

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

TEN-T Priority Route Improvement Project, Donegal Chapter 14: Noise & Vibration



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EIAR

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List of Abbreviations

The following is a list of abbreviations used within this chapter of the Environmental Impact Assessment Report (EIAR).

List of Abbreviation	
AADT	Annual Average Daily Traffic
CNMA	Candidate Noise Management Areas
CPO	Compulsory Purchase Order
CRTN	Calculation of Road Traffic Noise
DAERA	Department of Agriculture, Environment and Rural Affairs
DEFRA	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges
DNAP	Donegal County Council Draft Noise Action Plan
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
END	Environmental Noise Directive
EOP	Environmental Operating Plan
HCV	Heavy Commercial Vehicles
HGV	Heavy Goods Vehicle
HRA	Hot Rolled Asphalt
IHD	Ischemic Heart Disease
LNRS	Low Noise Road Surface
NML	Noise Monitoring Location
NRA	National Road Authority
NSL	Noise Sensitive Location
NSR	Noise Sensitive Receptor
SMA	Stone Mastic Asphalt
TII	Transport Infrastructure Ireland
TRH	Temporary Re-Housing
WHO	World Health Organisation

14 NOISE AND VIBRATION

14.1 Introduction

This chapter assesses the impacts of noise and vibrations associated with the Proposed Development. This includes an assessment of the potential impacts on sensitive receptors in the vicinity of the Proposed Development during the construction and operational phases.

The description and background of the Proposed Development is provided in Chapter 4: Project Description of the EIAR. The Proposed Development is divided into three sections as follows:

- Section 1 – N15/N13 Ballybofey/ Stranorlar Urban Region
- Section 2 – N56/N13 Letterkenny to Manorcunningham
- Section 3 – N14 Manorcunningham to Lifford/Strabane/A5 Link.

14.2 Competent Experts

Dr John Mahon holds a BA BAI in Mechanical Engineering from Trinity College Dublin and PhD in Acoustics and Vibration from Trinity College Dublin (2008). He is a member of the Institute of Acoustics and is a Chartered engineer with Engineers Ireland. John has 22 years' experience in environmental projects including planning applications and environmental impact assessments for a wide range of strategic infrastructure projects in Ireland and the UK. John sits on the Irish and European Committees for Standardization CEN/TC226/WG 6 (Road traffic noise reducing devices).

Benny Cryan is an acoustics engineer with a BA BAI from Trinity College Dublin. He also has an IOA Diploma in Acoustics and Noise Control. He is a member of the Institute of Acoustics and Engineers Ireland. Benny has over eight years' experience in environmental assessment of noise and vibration for both the planning and operation of infrastructure projects in Ireland and the UK. His technical expertise in noise is backed by well over a decade of technical experience in the music industry and pro audio.

Sean Mansfield has over three years' experience in acoustics. He completed the Institute of Acoustics Postgraduate Diploma in Acoustics and Noise Control in 2022 and he is an Associate Member of the Institute of Acoustics. Sean has gained experience working in a wide range of environmental areas including road, rail, offshore wind, industrial, flood relief, underwater noise and bat acoustics analysis projects. His work on roads projects includes baseline noise surveys, construction and operational noise modelling as well as assessment of impacts and provision of mitigation measures.

14.3 Legislation, Policy and Guidance

14.3.1 Legislation

The following have been referred to in the preparation of this chapter:

- Directive 2002/49/EC (as amended) of the European Parliament and of the Council of 25 June 2002 relating to the assessment and management of environmental noise - Declaration by the Commission in the Conciliation Committee on the Directive relating to the assessment and management of environmental noise, as amended (the "END").

Road traffic noise is considered in the END relating to the assessment and management of environmental noise. In Ireland the requirement to prepare Noise Action Plans stems from the European Communities (Environment Noise) Regulations 2018 (SI 549 of 2018) (as amended) (the "2018 Regulations") which give effect to the END. The 2018 Regulations use the L_{den} and L_{night} noise indicators for road traffic noise in Ireland. L_{den} and L_{night} are based on L_{Aeq} with adjustments for the evening and night periods.

The parameter most commonly used for the assessment of noise impact is L_{Aeq} , which is defined as being the A-weighted equivalent continuous steady sound level during the sample period and effectively represents an equivalent energy value. The L_{Aeq} is therefore an indicator of the average noise level. A glossary of noise level indices terms is given below:

L _{Aeq,T}	is the continuous equivalent A-weighted sound pressure level. This is an “average” of the sound pressure level over a period of time (T).
L _{den}	is the day-evening-night level L _{den} in decibels (dB) is defined by the following formula: $L_{den} = 10 \text{ Log} \frac{1}{24} \left[12 * 10^{\frac{L_{day}}{10}} + 4 * 10^{\frac{L_{evening}+5}{10}} + 8 * 10^{\frac{L_{night}+10}{10}} \right]$
L _{day}	is the A-weighted long-term average sound level as defined in ISO 1996-2:2017, determined over all the day periods of a year. Day periods are from 07:00 to 19:00 hrs.
L _{evening}	is the A-weighted long-term average sound level as defined in ISO 1996-2:2017, determined over all the evening periods of a year. Evening periods are from 19:00 to 23:00 hrs.
L _{night}	is the A-weighted long-term average sound level as defined in ISO 1996-2:2017, determined over all the night periods of a year. Night periods are from 23:00 to 07:00 hrs.
L _A	Denotes using the A-weighting network. The A-weighting represents the response of human ear to sound.

