CLIENT: An Bord Pleanála

PROJECT: Slane Bypass Noise IA Review

Prepared by: AONA Environmental Consulting Ltd.

Date: June 2024

REPORT CONTROL

Client: An Bord Pleanála

Project: Slane Bypass Noise IA Review

Job Number: ENV-9229

Document Checking:

Author:	Mervyn Keegan, B.Sc, M.Sc. MIoA	Initialed:
Review By:	Olivia Maguire, B.Sc, M.Sc.	Initialed:

Issue	Date	Status	Checked for Issue
1	20/06/2024	Draft	MK
2	27/06/2024	Final	MK

AONA Environmental Consulting Ltd.

Unit 8A,

Northwest Business Park,

Sligo

F91 E285

www.aonaenvironmental.ie

Contents

1 INTRODUCTION 1
1.1 Brief & Objectives. 1
1.2 Statement of Authority. 1
2 METHODOLOGY 2
2.1 Documents Reviewed. 2
3 REVIEW OF ASSESSMENT METHODOLOGY 3
3.1 Guidance – Noise. 3
3.2 Existing Environment (Baseline) Assessment – Noise. 3
3.3 Construction Effects – Noise. 4
3.3.1 Construction Noise Impact 4
3.3.2 Underwater Construction Noise Impact 5
3.4 Construction Effects – Vibration. 6
3.5 Operational Effects – Noise. 6
3.5.1 Noise Prediction Modelling 6
3.6 Operational Effects – Vibration. 7
4 PREDICTED NOISE LEVELS & IMPACT 8
4.1 Predicted Traffic Noise Levels 8
5 MITIGATION MEASURES 9
5.1 Mitigation Measures – Noise. 9
5.1.1 Construction Noise Mitigation Measures 9
5.1.2 Operational Noise Mitigation Measures 9
6 BRÚ NA BÓINNE UNESCO WORLD HERITAGE SITE 10
6.1 Noise Surveys at Brú na Bóinne UNESCO World Heritage Property 10
6.2 Noise Impact Prediction at Brú na Bóinne UNESCO World Heritage Property 11
7 RESIDUAL EFFECTS - NOISE 13
8 REVIEW OF RELEVANT SUBMISSIONS RECEIVED 13
9 ADVICE & TECHNICAL SUPPORT TO THE REPORTING INSPECTOR RE: CONDITIONS 29

1 Introduction

AONA Environmental Consulting Ltd. has been commissioned by An Bord Pleanála to review Chapter 9 Noise and Vibration of the Environmental Impact Assessment Report (EIAR) for the proposed N2 Slane Bypass and public realm enhancement scheme (hereafter referred to as the 'proposed scheme'). This chapter identifies, describes and presents an assessment of the likely significant noise and vibration impacts of the proposed scheme on the receiving environment during both the construction and operational phases of the proposed scheme.

1.1 Brief & Objectives.

AONA Environmental Consulting Ltd. has followed the brief outlined in the An Bord Pleanála document entitled, *Noise Consultancy Support – Slane By Pass 318573 23*. This brief outlined the work to be undertaken as follows:

1. *To review the information presented by the applicant relating to the topic of Noise in the EIAR.*
2. *To highlight any significant inadequacies in the documentation submitted with the application having regard to the nature of the proposed development and context of the surrounding area. Specific regard to be had to the adequacy of technical information in the assessment of potential effect upon the setting and context of Brú na Bóinne UNESCO World Heritage Site, and any other sensitive noise receptors.*
3. *To provide advice and technical support to the reporting inspector.*
4. *Review submissions (if any) that may be received by the Board following public consultation and provide input to the reporting inspector on the issues raised related to noise.*
5. *Advise on conditions to be included to address any likely main effects (if necessary) or matters to be further examined in any next phase.*
6. *Prepare a written memo providing a synopsis of matters considered and key issues discussed.*
7. *This brief may be subject to amendment as required by the Inspector, and in agreement with the consultant, as the case progresses.*

1.2 Statement of Authority.

Mervyn Keegan [B.Sc., M.Sc., MIoA, MIES, MIAQM] is the author of this Technical Review, whose qualifications include;

- M.Sc. Environmental Science, Queens University Belfast (1998)
- B.Sc. (Hons) Applied Biology, Coventry University (1996)
- Diploma in Pollution Assessment & Control, Institute of Technology, Sligo (1995)
- Diploma in Acoustics & Noise Control, Institute of Acoustics (University of Ulster, 2001)

Mervyn Keegan is a Director of AONA Environmental Consulting Ltd. and is a Member of the Institute of Acoustics, the Institute of Air Quality Management and the Institute of Environmental Sciences.

Mervyn has over 25 years of experience in Environmental Consultancy and his main areas of expertise are in Noise, Air Quality & Odour impact assessment and mitigation design as well as Environmental Impact Assessment and IPPC Licensing.

Mervyn has completed numerous Noise Impact Assessments for a range of project types including road projects, residential developments, industrial developments, wind farms, renewable energy developments, mineral extraction projects, etc. throughout Ireland, Northern Ireland and the UK in accordance with the relevant planning guidelines.

Mervyn has completed numerous Noise Impact Assessments for road projects, examples of which include N3 Virginia Bypass, N72-N73 Mallow Bypass, N52 Ardee Bypass, M20 Blarney to Patrickswell, N22 Baile Bhuirne to Macroom, N59 Oughterard to Clifden, N6 Bothar na dTreabh - Kirwan Roundabout Improvement, N16 Sligo to County Realignment among others.

2 Methodology

2.1 Documents Reviewed.

AONA Environmental has reviewed Chapter 9 Noise and Vibration of the EIAR in detail as well as reviewing the following relevant components of the EIAR;

- Chapter 4 Description of the Proposed Scheme
- Chapter 5 Description of the Construction Phase
- Chapter 8 Population
- Chapter 11 Human Health
- Chapter 13 Archaeological and Cultural Heritage
- Chapter 15 Biodiversity Terrestrial Ecology
- Chapter 16 Biodiversity Aquatic Ecology
- Volume 1 Non-technical Summary
- Appendix 9.1 Noise Meter Calibration Certificates
- Appendix 9.2 Receptor Locations
- Appendix 9.3 Baseline Noise Survey Data
- Appendix 9.4 Operational Noise Predictions
- Appendix 9.5 Operational Noise Prediction with Mitigation
- N2 Slane Location Map_EIAR_FINAL
- MDT0806 RPS 01 N2 DR C DM1000 A1 C01 Engineering Drawings
- MDT0806 RPS 01 N2 DR C DM1001 A1 C01 Engineering Drawings
- MDT0806 RPS 01 N2 DR C DM1002 A1 C01 Engineering Drawings
- MDT0806 RPS 01 N2 DR C DM1003 A1 C01 Engineering Drawings
- Submissions received by An Bord Pleanála with specific reference to noise impacts, as outlined in the document entitled 'MCC Submission Response EIAR ABP 318573 23'.

3 Review of Assessment Methodology

3.1 Guidance – Noise.

As outlined in Chapter 9 Noise and Vibration of the EIAR, the Noise and Vibration impact assessment has been undertaken in accordance with the principal national and European legislation as relevant to the assessment of potential noise and vibration impacts from the proposed scheme during the construction and operational phase.

In terms of the potential construction noise impact, the assessment has primarily been undertaken with reference to BS5228-1:2009 +A1:2014 Code of Practice for Noise and Vibration Control and Construction and Open Sites – Noise.

In terms of the potential construction vibration impact, the assessment has been undertaken with reference to BS5228-1:2009 +A1:2014 Code of Practice for Noise and Vibration Control and Construction and Open Sites – Vibration.

In terms of the potential operational noise impact, the assessment has primarily been undertaken with reference to the TII guidance which includes the Good Practice Guide for the Treatment of Noise during Planning of National Road Schemes (2014) and the Guidelines for the Treatment of Noise and Vibration in National Road Schemes (2004). The assessment has also been undertaken with reference to the LA 111 Sustainability and Environment Appraisal Noise and Vibration (Revision 2) from the Design Manual for Roads and Bridges from Highways England (2020).

The operational noise impact assessment has included reference to the Meath Noise Action Plan (2019) and The World Health Organisation (WHO) Environmental Noise Guidelines for the European Region (2018).

