

**N4 Collooney to Castlebaldwin  
Oral Hearing**

**Compulsory Purchase Order**

**and**

**Environmental Impact Statement  
Oral Hearing**

**Brief of Evidence**

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of  
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## 1.0 INTRODUCTION

My name is Jennifer Harmon. I am a Senior Acoustic Consultant with AWN Consulting which is a multi-disciplinary environmental and acoustic consultancy company. I hold a degree in Environmental Science from the University of Ulster and a Diploma in Acoustics and Noise Control from the Institute of Acoustics, of which I am a full member. I have over thirteen years' experience working as an acoustic consultant and have prepared several impact assessments for various transport, industrial, commercial and leisure developments throughout Ireland.

AWN Consulting Limited was commissioned to conduct a detailed appraisal of the potential noise and vibration impacts associated with both the construction and operation of the N4 Collooney to Castlebaldwin proposed road development.

Chapter 8 in Volume 2 of the Environmental Impact Statement (EIS) for the proposed road development contains details of the noise study performed in accordance with the National Roads Authority publication *Guidelines for the Treatment of Noise and Vibration in National Road Schemes* (October 2004).

## 2.0 METHODOLOGY

### 2.1 Baseline Noise Survey

Full details of the baseline noise survey are contained within Table 8.1 and 8.2 of Chapter 8 of Volume 2 of the EIS. The survey locations are illustrated in Figures 8.1.1 to 8.1.8 in Volume 3 of the EIS.

The existing noise climate along the route of the proposed road development was quantified by measurement in accordance with the survey methodology laid down in *Guidelines for the Treatment of Noise and Vibration in National Road Schemes*. Measurements were performed in the vicinity of 24 locations. The survey programme included both unattended 24-hour and attended short-term measurements.

Surveys were conducted at properties in proximity to both the existing N4 and the proposed realigned road. A large number of properties in proximity to the existing N4 face directly onto the main carriageway at close distances. Noise levels at these properties were noted to be typically above 60dB  $L_{den}$ . The primary contributor to noise build-up in the area was road traffic on the existing N4, and distance traffic from other local roads. At properties set back from the existing N4 noise levels were noted to be influenced by traffic along local roads, distant traffic from the N4 road farm machinery, birdsong and rustling foliage.

No significant source of vibration was observed during the survey periods.

### 2.2 Construction Phase

The construction phase will primarily involve the construction of the realigned N4 which in essence be a linear development involving typical road building activities, namely site clearance, construction of cuttings and embankments, structures, road surfacing and other ancillary infrastructure.

Indicative noise prediction calculations were undertaken for a range of activities associated with typical construction activities associated with construction of the

proposed development. These predictions were performed in accordance with ISO9613<sup>1</sup> using source data taken from BS5228 Part 1<sup>2</sup>.

Consideration has also been given to the potential for large volumes of spoil to be excavated from the road development. This spoil will be transferred to a number of identified spoil repository sites occurring predominately within the confines of the proposed road development. Indicative noise levels at the closest properties to these sites have been calculated using the same source and calculation standards noted above. The assessments assume a worst case analysis of expected mobile plant and working hours. This assessment is summarised in Section 8.4.2 of the EIS.

The maximum permissible noise and vibration limit values for construction activities from the proposed development, put forward by the NRA are directly referenced in Tables 8.9 and 8.14 respectively in the EIS.

There is also a potential for suitable material to be sourced locally as part of the construction phase. These sites will involve soil and rock excavation, with the potential for rock breaking and blasting. In this regard the control of noise and vibration from these sites have been set in accordance with the guidance document *Environmental Management in the Extractive Industry, EPA, 2004; Quarries and Ancillary Activities – Guidelines for Planning Authorities – Department of Environment, Heritage and Local Government (DoEHLG)*. Specific details relating to these sites are included in Appendices 8.2 and 8.3 within Volume 4 of the EIS.