14.3.2 Policy

National and local policy relevant to the Proposed Development includes the following:

- Project Ireland 2040 National Planning Framework First Revision April 2025:
 - **National Policy Objective 94:** “Promote the pro-active management of noise where it is likely to have significant adverse impacts on health and quality of life and support the aims of the Environmental Noise Regulations through Strategic Noise Maps, Noise Action Plans and national planning guidance.”
- County Donegal Development Plan 2024-2030 (as varied).
- Letterkenny Plan and Local Transport Plan 2023-2029.
- Donegal County Council Noise Action Plan 2024-2028.
- NI Department for Infrastructure – Noise Action Plan 2018-2023.

14.3.2.1 County Donegal Development Plan 2024-2030

The County Donegal Development Plan 2024-2030 (as varied) recognises environmental noise as an issue and includes several objectives requiring that development do ‘*not create a noise nuisance and will not cause any significant environmental emissions.*’

There are no specific objectives relating to road traffic noise generally or in the study areas for the Proposed Development in the County Donegal Development Plan 2024-2030.

14.3.2.2 Letterkenny Plan and Local Transport Plan 2023-2029

The Letterkenny Plan and Local Transport Plan “sets out an overall strategy for the proper planning and sustainable development of Letterkenny in the context of the National Planning Framework (NPF), the Regional Spatial and Economic Strategy for the Northern and Western Regional Assembly area (the RSES) and the Donegal County Development Plan 2018-2024 (As Varied) (the CDP).”

The plan refers to the Climate Action Plan 2023, identifying that “*the levels of noise, accidents, and congestion associated with road transport reduces quality of life, deters active travel, and costs society hundreds of millions of euro per annum in wasted time.*” The plan also contains a section on the TEN-T Priority Route Improvement Project, stating that the project “*will tackle key transportation issues affecting the existing strategic transport network*”, including “*to reduce overall traffic noise levels near sensitive receptors.*”

There are no specific policies relating to road traffic noise generally or in the study areas for the Proposed Development in this document. Policies relevant to noise focus on commercial establishments.

14.3.2.3 Donegal County Council Noise Action Plan 2024-2028 (DNAP)

The DNAP has identified that traffic flows per annum along the N13, N14, N15, on a section of the N56 and on certain sections of some regional routes are above the three million vehicles per annum threshold for the preparation of strategic noise mapping. Requirements for the mapping of noise from major railways, airports or agglomerations of greater than 100,000 inhabitants do not apply.

The DNAP has considered locations where predicted noise levels from road traffic are above the World Health Organisation (WHO) 2018 guideline levels of 53 dB L_{den} and 45 dB L_{night} as “Important Areas”. The results of the strategic noise mapping show that the number of people in dwellings that are exposed to road traffic noise above these guideline levels is 14,791 and 13,881, respectively. The number of hospital buildings that are exposed to noise levels in excess of these levels are one and four, respectively. Furthermore, there are 14 school buildings that have been identified as Important Areas. St. Patrick’s National School (Lurgybrack) in Section 2 is located along the N13, south of the Dry Arch Roundabout in close proximity to passing traffic. The Proposed Development would move much of this traffic further away from the school and significant improvements in noise levels are predicted.

Most Important Areas are a sub-set of Important Areas where the health effects due to exposure to noise are highest. The DNAP has identified 27 such areas. Of these areas, 10 “Priority Important Areas” have been chosen. Priority Important Areas are areas where there would be a commitment to undertake an assessment of noise mitigation measures within the life cycle of the DNAP and are selected based on high levels or health impact due to both noise exposure levels and population density. In the context of the Proposed Development, none of the identified Priority Important Areas are located within the Project’s study area, defined in Section 14.4.1, and further assessment of these areas has not been considered in this chapter.

“Quiet Areas” within agglomerations may be delimited by noise action plans. No quiet areas within the DNAP area have been identified, as no agglomerations qualify for strategic noise mapping.

It is an objective of Donegal County Council in the DNAP to encourage the completion of a series of road improvements which may have an influence on the DNAP area. Objective T-O-11 states: “*To deliver improvements to the Trans European Transport Network (TEN-T) including: Progress and ultimately carry out/implement the TEN-T Priority Route Improvement Project, Donegal and the N13 Bridgend to County Boundary Route Improvement TEN-T Priority Route Improvement Project*”.

14.3.2.4 Department for Infrastructure – Road Noise Action Plan 2018-2023

The Northern Ireland Department for Infrastructure has published a Roads Noise Action Plan 2018-2023 under the END and is relevant to the Proposed Development in Section 3, particularly for the A5 route and the Strabane area.