The significance of operational impact has been assessed using the classification of the significance of impacts set out in the EPA Guidelines on the information to be contained in Environmental Impact Assessment Reports (EPA, 2021). The guidance outlines that there are seven generalised degrees of effect significance namely, 'Imperceptible', 'Not Significant', 'Slight', 'Moderate', 'Significant', 'Very Significant' and 'Profound'.

Conclusion: *No significant inadequacies identified in the documentation submitted.*

3.2 Existing Environment (Baseline) Assessment – Noise.

The Noise and Vibration impact assessment the noise and vibration impact assessment has correctly determined that the noise and vibration sensitive receptors include all noise sensitive receptors within 300 meters of the center line of the proposed scheme and also includes locations adjacent to roads where traffic flows are reduced by 20% or more and where existing flows are increased by 25% as more as a result of the proposed scheme. A total of 1,391 receptors were considered in the noise model which includes residential receptors, schools, places of worship, hotels, commercial premises, etc. This is in accordance with best practice. The Brú na Bóinne UNESCO World Heritage Site has correctly been identified as a *'high sensitivity'* noise sensitive receptor.

The baseline noise surveys have been undertaken with reference to ISO 1996-1:2016 Acoustics – Description, Measurement and Assessment of Environmental Noise and the TII guidance which includes the Good Practice Guide for the Treatment of Noise during Planning of National Road Schemes (2014) and the Guidelines for the Treatment of Noise and Vibration in

National Road Schemes (2004).

The calibration certificates (as presented in Appendix 9.1) indicate that the sound level meters and acoustical calibrator used for the site surveys were within the specified manufacturer periods of calibration. This is in accordance with best practice.

The Noise and Vibration impact assessment outlines that unattended measurements for a period of 24 hours were undertaken at 4 locations and attended short term measurements (3 x 15 minutes) were undertaken at 20 locations in accordance with the relevant TII guidelines. For the extent of the proposed scheme and its zone of influence, this level of baseline noise monitoring is considered to be adequate and in accordance with best practice.

Table 9-15 and Figures 9.2 and 9.3 identify the location of the baseline noise monitoring survey locations in proximity to the existing N2 alignment through Slane village and in proximity to the proposed scheme alignment. Appendix 9.3 Baseline Noise Survey Data outlines how the L_{den} noise levels have been determined from the recorded noise levels at the selected noise monitoring locations. The methodology adopted is in accordance with the relevant TII guidelines.

In terms of underwater noise impacts in the River Boyne it was not considered necessary to carry out baseline underwater noise measurements. No specific methodology regarding underwater noise impact is outlined within the TII guidelines, and the approach taken is reasonable.

The noise surveys were undertaken during a period of partial lockdown due to the Covid epidemic in December 2021 and January 2022. Therefore, the noise impact assessment correctly references the approach outlined in the Association of Noise Consultants & Institute of Acoustics, *Joint Guidance on the impact of Covid-19 on the Practicality and Reliability of Baseline Sound Level Surveying and the Provision of Sound and Noise Impact Assessments* (January 2021). On review of the noise survey data, it is considered that the partial lockdown did not have a significant impact on the baseline noise levels as presented.

Conclusion: *No significant inadequacies identified in the documentation submitted.*

3.3 Construction Effects – Noise.

3.3.1 Construction Noise Impact

Appropriate absolute construction noise limit criteria in accordance with the guidance detailed in the TII documents has been outlined in the noise impact assessment. These absolute construction noise limit criteria relate to construction works during Monday to Friday normal working hours, Monday to Friday out of hours work, Saturdays, Sundays and Bank Holidays.

Reference has also been made to the ABC Method in Annex E of British Standard BS5228-1: 2009 + A1:2014 code of practice for noise and vibration control and construction and open sites - noise. This standard provides guidance on controlling the effect of construction noise based on existing ambient noise levels in an area and Has been used to assess impact when construction noise will occur during night-time.

Section 9.4.1 outlines the description of likely significant effects during the construction phase. Detailed construction noise impact prediction has been undertaken for the following; site enabling works, demolition works, earthworks, rock extraction and processing, watercourse works, road formation and paving, Boyne bridge, overpass and bridge structures, signage and

lighting, landscaping and public realm construction. This is outlined in detail from Section 9.4.1.1 to Section 9.4.1.11.

All of the above construction processes have been classified as either static works and/or mobile works. Suitable plant and equipment source noise levels have been referenced from BS5228 for the various work stages described above.

The predicted noise level at the nearest noise sensitive locations are presented for the various work stages described above, dependent on the distance to the construction activity. It is acknowledged that the duration of the various work stages will vary from location to location dependent on the construction program.

A determination has been provided as to whether or not the predicted construction noise levels from the various work stages described above are in excess of the TII construction noise daytime limit of 70 dB $L_{Aeq,\ 1\text{-hour}}$ at the nearest noise sensitive locations. In practice, it is likely that the noise levels will be below the relevant TI construction noise limits for the majority of the construction phase. However, there may be occasional higher levels of construction noise for short periods of time when plant is located at the nearest location to the boundary of the noise sensitive locations. Therefore, there may be temporary significant effects at a limited number of noise sensitive locations.

On account of the above, the recommendation for the application of best practice measures and detailed construction noise mitigation measures have been outlined in Section 9.5.1 with regard to specific noise sensitive locations where there may be temporary significant effects during the construction phase.

As outlined in Section 9.4.1.12, the predicted change in traffic noise levels during the construction phase was calculated using the Calculation of Road Traffic Noise (CRTN) methodology. The predicted change in traffic noise levels during the construction phase are predicted to range from '*imperceptible*' to '*not significant*' to '*slight*' along the various road links which have been assessed. Overall, the predicted change in noise level during the construction phase will be less than a 1.5 dB increase at the worst affected noise sensitive locations.

Due to the temporary nature of the construction phase and the detailed assessment undertaken, it is concluded that there will not be a significant construction noise impact due to the proposed scheme.

Suitable criteria for eligibility of temporary rehousing has been outlined with reference to section E.3 of BS5228-1:2009 +A1:2014. The assessment has concluded that it is highly unlikely that any of the noise sensitive locations in proximity to the proposed scheme will meet the criteria for temporary accommodation.

Conclusion: *No significant inadequacies identified in the documentation submitted.*

3.3.2 Underwater Construction Noise Impact

As outlined in Section 9.4.1.7.2, the construction phase will include the installation of cofferdams using sheet piling and foundation piles for the bridge piers. The cofferdams will be constructed 10 meters from the side of the River Boyne and the board piles will be installed at a distance of in excess of 12 meters from the sides of the river channel. The sheet piles will be installed using a press-in piling technique. The foundation piles will be installed using a bored piling rig. Press-in piling and bored piling techniques are low impact methodologies.

The assessment references underwater noise monitoring during a horizontal directional drilling project under the River Foyle. Table 9-38 outlines predicted underwater noise levels from bored piling. The predicted underwater noise levels are below the potential impact thresholds and it is concluded that there will be no underwater noise impact from piling operations for the bridge piers. The project ecologist has considered the predicted noise levels in relation to potential impacts on fish in Chapter 16 - Biodiversity: Aquatic Ecology.

Conclusion: *No significant inadequacies identified in the documentation submitted.*

3.4 Construction Effects – Vibration.

Appropriate absolute construction vibration limit criteria in accordance with the guidance detailed in the TII documents has been outlined in the vibration impact assessment. The absolute construction vibration limit criteria ensure that there is no risk of cosmetic damage to buildings in proximity to the construction works for the proposed scheme.

The assessment also outlines the threshold of perception in terms of the sensitivity of human beings to vibration, as being typically in the range of 0.14 mm/s to 0.3 mm/s peak particle velocity (PPV). It is acknowledged that vibration above these levels can disturb startle cause annoyance or interfere with work activities.

The significance of effect described in the DMRB guidance states that *"construction vibration shall constitute a significant effect where it is determined that a major or moderate magnitude of impact will occur for (1) a duration exceeding 10 or more days or nights in any 15 consecutive days or nights, (2) a total number of days exceeding 40 in any six consecutive months".* The vibration impact assessment includes a suitable vibration significance rating.

As outlined in Section 9.4.1.13, the vibration impact assessment includes a suitable methodology for the prediction of vibrations due to construction activities. Geometric spreading means that vibration levels decrease exponentially as the distance from the source to the receiver increases. Due to the relative distance between the proposed construction activities with the potential to cause a vibration impact and the nearest sensitive dwellings, construction vibration levels from the construction works on the proposed scheme are predicted to be below the TII criteria and are most likely to be below the threshold of perception at the nearest sensitive locations.