## 2.3 Operational Phase

Guidance contained within the document *Guidelines for the Treatment of Noise and Vibration in National Road Schemes*, published by the National Roads Authority has been used to assess the proposed road development. This is the appropriate approach for new national road schemes in Ireland.

Road traffic noise calculations were conducted using an acoustic modelling package (Brüel and Kjaer '*Predictor*'), which generates predicted noise levels for selected receiver points. The prediction methodology is based on the calculation of road traffic noise (CRTN) method which is the approved calculation method set by the NRA and which is also prescribed in the Irish Environmental Noise Regulations (2006).

The model incorporates the various stages of the CRTN method for predicting noise from a road development taking into account the source generated characteristics of road traffic noise and the propagation of sound. In this instance information relating to traffic volumes, traffic profiles, traffic speed, road surfaces and other contributors was inputted into the model. In addition the various factors affecting the propagation of sound including distance, ground attenuation and topography were also taken into account using accurate 3D information.

Road traffic models were developed for two scenarios, the 'Do Minimum' scenario which assumes the existing road network remains unchanged and the 'Do Something' scenario which incorporates the proposed road development. Traffic volumes for the 'Do Something' scenario for both the opening year of 2017 and the design year of 2032 are based on the *high growth* scenario flows in order to conduct a worst case assessment.

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<sup>1</sup> ISO9613-2:1996 *Acoustics – Attenuation of sound outdoors – Part 2: General method of calculation*

<sup>2</sup> BS 5228: 2009: *Code of practice for noise and vibration control on construction and open sites – Part 1: Noise*

Traffic noise levels have been predicted at a total of 86 receiver locations within the EIS, these being representative of the closest residential noise sensitive locations along the proposed route and a number of sample locations along the existing N4 Road. Additional assessment locations at adjoining properties have been assessed since the publication of the EIS to respond to individual landowner and residents queries. At all locations the relevant  $L_{den}$  value was calculated taking into account the relevant factors contributing to road traffic noise. The aforementioned 86 receiver locations are detailed in Figures 8.1.1 to 8.1.8 in Volume 3 of the EIS.

The predicted traffic noise levels were compared against the following conditions for mitigation as set out in the NRA guidance document.

- (a) The combined expected maximum traffic noise level, i.e. the relevant noise levels, from the proposed road scheme together with other traffic in the vicinity is greater than the design goal, i.e. 60dB  $L_{den}$ ;
- (b) The relevant noise level is at least 1dB more than the expected traffic noise levels without the proposed road scheme in place, and;
- (c) The contribution to the increase in the relevant noise levels from the proposed road scheme is at least 1dB.

Where the three conditions are satisfied, mitigation has been assessed for individual properties.

The design of noise mitigation in the form of noise barriers was undertaken for specific properties which were identified to require noise mitigation. The length and height of barriers at each location was determined taking into account local site characteristics including road alignments, ground topography and the level of noise reduction required. Residual noise prediction calculations were then performed, taking into account the effects of the proposed mitigation measures.

## **3.0 PREDICTED IMPACTS**

### **3.1 Construction Phase**

Section 8.4.2 of Volume 2 of the EIS discusses the noise and vibration impact of the construction phase in detail. A number of scenarios have been considered, including the construction of the mainline and associated junctions and structures, the transfer and processing of spoil at repository sites within the CPO (and potentially external to the CPO) and the excavation of soil and rock material from borrow pits (associated with the spoil repositories) adjacent to the mainline construction works.

#### General Construction Works

For works associated with the mainline and ancillary construction, indicative calculations of individual plant items have been conducted as part of the noise impact assessment at varying distances from the works.

The assessment has indicated that at distances greater than 20m the noise levels from individual plant items will be within the range of recommended construction limit values for daytime periods. During periods where a number of plant items are in operation simultaneously, noise levels would be increased.

The potential for vibration at neighbouring sensitive locations during construction is typically limited to excavation works, rock-breaking operations and blasting, where

required. Whilst such vibration may be perceptible at low levels at properties in very close proximity to these activities, the magnitude of vibration will be controlled to be within the limit values specified in the NRA *Guidelines for the Treatment of Noise and Vibration in National Road Schemes*. These limit values have been specified to ensure that vibration is well below a level which would give rise to cosmetic or structural damage to buildings.