Currently, there are no noise limit values set under the END for the UK. Department of Agriculture, Environment and Rural Affairs (DAERA) has recommended that the most appropriate approach is that of the Department for Environment, Food and Rural Affairs (DEFRA) and the Welsh Assembly Government in investigating Important Areas for potential action in relation to noise from roads by determining:

- Where the 1% of the population that are affected by the highest noise levels are located.
- Where the analysis has revealed that for Northern Ireland these locations are where the $L_{A10,18h}$ indicator is at least 75 dB.

The plan has identified 53 Candidate Noise Management Areas (CNMAs) across Northern Ireland based on the strategic noise mapping data for Round 3. However, none have been identified at Strabane and these areas have not been considered further in this assessment.

14.3.2.5 Department for Infrastructure – Draft Road Noise Action Plan 2023-2028

This Draft Road Noise Action Plan 2023-2028 sets out how Northern Ireland will address road traffic noise over the five year plan period, focusing on roads with the highest traffic and areas where the most people are affected. The plan’s scope covers both major roads and large urban areas, using updated noise mapping to pinpoint communities most at risk from excessive RTN. Its main goals are to identify where noise is a problem, inform the public, and put in place practical steps to reduce noise exposure, especially

where it could affect health. The plan also outlines how authorities will consult with the public, monitor progress, and coordinate with other agencies to manage noise in the long term.

In relation to Strabane and the A5 Western Transport Corridor (A5 WTC), the plan highlights that the proposed road upgrade includes noise-reducing features, such as noise barriers and low noise road surfacing, at key locations. These measures are intended to protect nearby communities from increased noise if the scheme proceeds. The plan confirms that any major road developments, including the A5 WTC, will be subject to further noise assessment and mitigation as part of the planning process, ensuring that noise management remains a priority for both current and future projects in the area.

14.3.3 Guidelines

The following standards and guidance documents have been considered and followed as appropriate in the preparation of this chapter:

- BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise (BSI, 2009a).
- BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration (BSI, 2009b).
- BS 7385-2:1993 Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration (BSI, 1993).
- Calculation of Road Traffic Noise (CRTN) (Department of Transport Welsh Office, 1988).
- Converting the UK traffic noise index $LA_{10, 18h}$ to EU noise indices for noise mapping (Transport Research Laboratory, 2002).
- Design Manual for Roads and Bridges (DMRB) LA 111 Noise and Vibration (Highways England, 2020).
- DIN 4150-3 Vibrations in buildings – Part 3: Effects on structures (DIN, 2016).
- Environmental Noise Guidelines for the European Region (WHO, 2018).
- Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes (TII, 2014).
- Guidelines for the Treatment of Noise and Vibration in National Road Schemes (TII, 2004).
- Guidelines on the information to be contained in Environmental Impact Assessment Reports (EPA, 2022).
- IEC 61672-1:2013 Electroacoustics – Sound level meters – Part 1: Specifications (IEC, 2013).
- ISO 17534-1:2015 Acoustics – Software for the calculation of sound outdoors – Part 1: Quality requirements and quality assurance (ISO, 2015).
- ISO 1996-1:2016 Acoustics – Description, measurement and assessment of environmental noise. Part 1: Basic quantities and assessment procedures (ISO, 2016).
- ISO 1996-2:2017 Acoustics – Description, measurement and assessment of environmental noise. Part 2: Determination of sound pressure levels (ISO, 2017).
- ISO 2631-1:1997 Mechanical vibration and shock – Evaluation of human exposure to whole-body vibration – Part 1: General requirements (ISO, 1997).
- ISO 2631-2:2003 Mechanical vibration and shock – Evaluation of human exposure to whole-body vibration – Part 2: Vibration in buildings (1 Hz to 80 Hz) (ISO, 2003).
- ISO 9613-1:1993 Acoustics – Attenuation of sound during propagation outdoors – Part 1: Calculation of the absorption of sound by the atmosphere (ISO, 1993).
- ISO 9613-2:2024 Acoustics – Attenuation of sound during propagation outdoors – Part 2: Engineering method for the prediction of sound pressure levels outdoors (ISO, 2024).
- Quarries and Ancillary Activities – Guidelines for Planning Authorities (DEHLG, 2004).
- Transit Noise and Vibration Impact Assessment Manual, Federal Transit Administration Report No. 0123 (Federal Transport Authority, 2018).