Conclusion: *No significant inadequacies identified in the documentation submitted.*

3.5 Operational Effects – Noise.

3.5.1 Noise Prediction Modelling

Noise prediction modeling has been undertaken using Predictor LimA 7810 noise modeling software. This noise modeling software was used to predict the noise impact from the proposed scheme at properties in proximity to the existing into alignment and in proximity to the proposed scheme alignment. Traffic noise levels were predicted using the methodology set out in the Calculation of Road Traffic Noise (CRTN) with the application of the relevant conversion factors as detailed in the TI guidelines.

The noise prediction modeling methodology and the inputs to the noise model are fully in accordance with the expected assessment methodology.

The following scenarios were modelled:

- Base Year 2021;
- Opening Year 2026: Do-Minimum and Do-Something scenarios;
- Opening Year 2026: Do-Something scenario with mitigation; and
- Design Year 2041: Do-Minimum and Do-Something scenarios;
- Design Year 2041: Do-Something scenario with mitigation.

Noise model validation is an important component of any noise prediction assessment. The TII guidelines state that "*whilst there is no need for further validation of the established CRT N prediction methodology, the authority considers that the noise models themselves should be validated in order to ensure that the roads, topography and other crucial features have been correctly represented and incorporated into the model. This could be done in a number of ways, for example, the survey results could be compared with the predicted results obtained using traffic data that are representative of the conditions during the period when the survey was conducted. The exact method of validation is left to the discretion of the acoustic engineer*".

Two unattended 24-hour locations have been selected for model validation. The survey locations 24-1 and 24-3 are reported to exhibit good agreement between the noise model and the noise level measurements and therefore, it is considered that the noise modeling software is correctly interpreting the input data. It is concluded that the model is validated.

It is standard procedure to use the unattended 24-hour survey locations for accurate model validation. However, there is no description given as to why the 24-hour survey locations 24-2 and 24-4 were not investigated for model validation purposes. The 24-hour survey location 24-2 is relatively proximate to the existing N2 alignment and therefore, it is considered that this is a suitable location for traffic noise prediction model validation. The 24-hour survey location 24-4 is relatively remote from the existing N2 and N51 alignment and therefore, it is considered that this may not have been a suitable location for a traffic noise prediction model validation.

Conclusion: *No significant inadequacies identified in the documentation submitted.*

3.6 Operational Effects – Vibration.

The TII Guidelines (2004) state: *"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 and smooth road surfaces. The Authority does not therefore consider it necessary to set limits for vibration during the operational phase of a road scheme."* Hence, vibration during the operational phase of the Proposed Scheme has not been considered further.

Conclusion: *No significant inadequacies identified in the documentation submitted.*

4 Predicted Noise Levels & Impact

4.1 Predicted Traffic Noise Levels

1,391 receptors were assessed for road traffic noise as outlined in Appendix 9.2. In accordance with correct procedure, existing and proposed traffic noise predictions were undertaken adjacent to multiple façades and elevations (depending on the number of storeys) as the most exposed façade to existing and proposed traffic flows.

In accordance with the TII guidelines, mitigation measures are deemed necessary when the following three conditions are met at sensitive receptor locations:

(a) the combined expected maximum traffic noise level, i.e. the relevant noise level, from the proposed road scheme together with other traffic in the vicinity is greater than the design goal of 60 dB L_{den};

(b) the relevant noise level is at least 1 dB more than the expected traffic noise level without the proposed road scheme in place; and

(c) the contribution to the increase in the relevant noise level from the proposed road scheme is at least 1 dB.

Table 9-51 presents the predicted noise levels for the Do-Minimum scenario and Do-Something scenario in the Opening Year (2026) and in the Design Year (2041) and compares the calculated results against the three conditions for noise mitigation as outlined in the TII Guidelines.

In order to reduce road traffic noise the proposed scheme will be constructed using a low noise road surface. The TII guidelines state that "*in the current state of knowledge and until best practice is established, it is recommended that where site-specific surface noise measurements are not available the corrections shown in Table 4.1 are made for road surface noise, for all traffic speeds and compositions, in preference to the advice provided in Paragraph 16 of CRTN. This table shows the benefit of a low noise road surface without unduly exaggerating its effectiveness over the maintenance life cycle. Where site-specific surface noise measurements have been made alternative corrections may be used".* A low noise porous asphalt road surface is considered to offer a noise level reduction of 2.5 dB(A) when compared to a standard Hot Rolled Asphalt road surface. The noise impact assessment has correctly assumed that the low noise road surface will provide a minimum noise reduction of 2.5 dB(A).

With the noise prediction model assuming a noise reduction of 2.5 dB(A) at all noise sensitive receptors along the alignment of the proposed scheme, further mitigation requirements were identified at 16 receptor locations.

The noise sensitive locations where mitigation measures are required are shown in Figure 9.5. The figure also shows locations where residual impacts occur following mitigation.

16 receptor locations have been identified as meeting the three TII criteria for mitigation, as follows;

- 2 No. receptors are located along the alignment of the proposed scheme - R696 & R762.
- 3 No. receptors are located adjacent to both the alignment of the proposed scheme and the existing N51 - R941, R942 & R1066.
- 11 No. receptors are located along the N51 between Slane village and the N51 /

proposed scheme roundabout – R34, R35, R222, R223, R395, R572, R931, R932, R933, R935 & R1063.

Conclusion: *No significant inadequacies identified in the documentation submitted.*

5 Mitigation Measures

5.1 Mitigation Measures – Noise.

5.1.1 Construction Noise Mitigation Measures

Industry standard construction noise mitigation measures are proposed.

Conclusion: *No significant inadequacies identified in the documentation submitted.*

5.1.2 Operational Noise Mitigation Measures

In order to reduce road traffic noise the proposed scheme will be constructed using a low noise road surface which will provide a minimum noise reduction of 2.5 dB(A).

A low noise road surface which will provide a minimum noise reduction of 2.5 dB(A), will replace the existing hot rolled asphalt surfacing along the N51 between Slane village and the N51 / proposed scheme roundabout.

It is also proposed to reduce the speed from 80 km/h to 60 km/h along the N51 between Slane village and the N51 / proposed scheme roundabout in line with the application of the TII structured approach to mitigate the noise impacts as far as practicable within the constraints of the scheme.

Table 9-53 (reproduced below) presents the 'Details of Noise Mitigation Measures'. Figure 9.6 presents the 'Locations of Noise-reducing Measures'.

Table 9-53: Details of Noise Mitigation Measures

Receptor ID	Location	Chainage	Description	Length	Height
R696	Mainline South	Ch. 1112 – 1178	Earthen berm/false cut with a 76 m long by 3 m high reflective noise barrier on top	76 m	3 m
R762	Realigned Rossnaree Road	Ch. 0 – 15	Extended existing 1m stone wall by 15 m	15 m	1 m
R941b	Mainline North transitioning into Realigned N51 East	Mainline North Ch. 2240 – 2450	Combined reflective noise barrier and bund/false cut with a total height of 2.5 m	295 m	2.5 m
R942a/R942b		N51 West Ch. 0 – 80			
R1066a	Realigned N51 West	Ch. 720	Reflective noise barrier adjacent to property boundary	21.5 m	2 m

The Noise Mitigation Measures presented in Table 9-53 are realistic and typical of roadside noise attenuation measures.

Conclusion: *No significant inadequacies identified in the documentation submitted.*

6 Brú na Bóinne UNESCO World Heritage Site

The Brú na Bóinne UNESCO World Heritage Property has been considered as a highly sensitive noise and vibration sensitive receptor as part of the study. Brú na Bóinne is famous for the spectacular prehistoric passage tombs of Knowth, Newgrange and Dowth which were built circa 3200BC.

6.1 Noise Surveys at Brú na Bóinne UNESCO World Heritage Property

Two attended noise surveys were undertaken at the following locations in the Brú na Bóinne UNESCO World Heritage Property;

- 24-4-A - At the entrance to Knowth passage tomb within the Brú na Bóinne World Heritage Property. The monitoring location is approximately 4.1 km from the existing N2 alignment and approximately 2.2 km from the N51 alignment.
- 24-4-B - At the entrance to the Dowth monument within the Brú na Bóinne World Heritage Property. The monitoring location was approximately 5.7 km from the existing N2 and approximately 1.5 km from the N51.