#### Spoil Repositories within confines of the Proposed Development

Specific sites have been identified for spoil deposits and or treatment within the confines of the CPO which are set out in the Spoil Management Report contained within Appendix 4.3 of Volume 4 of the EIS. An outline work programme has been established for these sites based on the assumed level of activity likely to be required. This information has been used to calculate noise levels at the nearest properties. Indicative worst case calculations indicate that noise levels at the closest properties are below the recommended construction noise criterion. This is mainly due to the distance of any noise sensitive properties to these sites.

#### Potential associated activities outside the CPO of the Proposed Development

Although unlikely, there is a potential for surplus spoil to be deposited and treated at sites external to the CPO line, this is a possible cumulative and indirect impact of the Proposed Road Development. To this end, a range of possible sites which appear to be broadly suitable have been identified within the Spoil Management Report and indicative noise levels have been calculated at the nearest noise sensitive properties to each. The results of the assessment indicate that activities within these sites could operate within the construction noise criterion for the worse case scenarios assessed.

#### Borrow Pits

The EIS notes that borrow pits may be excavated within the CPO with the objective of sourcing some of the required construction materials for the Proposed Road Development and accepting thereafter spoil material. In this instance, specific noise and vibration impact assessment have been undertaken for the key identified sites using a range of potential activities. Noise levels associated with these sites will be controlled to noise levels not exceeding 55dB  $L_{Aeq, 1hour}$  in accordance with guidance from Environmental Management in the Extractive Industry *Quarries and Ancillary Activities (EPA 2004)*. This limit will ensure that in areas where road works and Borrow pits are in close proximity, the cumulative noise level will be controlled to not exceed the NRA construction noise criterion at the nearest noise sensitive locations.

Indicative calculations made at the closest noise sensitive properties indicate that works from these pits can operate below the adopted 55dB  $L_{Aeq, 1 hour}$  for these sites.

The potential for vibration at neighbouring sensitive locations at these properties will be from potential rock-breaking or blasting if required. Any works undertaken will be required to operate within the vibration limits set out in the respective impact assessments contained within Appendices 8.2 and 8.3 of the EIS. These limit values are taken from the EPA reference document and British Standard guidance documents BS 5228<sup>3</sup>-2 and BS 7385<sup>4</sup>.

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<sup>3</sup> BS 5228, 2009. *Code of practice for the control of noise and vibration from construction and open sites – Part 2 Vibration*

<sup>4</sup> BS 7385, 1993. *Evaluation and measurement for vibration in buildings. Part 2: Guide to damage from groundborne vibration.*

## 3.2 Operational Phase

### Noise

Section 8.4.1 of Volume 2 of the EIS details the assessment of operation phase noise due to the proposed road development. In the assessment, the traffic noise predictions were performed for both the Do Minimum and Do Something scenarios. For the purposes of this assessment a standard Hot Rolled Asphalt (HRA) road surface has been assumed for all roads.

The assessment has determined that during the design year operational phase (2032), six locations satisfy the requirements for noise mitigation. At the remaining locations the traffic noise level during the 'Do Something' scenario is either below the design goal or is less than or equal to the 'Do Minimum' level.

### Vibration

With regard to vibration, it has been found that ground vibrations produced by road traffic are unlikely to cause perceptible structural vibration in properties located near to well-maintained roads. Therefore maintenance of the road surface will ensure that vibration from vehicular traffic is not significant. Further mitigation measures are not necessary.

