed to ensure the appropriate limit values are not exceeded at adjacent buildings and structures in order to ensure no structural damage can occur. Pre and post property condition surveys will be undertaken at all properties within 150m of blast works. Vibration and noise monitoring will be undertaken during all blast events.
- 5.6 The guidelines used in the assessment for noise and vibration are best practice and in line with those used for all national road projects across Ireland.
- 5.7 During the operational phase, noise levels will be increased at noise sensitive locations along the length of the proposed road development and a long-term change in the noise environment will occur.
- 5.8 Whilst noise levels of varying increases and impact magnitudes are calculated at the assessment locations, the incorporation of a low noise road surface and the use of extensive noise barriers along the proposed roadside boundary will reduce noise levels to within the design goal of 60dB L_{den} or to the pre-existing Do Minimum noise levels.
- 5.9 Residual noise levels at a small number of locations will remain above the 60dB L_{den} design goal by 1 to 2dB. The assessment has concluded that changes in road traffic noise levels will be negligible to major in accordance with DMRB guidance.
- 5.11 Whilst the proposed road development will result in increased noise levels at noise sensitive locations along its route, it has been designed to reduce operational noise levels to within national design guidelines through the incorporation of detailed noise mitigation measures. The TII noise design goal protects the majority of the exposed population being highly annoyed by road traffic noise.

- 5.12 The number of properties along the route of the proposed road development is relatively low compared to those within the city centre which are currently exposed to significantly higher noise levels from passing road traffic. The reduction in high volumes of traffic traversing the city centre will result in a moderate to major positive noise impact to an extensive number of noise sensitive properties along the existing road network.
- 5.13 In conclusion, each of the issues relating to noise and vibration have been reviewed and responded to within this Statement of Evidence. In responding to the issues raised, the relevant sections of Chapter 17 of the EIAR, its associated Figures and Appendices have been directly referred to and summarised in this Statement of Evidence. Where required, additional calculations or validation of information has been provided to respond to specific queries. It is concluded that nothing raised in the submissions/ objections results in changes to the conclusions of Chapter 17 of the EIAR.