Table 1: Measured baseline noise levels at 24-4-A and 24-4-B.

Noise Monitoring Location (NML)	Measured Daytime Noise Level (15-min periods)			Derived $L_{A10,\ 18\ Hr}$	Derived L_{den}
	$L_{Aeq,\ 15\ min}$	L_{AF10}	L_{AF90}		
24-4-A	47.6	42.9	35.4	43	47
	47.9	42.0	33.7		
	45.8	42.0	34.3		
24-4-B	57.9	49.9	32.0	47	50
	57.3	46.4	40.6		
	59.1	48.7	34.3		

The narrative in Appendix 9.3, Baseline Noise Data – Short-term Monitoring Results, states that at 24-4-A, "*This measurement location was quiet with low background noise levels. Distant road traffic noise from the south and bird song. During all measurements there was a single bus passing the measurement location*".

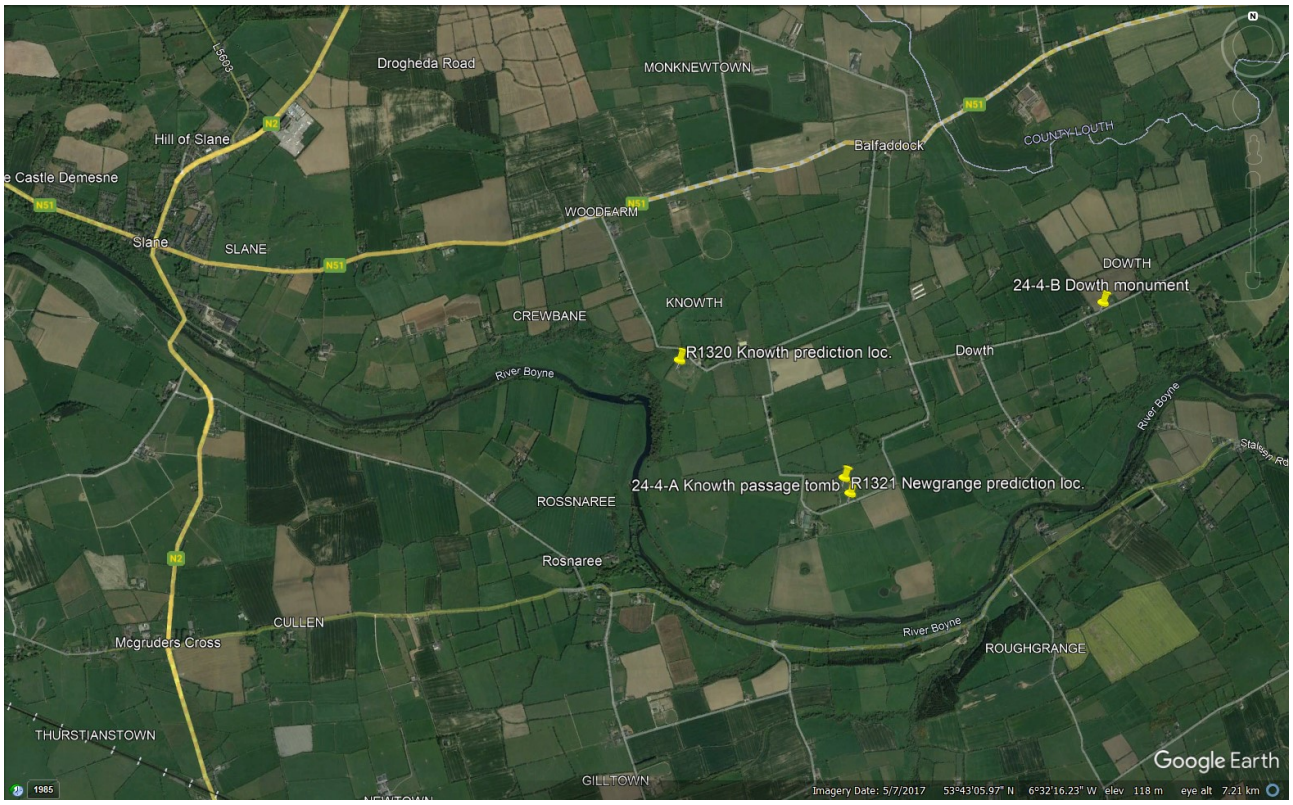
The narrative in Appendix 9.3, Baseline Noise Data – Short-term Monitoring Results, states that at 24-4-B, "*This measurement location was quiet with low background noise levels. N51 traffic noise audible. Occasional local road traffic. During the second measurement OPW were working at Dowth. The equipment being operated sounds like a leaf blower*".

At Page 13 of Chapter 13 Archaeological and Cultural Heritage it is stated that "*the traffic noise from passing vehicles is loud and distracting at both monuments, negatively affecting their setting and detracting from the experience*."

The measured baseline noise levels quoted in Table 1 are relatively quiet daytime noise levels and typical of such a rural area located in excess of four kilometers from the main traffic routes in the area, i.e. the N2 and N51. The reported baseline noise levels of <40 dB L_{A90} at

24-4-A and 24-4-B indicate that traffic noise is not at a level that could be construed to have a significant impact at the protected monument sites.

Figure 1: Baseline noise survey locations at 24-4-A and 24-4-B and noise impact prediction locations at R1320 and R1321 [Google Earth Imagery].



6.2 Noise Impact Prediction at Brú na Bóinne UNESCO World Heritage Property

It is acknowledged in Chapter 13 Archaeological and Cultural Heritage that any changes in the noise environment due to construction works would be of short-duration and entirely reversed at the end of construction works.

In terms of operational noise impact, Appendix 9.2, Receptor Locations outlines the traffic noise prediction locations entered in the model at R1320 'Knowth' (Grid Ref. 699552, 773456) and R1321 'Newgrange' (Grid Ref. 700630, 772723). The locations of R1320 'Knowth' and R1321 'Newgrange' are shown in Figure 1.

R1320 'Knowth' represents the closest area within the 'core zone' of the Brú na Bóinne UNESCO World Heritage Property to the proposed scheme alignment.

R1321 'Newgrange' represents the Knowth passage tomb within the Brú na Bóinne World Heritage Property.

The predicted noise levels quoted in Table 2 indicate no significant change in noise level at the Brú na Bóinne UNESCO World Heritage Property and the predicted traffic noise is not at a level that could be construed to have a significant impact at the protected monument sites.

In the Opening Year (2026) there will be a predicted +1 dB(A) increase in noise levels and in the Design Year (2041) there will be no predicted increase in noise levels at the Brú na Bóinne UNESCO World Heritage Property. Therefore, there will be no discernible change in traffic noise level due to the proposed scheme.

Table 2: Predicted baseline noise levels at R1320 'Knowth' and R1321 'Newgrange'.

Receptor ID	Description	Predicted Noise Levels – Opening Year (2026)		Predicted Noise Levels – Design Year (2041)		Mitigation Required.
		Do-Minimum	Do Something	Do-Minimum	Do Something	
Without Mitigation Measures (Ref. Appendix 9.4 Operational Noise Predictions)						
R1320	Knowth	46	47	48	48	No
R1321	Newgrange	43	44	45	45	No
With Mitigation Measures (Ref. Appendix 9.5 Operational Noise Prediction with Mitigation)						
R1320	Knowth	46	47	48	48	No
R1321	Newgrange	43	44	45	45	No

The noise impact assessment states that "*the requirement to protect the views from the Brú na Bóinne site include measures that will also have a beneficial acoustic impact*".

The entrance to Knowth passage tomb within the Brú na Bóinne World Heritage Property is approximately 4.1 km from the existing N2 alignment and approximately 2.2 km from the N51 alignment. The entrance to Knowth passage tomb will be approximately 3.7 km from the proposed scheme alignment, with no change in distance to the N51 alignment, i.e. approximately 400m closer to the proposed scheme alignment.

The entrance to the Dowth monument within the Brú na Bóinne World Heritage Property is approximately 5.7 km from the existing N2 and approximately 1.5 km from the N51. The entrance to Dowth monument will be approximately 4.9 km from the proposed scheme alignment, with no change in distance to the N51 alignment, i.e. approximately 800m closer to the proposed scheme alignment.