## 4.0 MITIGATION MEASURES AND RECOMMENDATIONS

### 4.1 Construction Phase

Section 8.5.2 of Volume 2 of the EIS discusses the mitigation measures proposed for the construction phase. In summary, the contract documents for the project will clearly specify that the Contractor undertaking the construction of the works will be obliged to take specific noise abatement measures and comply with the recommendations of BS 5228: Part 1 and the *European Communities (Noise Emission by Equipment for Use Outdoors) Regulations, 2001*. These measures will ensure that:

- No plant used on site will be permitted to cause an on-going public nuisance due to noise.
- The best means practicable, including proper maintenance of plant, will be employed to minimise the noise produced by on site operations.
- All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of the contract.
- Compressors will be attenuated models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools shall be fitted with suitable silencers.
- Machinery that is used intermittently will be shut down or throttled back to a minimum during periods when not in use.
- The use of construction site hoarding or localised screens will be used in work areas or around individual items of plant, where works have the potential to exceed the construction noise criteria.
- During the course of the construction programme, supervision of the works will include ensuring compliance with the limits detailed in Table 8.9 using methods outlined in BS 5228 "*Noise and Vibration Control on Construction and open sites*".

## 4.2 Operational Phase

The design option that has been adopted for the mitigation of noise associated with the project is the use of noise barriers. The mitigation measures have been specified based on the predicted noise levels for the design year of 2032 using high growth traffic volumes in order to ensure adequate mitigation is provided for the worst-case scenario. Specific noise mitigation measures have been proposed for the six locations determined to require noise mitigation. The details of these mitigation measures are provided in Section 8.5.1 of Chapter 8 in Volume 2 of the EIS and illustrated in Figures 8.1.1 to 8.1.8 in Volume 3 of the EIS and in Section 2.6 of the *Environmental Impact Statement - Errata No. 1* document issued as part of the oral hearing.

For this development, noise mitigation measures have been derived in consultation with the road engineers and are indicative of the current development design. The mitigation requirements for the development will be further progressed during the detailed design and construction phase of the project, should approval be granted, taking into account the available construction techniques and technologies at the time of development. It is possible, for example that the vertical alignment may change during the final construction design which in turn could reduce or increase the requirements for noise mitigation. Any changes to the development design likely to result in the increase of noise at any noise sensitive receptor would require an updated noise assessment to ensure that the NRA design goals for noise are complied with at all noise sensitive receivers.

There are five locations highlighted in the EIS chapter and one additional location identified since publication where the Proposed Road Development meets all three of the conditions that must be satisfied before noise mitigation measures are deemed necessary. In this instance, mitigation measures have been specified for each of these locations. Once mitigation measures are taken into consideration all locations comply with the adopted criterion.

Due to the rural nature of the existing environment along the majority of the proposed road development, there will be an increase in noise levels to the surrounding environment once the development is in operation, particularly at properties which are currently set back from the N4 road. Whilst there will be an increase in noise, the actual level of noise emissions will be within the guidance level of 60dB  $L_{den}$  at the facades of the residential locations for the worst case assessment undertaken, (i.e. for the future design year using high growth traffic). For properties along the existing N4 road where the road remains on-line, noise levels are predicted to remain nominally unchanged compared to the 'Do Minimum' scenario and hence will experience a neutral impact. A positive impact will be experienced at properties along the existing N4 road where the realigned road will be moved off-line from these properties.

## **5.0 RESPONSE TO OBJECTIONS**

A number of submissions have been made with regard to the noise impact of the proposed road development. The key concerns outlined in the submissions received are addressed below.

### **5.1 Use of Noise Criteria for Scheme**

Comment has been made in a number of submissions stating that mitigation is required to ensure that the road complies with WHO standards. In response, the WHO guidelines are not applicable for road schemes in Ireland and have not formed part of any noise criteria or conditions for any road or transport project in Ireland to date, nor have they been transposed into any Irish statutory guidelines. The WHO guidelines are therefore not applicable to this project.

The most relevant guidelines for the road development in question are the NRA *Guidelines for the treatment of noise and vibration in national road schemes* (2004). These guidelines are those used for the assessment of new roads throughout Ireland and have formed the basis of noise control for all new road schemes since their publication. The design goal for noise mitigation is outlined in Section 8.1.2 of the EIS under the section *Design Goal for Specifying Mitigation Measures*, which is set as 60dB  $L_{den}$ . This design goal has been set taking into account a number of international standards and guidelines relating to road traffic and environmental noise.