14.4 Methodology

The following summarises the methodology used for the assessment of noise and vibration during the construction and operational phases of the Proposed Development:

- Review of the Donegal County Council Noise Action Plan 2024 – 2028 (DNAP).
- Review of the location of the Proposed Development including consideration of the location of sensitive receptors and topography.
- A baseline noise survey was conducted in accordance with TII guidelines and ISO 1996 (TII, 2004; TII, 2014; ISO, 2016; ISO, 2017).
- Predicted construction noise levels for the Proposed Development have been calculated with data from BS 5228-1:2009+A1:2014 (BSI, 2009).
- Predicted construction vibration levels for the Proposed Development have been calculated with data from BS 5228-2:2009+A1:2014 (BSI, 2009).
- Operational noise modelling for the Proposed Development has been undertaken in accordance with CRTN, modified using Transport Research Laboratory guidelines, as recommended by TII (Department of Transport Welsh Office, 1988; Transport Research Laboratory, 2002; TII, 2004).
- An assessment of the likely impacts and recommendations for mitigation (where required) has been made using EPA and TII guidance (EPA, 2022; TII, 2004; TII, 2014).

14.4.1 Study Area

The study area for the noise and vibration impact assessment is predominantly focused on areas likely to be affected by the Proposed Development. Based on the TII 2004 guidelines, the initial study area is based on a 300 m buffer distance from the Proposed Development (section 5.3 of the guidelines). This includes noise and vibration sensitive receptors along the route of the Proposed Development, sensitive receptors adjacent to existing roads in proximity to the Proposed Development, 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 Development.

A total of 4,585 receptors, within a 300 m buffer from the Proposed Development (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 Development) were considered in the model, including residential receptors, schools, places of worship, commercial premises, etc. The most sensitive Noise Sensitive Locations (NSLs) for the purpose of this document are residential dwellings where people are present for daytime, evening and night-time periods and thereby continuously exposed to road traffic noise. Residences, pre-school/ schools and places of worship are regarded as more sensitive than sporting grounds or commercial operations.

Groundborne construction related vibration is generally significant only at short distances from the source as it attenuates rapidly. BS 5228-2 includes 174 datasets of groundborne vibration measurements. Of the extensive data collated in BS 5228-2 only one set was measured over 100 m from the source with the vast majority of measurements taken within 50 m, thus indicating the limited scale of impact for construction vibrations. Consideration of potential vibration impacts has therefore been limited to properties within 50 m of the site boundary or in the case of structures of significant intrinsic value, i.e., protected structures, a radius of 300 m has been considered. The larger radius for structures of significant intrinsic value is chosen within the context of the assessment in order to afford an increased degree of protection to valuable cultural monuments.

14.4.2 Survey Methodology

14.4.2.1 Desktop Study

Data sources utilised during the assessment include those listed in Table 14-1.

Table 14-1: Summary of Key Datasets

Title	Source
GeoDirectory	https://www.geodirectory.ie
Traffic flow data	Environmental Impact Assessment Report (EIAR) Chapter 6: Traffic & Transportation
Mapping data	OSI mapping

14.4.2.2 Site Specific Surveys

A series of site-specific baseline noise surveys were undertaken between 23rd and 26th April 2024, between 7th and 10th May 2024, between 15th and 16th May 2024 and on 12th June 2024 to quantify the existing noise environment and to provide baseline noise data for the validation of the noise model. Further details on the baseline surveys can be found in Section 14.5.4.

14.4.3 Assessment Criteria

14.4.3.1 Noise and Vibration Sensitive Receptors

TII 2004 guidance provides a characterisation of a sensitive receptor and states:

“Receptors that are, or have the potential to be, particularly sensitive to noise and/or vibration should be identified. Examples of such receptors are schools, hospitals, places of worship, heritage buildings, special habitats, amenity areas in common use and designated quiet areas” (TII, 2004).

This definition has been broadened by best practice and the range of sensitivities as described in Table 14-2. The sensitivity of different receptor types is set out in the table although circumstances may justify a receptor specific sensitivity.

Table 14-2: Noise Sensitive Locations (NSLs) and Sensitivity Criteria

Sensitivity	Description	Examples of receptors	Modifiers
High	Receptors where people or operations are particularly susceptible to noise.	Residential, including private gardens where appropriate. Hospitals/residential care homes. Schools during the daytime. Quiet outdoor areas used for recreation Places of worship.	Magnitude and Character of Baseline Noise.
Medium	Receptors moderately sensitive to noise, where it may cause some distraction or disturbance.	Offices. Bars/Cafes/Restaurants where external noise may be intrusive. Community facilities and amenity areas. Sports grounds when spectator noise is not a normal part of the event and where quiet conditions are necessary (e.g., tennis, fishing and golf). Recording studios and some concert halls are also included in this category.	
Low	Receptors where distraction or disturbance from noise is low.	Buildings not occupied during the daytime. Sports grounds when spectator noise is a normal part of the event. Night Clubs.	
Negligible	Receptors where distraction or disturbance from noise is negligible.	All other areas such as those used primarily for industrial or agricultural purposes.	

The majority of receptors which have the potential to be affected by noise and vibration impacts arising from the Proposed Development are the residents of dwellings in the vicinity of the Proposed Development. Residents, due to the nature and use of residential receptors are deemed to have 'High' sensitivity. Hotels and commercial accommodation have a high sensitivity at night and medium sensitivity during the day. Commercial developments such as offices (including those co-located with warehouses) are considered 'Medium' sensitivity during daytime periods with the sensitivity reducing to 'Low' during evening. At night-time periods both community facilities and commercial developments are considered 'Low' sensitivity as they have reduced occupancy or are unoccupied.