On the basis of noise propagation prediction from a line source, such as the N2 road, it requires a halving or doubling of distance from traffic flows to result in a +/- 3 dB(A) change in traffic noise levels. Even assuming no mitigation measures, it can be surmised that the relatively minor change in distance from the existing roads and proposed scheme alignment, as well as the relatively small change in existing and proposed AADT flows, will result in a <1 dB(A) change in noise level at the Brú na Bóinne World Heritage Property site. A <1 dB(A) change in noise level is not perceptible to the human ear. This 'rule of thumb' assessment equates to the noise model predictions outlined in the noise impact assessment.

It is stated in the TII guidance (2014) that *"3 dB is widely acknowledged to be the smallest change that will give a reliable difference in public response"* and *"an increase of up to 3 dB is barely perceivable".* Therefore, the proposed scheme will not result in a perceptible noise level difference at the Brú na Bóinne World Heritage Property.

The predicted impact at the Brú na Bóinne UNESCO World Heritage Property has been assessed to indicate that there will be no significant noise impact as a result of the proposed scheme.

Conclusion: *No significant inadequacies identified in the documentation submitted.*

7 Residual Effects - Noise

The proposed scheme will result in a positive aggregate residual impact under the END (Environmental Noise Directive 2002/49/EC) Noise Mapping and the DMRB (Design Manual for Roads and Bridges) impact rating which will result in beneficial environmental and health effects on the general population in the study area.

Conclusion: *No significant inadequacies identified in the documentation submitted.*

8 Review of Relevant Submissions Received

The relevant submissions raised with regards to noise and vibration have been reviewed in detail.

Table 3 overleaf provides advice and Technical Support to the reporting inspector with regards to individual submissions raised regarding noise impact during the construction and operation phase of the proposed scheme.

Table 3: Review of individual submissions regarding noise impact during the construction and operation phase of the proposed scheme.

No.	8		
Name of Submitter	Francis Ledwidge Museum		
Item No.	Observation	Response	M Keegan Comment
3	In expressing our disappointment, we accept the compliance here and now wish to draw attention to two design issues of particular concern. On drawing No. DM1002 the existing road will be realigned, and C.P.O. Ref. plot marked 128a.1 shows the front of the Museum. On the CPO-Schedule. PDF, Page 46 Ref. E09-E10 there is a reference to the construction of a sound barrier on plot 146g.1 beside the eastern boundary of the Museum (with plot 146a.2 being used for temporary inspection and maintenance). Our concern is the design of this sound barrier. We would require a solid wall barrier to mitigate the increased noise level anticipated from all the extra traffic on the new roundabout. It is an established fact that masonry walls are more effective at blocking road sounds than even the best wooden fences which would have gaps and a much lighter mass. The RPS Group, in part of their E.I.A.R Report state that noise mitigation is required Ref. R1066a Ledwidge Cottage Museum in their prepared Noise level Report. This is in Vol 4, Appendix 9, Page 107 (see attached). For all the above reasons, we believe a masonry wall is essential.	A 2m high noise barrier is proposed along the eastern property boundary of the Ledwidge Museum as shown on EIAR Vol. 3 Scheme Drawings, Drawing No. MDT0806-RPS-01-N2-DR-C-FE0004. A key design requirement for a noise barrier is that it be 'solid' and without gaps through which noise vibrations may pass. Timber noise barriers are the typical bespoke proprietary products designed to achieve this objective. TII's Specification for Road Works - Fencing and Environmental Noise Barriers CC-SPW-00300 sets out the requirements for noise barriers. Section 10 of the TII document states…"Environmental Noise Barriers shall achieve the performance criteria set out in the Contract Documents in accordance with I.S. EN 1793-1, I.S. EN 1793-2, I.S. EN 1793-3, I.S.EN 1794-1 and I.S. EN 1794- 2 following the specifications outlined in I.S. EN 14388, this Section, and any additional requirements described in Appendix 3/1. Environmental Noise Barriers are to be manufactured in a factory, where the barrier was developed and the factory shall be accredited to ISO 9001 for the manufacture of the specific noise barrier panel or components. No on-site assemblies of Environmental Noise Barrier panels are permitted." The standard goes on to say that "The Contractor shall submit documented evidence demonstrating how the barriers meet the specified standards and the documentation shall clearly indicate the absorptive performance where such barrier	The response provided references the TII's Specification for Road Works - Fencing and Environmental Noise Barriers CC-SPW-00300 which sets out the requirements for noise barriers. As a minimum, the proposed noise barrier must meet the requirements in IS EN 1793-2. The noise impact assessment and modelling outputs, without and with noise mitigation measures at R1066a Ledwidge Cottage Museum indicates that existing and future predicted noise levels exceed the TII Design Goal of 60 dB L_{den}. However, the recommended mitigation measures are in accordance with best practice. With respect to achieving the 60 dB L_{den} design goal, the TII Best Practice Guidance (2014) state that "*…in some cases the attainment of the design goal may not be possible by sustainable means*", and 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.*"

		type is used and airborne sound insulation categories of the constructed barriers as outlined in I.S. EN 1793 –1 and I.S. EN 1793 –2" Noise barriers must have a minimum insulation performance of B3 in accordance with I.S. EN 1793: Part 2. The solution provided will meet the requirements in TII's Specification for Road Works -Fencing and Environmental Noise Barriers CC-SPW-00300. In respect of the sound insulation performance of a timber noise barrier vs a masonry wall, it is correct to say the sound insulation performance of a masonry wall will be greater than that of a timber noise barrier due to the density and thickness of the material. However, this relates to the intrinsic performance of the noise barrier, the noise barrier dimensions (e.g. length and height) as well as proximity to the source and receiver locations will impact on the overall performance of the noise barrier and the noise level received at the receiver location. Provided, there would a negligible difference in the received noise level. EIAR Vol. 2 Chapter 9 – Noise and Vibration in the mitigation set out in Section 9.5.2 states that noise barriers may take the form of walls, earthen berms and other landscaping features provided they fulfil the acoustics screening requirements as well as meeting all other technical specifications.	

No.	10		
Name of Submitter	Health Service Executive		
Item No.	Observation	Response	M Keegan Comment
5	Predictive modelling indicates that site enabling works at the site compounds will result in noise levels exceeding the NRA/TII construction noise limit of 70 dB LAeq, 1 hr at the nearest noise sensitive locations. Similarly, a number of other noise sensitive locations have been identified which may experience short periods of noise above the guideline limit during various construction works. It is expected that these works may take up to 2 months. In some cases, it is accepted that noisy machinery will not operate continuously close to the noise sensitive locations throughout these periods. However, it is recommended that construction times are limited at these noise sensitive locations to minimise the impact of construction noise on local residents, as follows: Monday to Friday 08:00 - 18:00 Saturday 09:00 - 13:00 Sundays and Public Holidays - No noisy operations on site. Construction outside of these hours should not be allowed without approval of the Local Authority and local residents should be notified. Night working in residential areas or areas close to healthcare settings should be avoided if at all possible to prevent sleep disturbance and protect public health.	EIAR Vol. 2 Chapter 5 – Description of the Construction Phase, Section 5.9 (Employment and Welfare) outlines that normal working times will be 07.00 to 19.00 hours Monday to Friday and 08.00 to 16.30 hours on Saturday (if required). Works other than the pumping out of excavations, security and emergency works will not be undertaken outside these working hours without the written permission of the local authority. This permission, if granted, can be withdrawn at any time should the working regulations be breached. Site working hours may vary throughout the duration of the construction period and will also depend on weather and seasons. Subject to Local Authority approval, working times outside these normal hours, including Sundays, may be permitted. Example of works that may be required outside the normal working hours include diversion of utilities or working on existing roads outside of peak traffic periods to avoid or minimise traffic congestion. Noisy construction activities will be avoided outside normal hours and the amount of work outside normal hours will be strictly controlled. Meath County Council consent will be required for proposed work outside normal hours and as part of procedures to be followed, the Contractor will be required to notify affected residents in good time of upcoming planned works. Acceptable construction noise levels as summarised in EIAR Chapter 9 – Noise and Vibration, Section 9.2.4.2 (Construction Noise Criteria) will be adhered to throughout the duration of the construction	Construction noise criteria in accordance with the TII guidelines are predicted in EIAR Chapter 9 – Noise and Vibration. Acceptable and appropriate construction noise mitigation measures have been recommended and these will be adhered to throughout the duration of the construction of the scheme by the Contractor.