In this instance, when assessing the requirement for noise mitigation in Ireland for new road schemes, the national agreed design goal of 60dB  $L_{den}$  is applied to ensure a uniform and best practice approach across the country.

### **5.2 Noise Monitoring**

A large number of submissions have stated “*Noise Monitoring Proposals are Inadequate*” as part of their objections.

In response, as part of the noise impact assessment for the project, a detailed baseline survey has been undertaken along the length of the route. The baseline surveys have been undertaken in line with the NRA’s *Guidelines for the Treatment of Noise and Vibration in National Road Schemes* and are not considered to be inadequate. It is important to note that the baseline survey data is used as a tool to help characterise the existing noise environment along the route. The baseline data is however not used to develop the noise model for the proposed road for future years. This is based on the various input data for road schemes such as traffic flows, traffic speeds, alignment profiles and the other various factors relating to the propagation of sound.

As part of the construction phase, the various best practice noise control methods for construction sites set out in British Standard BS 5228 (2009) will be employed by the contractor to ensure the works are undertaken within the construction noise criteria. The use of noise monitoring will be employed by the contractor, where required to ensure the noise criteria are not exceeded.

### **5.3 No Specific Assessment at Landowners Property**

Some submissions have queried why their property has not been included in the noise impact assessment. In response, a total of eighty six assessment locations have been modelled as part of the noise impact assessment. This includes residences along both the existing N4 road and those along the proposed realigned road section.



Whilst not every property along the length of the development has been included within the noise impact assessment, the equivalent road traffic noise level has been predicted at an adjacent house, for example along a row of houses at an equivalent distance from the road. The range of properties assessed within the EIS has provided sufficient information for the noise assessment of the proposed road development and for the determination of mitigation required for either individual or groups of properties along the road. As part of on-going consultation for the project, however, where individual landowners have requested the specific noise level at their property, Sligo County Council have provided this information through additional noise modelling. At all additional locations assessed, the predicted road traffic noise level has been confirmed to be below the design goal of 60dB  $L_{den}$ .

#### **5.4 Noise Prediction Queries**

Two submissions in the vicinity of chainage 100 to 300 have queried the noise predictions at their property. In response, the predicted noise levels take account of a range of factors including reduced traffic flows during the Do Something scenario on the mainline in the vicinity of these properties, the local road realignment, realignment works to the mainline, boundary lines etc. The various contributions of these factors to noise levels at the individual properties have all been taken into account and are considered to be valid. At the properties in question, operational noise levels are not increased when compared to the Do Minimum scenario and a positive to neutral impact is predicted.

#### **5.5 Noise Mitigation**

Section 8.1.2 of the EIS set out the criteria for determining the requirement for noise mitigation. The criteria are those set for road schemes throughout Ireland, as specified in the NRA's guidance document. Noise mitigation measures are provided whenever all of the three conditions as set out in Section 2.3 of this brief are satisfied. The assessment undertaken within the EIS has assessed the most exposed properties adjacent to the proposed development and has assessed each against the criteria for noise mitigation.

Whilst it is acknowledged that properties in proximity to the new alignment will experience an increase in noise levels, these have been assessed within the noise section of the EIS. The road side barriers set out in the EIS are those which have been determined necessary for locations where the three criteria for noise mitigation have been met. The residual noise levels within the EIS have taken account of the noise mitigation incorporated into the scheme. With the noise mitigation measures in place, the residual noise level at all locations have been sufficiently reduced to below the traffic noise design goal of 60dB  $L_{den}$  or below the 'Do Minimum' noise level in the absence of the proposed scheme and are considered to be acceptable. In addition, traffic noise levels at properties along sections of the existing N4 will be reduced where the road is moved off line, and hence a positive impact will be experienced at these properties.