Other noise and vibration sensitive receptors include cultural heritage sites and sensitive ecological sites are identified in Chapter 17: Cultural Heritage and Chapter 9A: Biodiversity - Terrestrial, respectively.

14.4.3.2 Construction Noise Criteria

Guidelines relating to construction noise and vibration thresholds are set out within the TII guidance documents and other relevant national and international documentation for the control of noise and vibration from construction sites. The TII noise guidance documents specify noise levels that are deemed acceptable in terms of construction noise for new national roads (TII, 2004; TII, 2014). These noise guidelines are set out in Table 14-3.

Table 14-3: Construction Noise Thresholds – Normal Hours

Days and Times	$L_{Aeq,1hr}$ dB	$L_{pA(max)slow}$ dB
Monday to Friday 07:00 to 19:00 hrs	70	80
Monday to Friday 19:00 to 22:00 hrs	60*	65*
Saturdays 08:00 to 16:30 hrs	65	75
Sundays & Bank Holidays 08:00 to 16:30 hrs	60*	65*

* Construction activity at these times, other than that required for emergency works, will normally require the explicit permission of the local authority.

For periods outside of the days and hours identified in Table 14-3, reference is made to the ABC method in Annex E of BS 5228-1:2009+A1 2014 (BSI, 2009a). This standard provides guidance on controlling the effect of construction noise based on existing ambient noise levels. For the purpose of this assessment, the ABC method will be applied where TII guidance is not applicable (e.g., in the event of works having to be carried out at night). Table 14-4 outlines the applicable noise threshold of potential significant effect at the nearest NSLs during the periods not covered by the TII guidelines.

Table 14-4: Construction Noise Guidelines – Outside Normal Hours (BSI, 2009)

Assessment Category and Threshold Value Period (L_{Aeq})	Noise Threshold Value, in decibels (dB)		
	Category A ^A	Category B ^B	Category C ^C
Night-time (23.00 – 07.00)	45	50	55
Evenings and weekends ^D	55	60	65
Daytime (07.00 – 19.00) and Saturdays (07.00 – 13.00)	65	70	75

NOTE 1 A potential significant effect is indicated if the $L_{Aeq, T}$ noise level arising from the site exceeds the threshold level for the category appropriate to the ambient noise level.

NOTE 2 If the ambient noise level exceeds the Category C threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a potential significant effect is indicated if the total $L_{Aeq, T}$ noise level for the period increases by more than 3 dB due to site noise.

NOTE 3 Applied to residential receptors only.

- A) Threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than category A values.
- B) Threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values.
- C) Threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values.
- D) 19.00–23.00 weekdays, 13.00–23.00 Saturdays and 07.00–23.00 Sundays.

The thresholds apply to residential buildings and receptors with a high sensitivity as described in Table 14-2. For commercial buildings (offices, industrial facilities, sport clubs etc.), which are of medium, low or negligible sensitivity, Category C values from Table 14-4 apply.

14.4.3.3 Noise from Blasting

Blasting can give rise to vibration and audible noise in the form of pressure waves or 'air overpressure'. While air overpressure levels will be well below any level that could cause damage to buildings etc., it is likely that air overpressure will be noticeable during each blast. Rock blasting includes drilling holes through the rock into which the explosives are placed. The diameter and spacing of the holes and the use of delayed detonation timers are all parameters that will be used to control noise (air overpressure) and vibration from blasting.

The Guidelines for Quarries and Ancillary Activities recommends that blasting operations should only be carried out between 09.00 and 18.00 hours, Monday to Friday (except in emergencies or for health and safety reasons beyond the control of the developer) (DEHLG, 2004). Air overpressure values at the nearest occupied dwelling should not exceed 125 dB(Lin) max peak with a 95% confidence limit.

14.4.3.4 Construction Traffic Noise Criteria

There is currently no Irish legislation that states a limit value for noise levels from construction traffic. Hence, the impact of off-site traffic associated with the construction phase of the Proposed Development has been assessed with respect to the DMRB LA 111 Noise and Vibration (Highways England, 2020). This document presents details on the classification of magnitude of noise impacts and noise level changes and associated magnitude of impact are presented in Table 14-5. The thresholds will apply to residential buildings and receptors with a high sensitivity as described in Table 14-2. Commercial buildings (offices, industrial facilities, sport clubs etc.) which are less noise sensitive can tolerate greater increases in ambient noise levels.