		of the scheme by the Contractor.	
7	The 2014 NRA Guidance document specify a 60dB Lden design goal for receptors (noise level measured over 24 hour period). It is widely accepted that road traffic noise can result in annoyance and sleep disturbance and compliance with this limit should reduce the risk these health impacts. Road traffic noise is expected to reduce on the N2 through Slane village while noise levels are expected to increase on the N51 in line with increased traffic along this road and noise levels will increase in areas where new roads are constructed. The applicant has concluded that the vast majority of noise sensitive locations along the proposed route will experience a negligible change in noise levels when the road is operational. Section 9.4.2 of the EIAR Identified 16 noise sensitive locations using the NRA Guidelines (2004) where mitigation would be required to reduce traffic noise levels to within acceptable limits. Section 9.5.2 outlines the mitigation measures which would be implemented to reduce traffic noise at sensitive locations when the road has been completed. These measures include the use of low noise road surfaces, installation of noise barriers - walls, earthen berms, landscaping. It is understood that mitigation measures at a number of locations will not achieve an adequate reduction in noise levels to fully comply with the NRA limits. The applicant does advise that there may be an additional unquantified reduction in predicted noise levels at these noise sensitive locations through the use of low noise road surfaces. The applicant concludes that the proposed scheme will result in a positive aggregate residual impact under the END (Environmental Noise Directive 2002/49/EC) Noise Mapping and the DMRB	Section 9.6.2 provide details on operational phase residual effects. The residual impacts are examined under both the END noise mapping noise level bands and the DMRB impact rating. In summary, the Proposed Scheme will result in a positive aggregate residual impact under the END Noise Mapping and the DMRB impact rating. This will result in beneficial environmental and health effects on the general population in the study area. Section 9.5.2 provides details on mitigation measures during the operational phase. It is detailed in this section that a number of receptors along the N51 between Slane village and the N51 / Slane bypass roundabout meet the criteria for noise mitigation. However, even with the mitigation measures in place the predicted noise levels were above the Do Minimum/design goal noise levels. Further analysis from the EIAR is outlined as follows for completeness: The current road surface adjacent to these receptors is worn HRA surface. As part of the Proposed Scheme, the sections of road adjacent to these receptors will have a low noise road surface installed. It is also proposed to reduce the speed from 80 km/h to 60 km/h along these sections of road in line with the application of the TII structured approach to mitigate the noise impacts as far as practicable within the constraints of the scheme. However, even with these measures in place, the predicted noise levels will remain above the design goal/Do-Minimum noise level at eleven noise sensitive locations. The only other mitigation option available is the installation of barriers or extension of the boundary walls adjacent to the receptors. However, the close proximity of	The noise impact assessment and modelling outputs, without and with noise mitigation measures, indicates existing and future predicted noise levels exceed the TII Design Goal of 60 dB L_{den} at a small number of noise sensitive receiver locations. Where appropriate, mitigation measures in accordance with best practice have been recommended. With respect to achieving the 60 dB L_{den} design goal, the TII Best Practice Guidance (2014) state that "*…in some cases the attainment of the design goal may not be possible by sustainable means*", and 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.*"

	(Design Manual for Roads and Bridges) impact rating which will result in beneficial environmental and health effects on the general population in the study area.	the residences to the footpath, limited set-back distances achievable, the elevation of some of the properties and the extent in length and / or height of barrier needed to achieve the required noise would result in unacceptable health and safety risks associated with accessing the properties onto the N51 and serious visual impact due to the close proximity of barriers to residences and the extent and height required. The Do-Something noise level in the design year remain above the design goal and/or above the Do-Minimum noise level at ten receptors despite the application of the TII structured approach. Whilst low noise road surfacing is being used, the effectiveness of the low noise surface performance being modelled is limited to 2.5 dB despite the limit being based on data that is 20 years old. Current low noise surface designs offer validated noise reductions greater than 2.5 dB. This factor provides a high degree of confidence that the road traffic noise levels will be lower than the predicted noise levels in the longer term.	

No.	16		
Name of Submitter	John and Mary Colgan		
Item No.	Observation	Response	M Keegan Comment
3	Noise Inadequate information has been provided regarding the mitigation measures that are being proposed to control noise pollution.	EIAR Chapter 9 (Noise and Vibration) identifies, describes and presents an assessment of the likely significant noise and vibration effects of the proposed scheme on the receiving environment during both the construction and operational phases of the scheme. Sections 9.2.4.2 and 9.2.4.3 provide details on construction noise and construction traffic noise criteria, respectively. Section 9.2.4.5 provides details on operational noise design goal and mitigation criteria. The likely significant effects are assessed in Section 9.4 with the construction phase assessed in Section 9.4.1 and the operational phase assessed in Section 9.4.2. Section 9.5 identifies the mitigation measures to mitigate both noise and vibration impacts during the construction phase (Section 9.5.1) and the operational phase (Section 9.5.2).	Nothing to add.

No.	16		
Name of Submitter	John Kealy		
Item No.	Observation	Response	M Keegan Comment
3	Noise Inadequate information has been provided regarding the mitigation measures that are being proposed to control noise pollution.	EIAR Chapter 9 (Noise and Vibration) identifies, describes and presents an assessment of the likely significant noise and vibration effects of the proposed scheme on the receiving environment during both the construction and operational phases of the scheme. Sections 9.2.4.2 and 9.2.4.3 provide details on construction noise and construction traffic noise criteria, respectively. Section 9.2.4.5 provides details on operational noise design goal and mitigation criteria. The likely significant effects are assessed in Section 9.4 with the construction phase assessed in Section 9.4.1 and the operational phase assessed in Section 9.4.2. Section 9.5 identifies the mitigation measures to mitigate both noise and vibration impacts during the construction phase (Section 9.5.1) and the operational phase (Section 9.5.2).	Nothing to add.

No.	22		
Name of Submitter	Michelle & Kevin Garrigan		
Item No.	Observation	Response	M Keegan Comment
2	Environmental Impact The proposed extinguishment of public right of way will have adverse effects on the environment in the immediate area, including disruption of natural habitats, increased traffic congestion, and air pollution right beside our property. We are very concerned that our neighbours house, who are only 30 meters from our boundary has been made subject to compulsory purchase order due to the projected noise levels once the bypass is complete. The potential impact of noise pollution on our family home is a matter of deep concern for us and without proper consultation, the potential environmental consequences remain unaddressed.	Regarding noise pollution concerns, EIAR Chapter 9 (Noise and Vibration) identifies, describes and presents an assessment of the likely significant noise and vibration effects of the proposed scheme on the receiving environment during both the construction and operational phases of the scheme. Sections 9.2.4.2 and 9.2.4.3 provide details on construction noise and construction traffic noise criteria, respectively. Section 9.2.4.5 provides details on operational noise design goal and mitigation criteria. The likely significant effects are assessed in Section 9.4 with the construction phase assessed in Section 9.4.1 and the operational phase assessed in Section 9.4.2. Section 9.5 identifies the mitigation measures to mitigate both noise and vibration impacts during the construction phase (Section 9.5.1) and the operational phase (Section 9.5.2). This dwelling is reference R32 in Appendix 9.4 Operational Noise Predictions and 9.5 Operational Noise Predictions with Mitigation Measures. The predicted noise levels between the Do-Minimum (without the scheme in place) and Do-Something (with the scheme) scenario at this dwelling will increase. However, the predicted noise levels do not exceed the NRA design goal of 60 dB Lden. The significance rating at this dwelling is Moderate. The rating for the other dwelling referred to is Significant.	The noise sensitive receiver reference is R32. The predicted noise level difference between the Do-Minimum scenario (without the scheme in place) and Do-Something (with the scheme & mitigation) scenario at this noise sensitive receiver is plus 10 dB(A). therefore, this results in a 'Moderate' impact. However, the predicted noise levels with the scheme & mitigation are below the TII design goal of 60 dB L_{den}, i.e. 59 dB L_{den}. Therefore, the EIAR achieves the TII design goal of 60 dB L_{den}.

No.	24		
Name of Submitter	Office of Public Works		
Item No.	Observation	Response	M Keegan Comment
3	Noise from the existing N2 is currently audible from Knowth under some atmospheric conditions. The proposed road will be closer to Knowth. Appendix 9.5 Operation Noise Prediction with Mitigation predicts that noise at R1320 at Knowth will change from 46dB to 47dB.	The source of existing vehicle noise at Knowth, is more likely to be coming from the N51, only 1km to the north, rather than the N2, 3km to the west. In any event, this forms part of the measured baseline condition against which the predicted impact of the proposed scheme has been modelled.	It is stated in the TII guidance (2014) that "*3 dB is widely acknowledged to be the smallest change that will give a reliable difference in public response*" and "*an increase of up to 3 dB is barely perceivable*". Therefore, because the predicted increase at the Brú na Bóinne site is +1 dB(A), the proposed scheme will not result in a perceptible noise level difference at the Brú na Bóinne World Heritage Property.
6	Noise impact at the Hill of Slane The OPW notes that the noise from the N2 at Slane Bridge is already audible at the Hill of Slane. Appendix 9.5 Operation Noise Prediction with Mitigation predicts that noise at R1322 at Slane Abbey will remain at 51dB. It is noteworthy that traffic on the Bypass will travel at a higher speed than traffic on the existing N2, which is subject to urban speed limits. If existing noise levels are considered an issue on the Hill of Slane, a lower speed limit, if feasible, could provide mitigation to benefit this and other locations.	The source of vehicle noise on the Hill of Slane is more likely to emanate from the more proximate source on the existing N2 north of Slane than the distant Slane Bridge. OPW is correct to note that noise modelling predicts no change in noise levels at the Hill of Slane due to operation of the proposed scheme. Therefore no mitigation is proposed.	It is stated in the TII guidance (2014) that "*3 dB is widely acknowledged to be the smallest change that will give a reliable difference in public response*" and "*an increase of up to 3 dB is barely perceivable*". Therefore, because the predicted increase at the Hill of Slane site is <1 dB(A), the proposed scheme will not result in a perceptible noise level difference at the Hill of Slane.

No.	26		
Name of Submitter	Patricia Farrell		
Item No.	Observation	Response	M Keegan Comment
3	Noise Inadequate information has been provided regarding the mitigation measures that are being proposed to control noise pollution.	EIAR Chapter 9 (Noise and Vibration) identifies, describes and presents an assessment of the likely significant noise and vibration effects of the proposed scheme on the receiving environment during both the construction and operational phases of the scheme. Sections 9.2.4.2 and 9.2.4.3 provide details on construction noise and construction traffic noise criteria, respectively. Section 9.2.4.5 provides details on operational noise design goal and mitigation criteria. The likely significant effects are assessed in Section 9.4 with the construction phase assessed in Section 9.4.1 and the operational phase assessed in Section 9.4.2. Section 9.5 identifies the mitigation measures to mitigate both noise and vibration impacts during the construction phase (Section 9.5.1) and the operational phase (Section 9.5.2).	Nothing to add.

No.	27		
Name of Submitter	Paul Loughran		
Item No.	Observation	Response	M Keegan Comment
2	Noise In relation to noise mitigation, my client does not believe that the clay bund that is being constructed along the western side of his property is appropriate. The road is in cut and therefore the noise should be trapped within the cutting.	A clay bund is not proposed along the western side of this landowner's property. EIAR Chapter 9 (Noise and Vibration) identifies, describes and presents an assessment of the likely significant noise and vibration effects of the proposed scheme on the receiving environment during both the construction and operational phases of the scheme. Sections 9.2.4.2 and 9.2.4.3 provide details on construction noise and construction traffic noise criteria, respectively. Section 9.2.4.5 provides details on operational noise design goal and mitigation criteria. The likely significant effects are assessed in Section 9.4 with the construction phase assessed in Section 9.4.1 and the operational phase assessed in Section 9.4.2. Section 9.5 identifies the mitigation measures to mitigate both noise and vibration impacts during the construction phase (Section 9.5.1) and the operational phase (Section 9.5.2).	Nothing to add.

No.	36		
Name of Submitter	The Heritage Council		
Item No.	Observation	Response	M Keegan Comment
3	The EIAR identifies the main archaeological, cultural and heritage assets in the vicinity of the proposed scheme. The Heritage Council has studied carefully the Heritage Impact Assessment (HIA; appendix 13.1). The construction site is outside the buffer zone of the WHP, therefore as such no concern is raised regarding temporary construction works to the physical integrity of the WHP. Although we have noted there will be visual and noise impacts, which will have a negative effect on the WHP. Given the protracted nature of road construction works, this is going to have a negative impact. The chapter on noise and vibration should have done more assessment on the construction noise impacts on the receptors of Knowth and Newgrange. They have been noted as part of the operational phase impacts but not for the construction phase.	The construction phase is temporary in nature and for noise sensitive locations in close proximity, short-term increases in noise impacts will occur during the construction phase of the works due to the requirement to use heavy plant and machinery. Knowth is located approximately 2.1 km from the nearest mainline works and 1.7 km from the nearest N51 works whilst Newgrange is located approximately 3.6 km from the nearest mainline works and 3 km from the nearest N51 works. Worst case predicted noise levels at Knowth are below 43 dB LAeq,1hr without consideration of attenuation due to atmospheric absorption, ground absorption factors and topographical features. Newgrange is setback further with worst case predicted noise levels below 38 dB LAeq,1hr. In practice, the construction plant source noise will generally be lower, attenuation of noise will be higher due to the factors outlined above and therefore it would be expected that construction noise levels are far below the construction noise criteria and the existing ambient noise levels, and other local noise sources would dominate the soundscape at Knowth and Newgrange.	It is acknowledged in Chapter 13 Archaeological and Cultural Heritage that any changes in the noise environment due to construction works would be of short-duration and entirely reversed at the end of construction works. Construction noise levels during typical road construction works fluctuate on a daily, weekly and monthly basis ads the project develops. Due to the significant offset distance from the proposed scheme to the Brú na Bóinne UNESCO World Heritage Property sites, at greater than 3.5 Km, the construction noise impact will be insignificant.
12	The issue of road noise is also a concern. From even a slightly elevated position, this can significantly impact on the setting of a heritage asset. Noise reverberation can significantly a affect the integrity of a heritage asset. Chapter 9 identifies Knowth (R1320) and Newgrange (R315) as Noise Sensitive Locations (NSL's). Appendix 9.4 is	The potential for changes in the noise environment to affect the OUV of the World Heritage Property were considered as part of the HIA (EIAR Vol. 4B, Appendix 13.1 – Heritage Impact Assessment) with the assistance of the project's acoustics consultant (HIA paras 2.7 and 7.7). Knowth, which is the sensitive location	The predicted noise levels indicate no significant change in operational traffic noise level at the Brú na Bóinne UNESCO World Heritage Property and the predicted traffic noise is not at a level that could be construed to have a significant impact at the protected monument sites. The predicted traffic noise levels are less than 50