Table 14-5: Noise Level – Magnitude of Impact (Highways England, 2020)

Magnitude of Impact	Increase in Baseline Noise Level of Closest Public Road Used for Construction Traffic (dB)
Major	Greater than or equal to 5.0
Moderate	Greater than or equal to 3.0 and less than 5.0
Minor	Greater than or equal to 1.0 and less than 3.0
Negligible	Less than 1.0

14.4.3.5 Construction Vibration Criteria

There is no statutory Irish guidance relating to the maximum permissible vibration level that may be generated during the construction phase of a road scheme. In the absence of specific vibration design goals, appropriate vibration emission criteria relating to permissible construction vibration levels for a development of this scale may be found in the TII guidance documents (TII, 2004; TII, 2014). Table 14-6 presents the vibration levels recommended in the TII guidelines and compliance with the values ensures that there is little to no risk of even cosmetic damage to buildings. These guidelines are stricter than those outlined in BS 5228-2.

Table 14-6: Construction Vibration Guidelines (TII, 2004)

Allowable vibration (PPV) at the closest part of any sensitive property			
Vibration Frequency (Hertz)	Less than 10Hz	10 to 50Hz	50 to 100Hz (and above)
PPV (mm/s)	8 mm/s	12.5 mm/s	20 mm/s

BS 5228-2 states that 'buildings of historical value should not (unless it is structurally unsound) be assumed to be more sensitive'. Good practice on national road schemes in Ireland has led to the adoption of lower thresholds for older properties such as recorded structures. The German standard DIN 4150-3 provides limits below which it is very unlikely that there will be any cosmetic damage to older buildings (DIN, 2016). For structures that are of 'great intrinsic value' and are particularly sensitive to vibration, transient vibration should not exceed 3 mm/s at low frequencies. Allowable levels for transient vibration increase to 8 mm/s at 50 Hz and 10 mm/s at 100Hz and above. For buildings known to be structurally unsound there is also a limit of 2.5 mm/s for continuous vibration at all frequencies.

Human beings are known to be sensitive to vibration, the threshold of perception being typically in the PPV range of 0.14 mm/s to 0.3 mm/s. Vibrations above these values can disturb, startle, cause annoyance or interfere with work activities. At higher levels they can be described as unpleasant or even painful. In residential accommodation, vibrations can promote concerns about possible structural damage. Guidance on effects of vibration levels are illustrated in Table 14-7.

Table 14-7: Guidance on Human Perception of Vibration Levels (BSI, 2009)

Vibration Level	Effect
0.14 mm/s	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.3 mm/s	Vibration might be just perceptible in residential environments.
1.0 mm/s	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.
10 mm/s	Vibration is likely to be intolerable for any more than a very brief exposure to this level.

Sensitive laboratory equipment in hospital operating theatres where microsurgery is undertaken, scientific laboratories, microelectronics manufacturing or electrical power generation turbine shafts may have lower tolerances for vibration based on criteria outlined in Annex B of BS 5228-2 (BSI, 2009b).

14.4.3.6 Vibration from Blasting

The Guidelines for Quarries and Ancillary Activities recommends that the vibration levels from blasting should not exceed a peak particle sum velocity of 12 mm/s as measured at a receiving location when blasting occurs at a frequency of once per week or less (DEHLG, 2004). In the rare event of more frequent blasting, the PPV should not exceed 8 mm/s. As blasting will occur on a regular basis when required on the project, the lower threshold of 8 mm/s peak particle sum velocity is adopted for residences. A lower threshold of 3 mm/s peak particle sum velocity will be adopted on this project for protected structures.

14.4.3.7 Operational Noise Criteria

There are no statutory guidelines relating to noise from road schemes in Ireland. In the absence of statutory guidance, the most commonly applied standard is that issued by TII in their 2004 and 2014 guidance documents (TII, 2004; TII, 2014). Both documents specify that the following absolute noise design criterion for new national road schemes in Ireland is appropriate:

Day-evening-night value of 60dB L_{den} free field façade level

The TII 2004 Guidelines states:

"The Authority accepts that it may not always be sustainable to provide adequate mitigation in order to achieve the design goal. Therefore, a structured approach should be taken in order to ameliorate as far as practicable road traffic noise through the consideration of measures such as alignment changes, barrier type (e.g. earth mounds), low noise road surfaces etc."

"Mitigation measures are only deemed necessary when the following three conditions are satisfied at designated sensitive receptors:

- a. *The combined expected maximum traffic noise level, i.e. the relevant noise level, from the proposed development together with other traffic in the vicinity is greater than the design goal;*
- b. *The relevant noise level is at least 1 dB more than the expected traffic noise level without the proposed development in place;*
- c. *The contribution to the increase in the relevant noise level from the proposed development is at least 1 dB.*

These conditions will ensure that mitigation measures arising out of this process are based upon the impact of the scheme under consideration.”

WHO Environmental Noise Guidelines for the European Region

The World Health Organisation (WHO) published Environmental Noise Guidelines for the European Region in October 2018 (WHO, 2018). The objective of these guidelines is to provide recommendations for protecting human health from exposure to environmental noise from transportation (road traffic, railway and aircraft), wind turbine noise and leisure noise. The guidelines set out recommended exposure levels for environmental noise in order to protect population health. The guidelines recommend L_{den} and L_{night} levels above which there may be adverse health risks for each source type.