	essential here. It is unacceptable, given the sensitivity of the WHP in this scheme, that no detailed assessment of noise annoyance levels in the context of the WHP is provided. See below: The potential for changes in the noise environment to affect the OUV of the World Heritage Property were considered as part of the HIA (EIAR Vol. 4B, Appendix 13.1 – Heritage Impact Assessment) with the assistance of the project's acoustics consultant (HIA paras 2.7 and 7.7). Knowth, which is the sensitive location within the World Heritage Property closest to the Proposed Scheme, was selected as a baseline noise monitoring location as part of the noise and vibration impact assessment. As reported in para 7.47 of the HIA (EIAR Appendix 13.1) "results for Knowth indicate that current low background noise levels in the World Heritage Property would be maintained with no measurable increase in noise levels when the Proposed Scheme first comes into operation. A negligible increase in noise level is predicted by 2041, as a result of increased traffic, but this would also occur if the Proposed Scheme was not constructed". Given this result, it was considered unnecessary to undertake additional detailed assessment of noise across the World Heritage Property more widely. The main issue here is that there is no detail/commentary that accompanies this modelling analysis. A higher standard is required here for the impact that road noise may have on the WHP. The following points are made: • Is a standard annoyance 60dB Lden level (general road scheme and receptors) suitable for assessing impacts on the OW of the WI-IP?	within the World Heritage Property closest to the Proposed Scheme, was selected as a baseline noise monitoring location as part of the noise and vibration impact assessment. As reported in para 7.47 of the HIA (EIAR Appendix 13.1) "results for Knowth indicate that current low background noise levels in the World Heritage Property would be maintained with no measurable increase in noise levels when the Proposed Scheme first comes into operation. A negligible increase in noise level is predicted by 2041, as a result of increased traffic, but this would also occur if the Proposed Scheme was not constructed". Given this result, it was considered unnecessary to undertake additional detailed assessment of noise across the World Heritage Property more widely. The study area for the noise and vibration impact assessment is predominantly focused on areas likely to be affected by the proposed road scheme (refer to EIAR Vol. 2 Chapter 9 – Noise and Vibration). The NRA Guidelines (2004) recognise this to include noise and vibration sensitive receptors within 300 m of the road centrelines and noise and vibration sensitive receptors adjacent to existing roads in proximity to the Proposed Scheme. It also includes locations adjacent to roads where traffic flows are reduced by 20% or more, and where existing flows are increased by 25% or more as a result of the Proposed Scheme. For the purposes of this scheme, the Brú na Bóinne UNESCO World Heritage Property has been considered as noise and vibration sensitive receptors and the environmental noise conditions at these sites were considered as part of the study. Details on the operational noise modelling	dB L_{den}. This is not a significant noise level. In the Opening Year (2026) there will be a predicted +1 dB(A) increase in noise levels and in the Design Year (2041) there will be no predicted increase in noise levels at the Brú na Bóinne UNESCO World Heritage Property. On the basis of noise propagation prediction from a line source, such as the N2 road, it requires a halving or doubling of distance from traffic flows to result in a +/- 3 dB(A) change in traffic noise levels. Even assuming no mitigation measures, it can be surmised that the relatively minor change in distance from the existing roads and proposed scheme alignment, as well as the relatively small change in existing and proposed AADT flows, will result in a <1 dB(A) change in noise level at the Brú na Bóinne World Heritage Property site. A <1 dB(A) change in noise level is not perceptible to the human ear. This 'rule of thumb' assessment equates the noise model predictions outlined in the noise impact assessment.

	• Given that the new scheme Will bring the road closer to Knowth and Newgrange, with assumed higher speeds compared to the current road through the village, how could the "do something scenario" be: • Either equal to or only slightly worse in both 2026 and 2041 years for Knowth • Have less noise impact on Newgrange for both 2026 and 2041 years?	are presented in Chapter 9, Section 9.2.3.3 of the EIAR. In respect of traffic flows and roads to be included as part of the assessment it is stated in the EIAR that: In accordance with the NRA Good Practice Guidance (2014) the extent of the noise model not only includes the Proposed Scheme, but it also included areas where traffic flows were shown to be reduced by 20% or more, and where existing flows were shown to be increased by 25% or more. The predicted operational noise levels presented in Section 9.4.2 of EIAR Chapter and EIAR Vol. 4B, Appendices 9.4 and 9.5 relate to the cumulative noise from the Proposed Scheme and other local, regional and national roads. The predicted cumulative noise at Knowth during the opening year is 47 dB Lden and 48 dB Lden during the design year with the Proposed Scheme in place. This results in a 1 dB increase in cumulative noise levels in the year of opening and no change in the design year compared to the scenario without the scheme in place. However, the dominant source of road traffic noise at Knowth (R1320) is from the N51 national road. The predicted noise levels from the proposed bypass are considerably lower than the road traffic noise from the N51 national road with predicted noise from the proposed bypass of 39 dB Lden which provides a negligible contribution to the overall noise level predicted at this location. In your submission, Newgrange was identified as receptor R315. This location is the front façade at the Brú na Bóinne visitor centre and the noise levels at this location are due to local traffic on the L1601. Newgrange site is at location R1321. Predicted cumulative noise levels at	

		Newgrange (R1321) are 44 dB Lden during the opening year and 45 dB Lden during the design year with the scheme in place. This results in a 1 dB increase in cumulative noise levels in the year of opening and no change in the design year compared to the scenario without the scheme in place. The dominant source of road traffic noise at Newgrange (R1321) is from the L1601 local road and N51 national road to a lesser extent. The predicted noise levels from the proposed bypass are considerably lower than the road traffic noise from the L1601 local road and the N51 national road with predicted noise from the proposed bypass of 35 dB Lden which provides a negligible contribution to the overall noise level predicted at this location. Given the assessment above, the predicted noise levels are considerably below the NRA design goal of 60 dB Lden. Furthermore, traffic on existing local and national roads are the dominant noise source at Knowth and Newgrange with the Proposed Scheme resulting in a negligible contribution to the overall noise level predicted at these locations.	

Receptor ID	Description	Predicted Noise Levels Opening Year (2026)		TII Condition for Noise Mitigation Satisfied?			Mitigation Required?	Predicted Noise Levels Design Year (2041)		TII Condition for Noise Mitigation Satisfied?			Mitigation Required?
		Do-Minimum	Do-Something	(a)	(b)	(c)		Do-Minimum	Do-Something	(a)	(b)	(c)	
R1320	Knowth		47	No	Yes	No	No		48	No	No	No	No
[redacted]	Newgrange Monument	[redacted]	57	No	No	No	No	[redacted]	61	Yes	No	No	No

9 Advice & Technical Support to the Reporting Inspector Re: Conditions

The planning conditions to be outlined for the project should be recommended on the basis of the construction and operational noise mitigation measures that have been proposed in Chapter 9 Noise and Vibration of the EIAR for the proposed scheme. No further noise mitigation measures are deemed to be necessary.

9.1 Construction Noise Mitigation Measures

Road construction industry standard mitigation measures are proposed to be implemented during the construction works. These are outlined in detail in Section 9.5 Mitigation Measures, 9.5.1 Construction Phase.

9.2 Operational Noise Mitigation Measures

Along the entire alignment of the proposed scheme, it is proposed to install a low noise surface. This will provide at least a 2.5 dB(A) reduction in traffic noise level when compared to a Hot Rolled Asphalt surface.

Despite this a further five receptor locations have been identified as meeting the NRA criteria for mitigation. Figure 9.5 outlined the noise sensitive locations requiring additional operational mitigation measures.

There are two receptors (R696 and R762) along the proposed scheme alignment to the south-east of Slane at which mitigation in the form of a noise barrier is required.

For receptor location R696 the mitigation proposed is an earthen berm/false cut with a 76m long by 3m high reflective noise barrier on top.

At receptor R762 there is an existing stone wall along the Rossnaree Road opposite the receptor and it is proposed to extend this wall by 15m with an overall height of 1m.

There are three receptors (R941, R942 and R1066) adjacent to both the proposed scheme alignment to the east of Slane and adjacent to the existing N51 at which mitigation in the form of a noise barrier is required.

To mitigate that noise impact for the receptors at R941 and R942 a 1.25 m bund/false cut with 1.25 m high noise barrier on top is proposed along the mainline and the N51.

At R1066a (Ledwidge Cottage Museum) it is proposed that a 21.5m long 2m high noise barrier is located adjacent to the property boundary.

Table 9-53 outlines the details of the noise mitigation measures at the noise sensitive locations described above.

Table 9-53: Details of Noise Mitigation Measures

Receptor ID	Location	Chainage	Description	Length	Height
R696	Mainline South	Ch. 1112 – 1178	Earthen berm/false cut with a 76 m long by 3 m high reflective noise barrier on top	76 m	3 m
R762	Realigned Rossnaree Road	Ch. 0 – 15	Extended existing 1m stone wall by 15 m	15 m	1 m
R941b	Mainline North transitioning into Realigned N51 East	Mainline North Ch. 2240 – 2450	Combined reflective noise barrier and bund/false cut with a total height of 2.5 m	295 m	2.5 m
R942a/R942b		N51 West Ch. 0 – 80			
R1066a	Realigned N51 West	Ch. 720	Reflective noise barrier adjacent to property boundary	21.5 m	2 m

11 receptors located along the N51 between Slane village and the proposed N51 / N2 Slane bypass roundabout have been recommended as requiring mitigation in the form of a low noise surface, which will be installed along this stretch of the existing N51.

The current road surface along this stretch of the existing N51 adjacent to these receptors is a deteriorated Hot Rolled Asphalt surface. This old road surface will be replaced with a low noise road surface and it is also proposed to reduce the speed from 80 km/h to 60 km/h along the N51 between Slane village and the proposed N51 / N2 Slane bypass roundabout in line with the application of the TII structured approach.