The WHO guideline values are recommended to serve as the basis for a policy-making process to allow evidence based public health orientated recommendations. They are not intended to be noise limits and WHO (2018) states the following regarding the implementation of the guidelines.

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

Noise at continuously high levels, in excess of 80 dB(A) (General Application Regulations 2007, chapter 1 of Part 5: Control of Noise at Work, Health and Safety Authority (2007), can cause hearing impairment. It is rare however for road traffic noise to reach this level. Road traffic noise has been linked to increased risk of direct and indirect health effects such as ischemic heart disease (IHD), high levels of annoyance and sleep disturbance. WHO (2018) found that a 5% relevant risk increase of the incidence of IHD occurs at a noise exposure level of 59.3 dB L_{den} , a level that is consistent with the TII guideline value above.

WHO (2018) cites moderate quality evidence that there is an absolute risk of 10% of the population being ‘highly annoyed’ by road traffic noise at a level of 53.3 dB L_{den} . Annoyance is an indirect health effect and this threshold has not been adopted by any country for road traffic noise. It will be a decision for national and local policy makers to adopt the WHO guidelines and propose noise limits. The current TII guideline for operational noise as set out above is therefore considered appropriate for this assessment.

14.4.3.8 Operational Vibration Criteria

Although the rubber tires and suspension systems of vehicles provide vibration isolation, it is not usual for traffic to cause groundborne vibration problems on well-maintained road surfaces. For most issues with Heavy Goods Vehicle (HGV) -related vibration, such as rattling of windows, the cause is almost always directly related to running surface conditions such as potholes, bumps, expansion joints, or other discontinuities in the road surface which is usually resolved by smoothing such discontinuities and this will not be an issue for the Proposed Development.

The TII 2004 guidelines 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” (TII, 2004).

The approach outlined in the TII 2004 guidelines aligns with our experience from analysis of vibration measurements in proximity to roads. **Hence, vibration during the operational phase of the Proposed Development will not be considered further in this assessment.**

14.4.3.9 Impact Significance

In keeping with the scope of an Environmental Impact Assessment (EIA), the emphasis of this noise and vibration chapter is on the assessment of the potential effects of the Proposed Development upon the surrounding environment.

The following terminology and definitions are defined:

- **Noise Impact** – The difference in the acoustic environment before and after the implementation of the proposals (also known as the magnitude of change). This includes any change in noise level and in other characteristics/ features, and the relationship of the resulting noise level to any standard benchmarks.
- **Noise Effect** – The consequence of the noise impact. This may be in the form of a change in the annoyance caused, a change in the degree of intrusion or disturbance caused by the acoustic environment, or the potential for the change to alter the character of an area such that there is a perceived change in quality of life. This will be dependent on the receptor and its sensitivity.
- **Significance of Effect** – The evaluation of the noise effect and, particularly if the noise impact assessment is part of a formal EIA, deciding whether or not that impact is significant.

14.4.4 Description and Significance of Potential Effects

The significance of effects is a function of the magnitude and quality of the impact, positive or adverse, the geographical extent, duration of the impact, the frequency and likelihood of the impact occurring, and the sensitivity of the receptor. The significance of effect is assessed by weighing up these attributes and categorising it according to the generalised degree of impact significance set out in the EPA 2022 guidance as shown in Figure 14-1 (EPA, 2022).

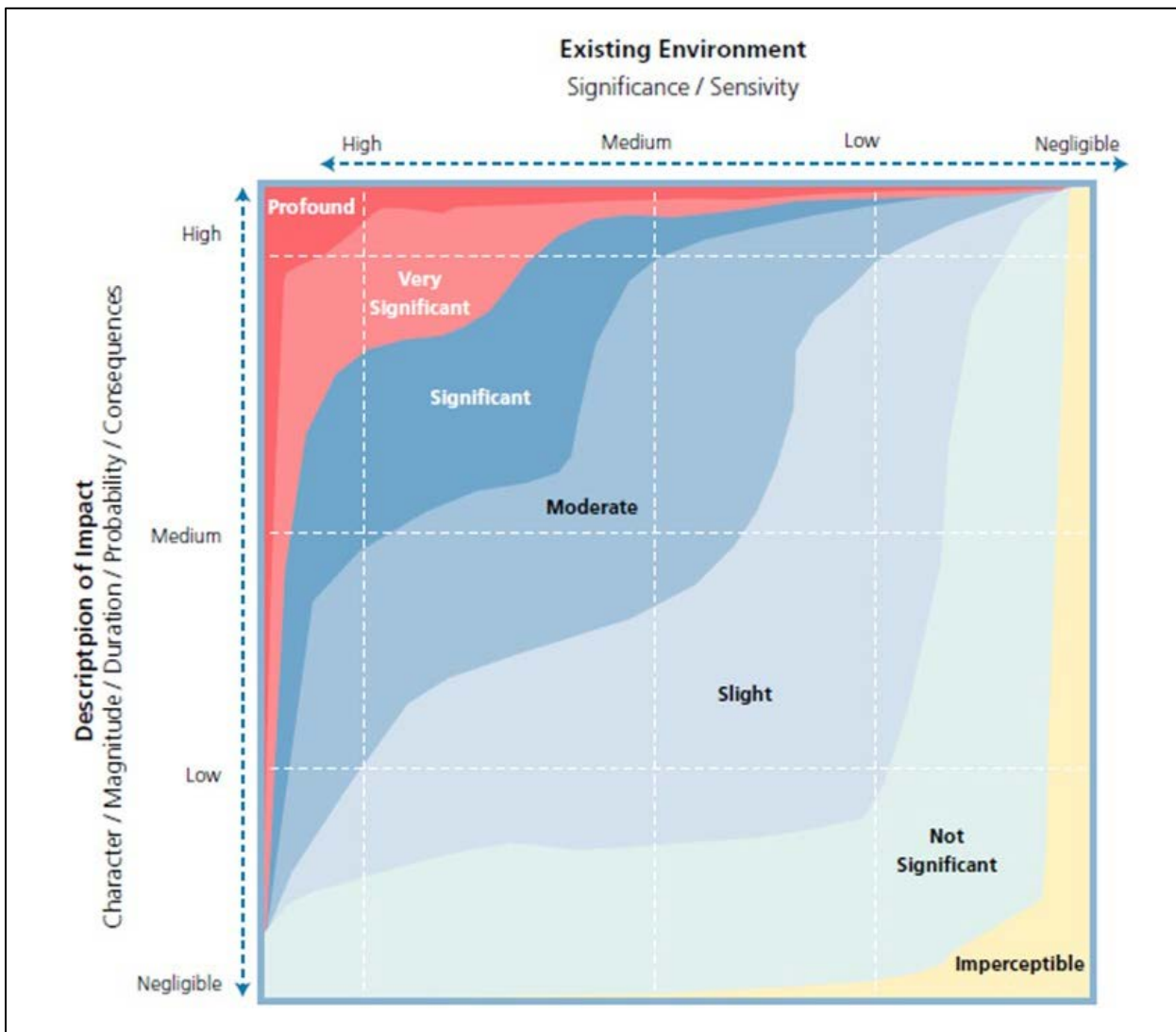


Figure 14-1: Classification of The Significance of Effects (EPA, 2022)

14.4.4.1 Construction Noise

Section 14.4.3.2 outlines the maximum permissible construction noise levels in the TII guidelines. These are used to determine the construction noise impact during all periods except night-time periods. The 'ABC' method in BS 5228-1 is used to determine the construction noise impact during night-time periods. The BS 5228-1 ABC method can be regarded as a method of categorising receptor sensitivity based on existing ambient noise levels, with thresholds for onset of significant impacts defined for each sensitivity category (A, B or C).

Using the baseline noise measurement data, it has been determined that the appropriate construction noise threshold value for determining the potential significant effects for residential receptors in the vicinity of the Proposed Development varies from Category A (i.e., 45 dB L_{Aeq} during night-time periods) to Category C (i.e., 55 dB L_{Aeq} during night-time periods) depending on location of the receptor. For assessing the significance of effect, reference is made to the EPA 2022 Guidelines and specifically the DMRB which states:

“Construction noise and construction traffic noise shall constitute a significant effect where it is determined that a major or moderate magnitude of impact will occur for a duration exceeding:

- 1) 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” (Highways England, 2020).

The method for rating significance of effects due to construction noise is set out in Table 14-8. As stated earlier, consideration of sensitivity of receivers is implicit in determination of the TII/BS 5228 threshold values.

Table 14-8: Construction Noise – Significance of the Impact

Noise Levels	EPA Magnitude of Impact	Significance Rating	Modifier
≤ Baseline noise level	Negligible	Imperceptible / Not Significant	
> Baseline noise level and ≤ TII/BS 5228 threshold	Low	Slight/ Moderate	Depends on TII/BS 5228 threshold value, baseline noise levels, duration and frequency. Public attitudes to, and acceptability of, the project itself.
> TII/BS 5228 threshold to ≤TII/BS 5228 threshold + 5 dB	Medium	Moderate/ Significant	
> TII/BS 5228 threshold +5 to + 10 dB	High	Significant/ Very Significant	
> TII/BS 5228 threshold + 10 dB		Very Significant / Profound	

14.4.4.2 Construction Traffic Noise

Section 14.4.3.4 outlined the DMRB magnitude of impact criteria used to determine the construction traffic noise impact. For assessing the significance of effect, reference is made to the EPA 2022 guidelines and the DMRB with the same criteria used for construction noise and construction traffic noise. Table 14-9 presents the construction traffic noise effect significance rating. Assessment of sensitivity of the receptor is undertaken by consideration of the baseline noise levels. The noise level increase is relative to the baseline, thereby also including some consideration of receptor sensitivity. Receptor sensitivity is further considered by taking account of character etc. in addition to the sensitivity criteria outlined in Table 14-2.

Table 14-9: Construction Traffic Noise – Significance of the Effect

Noise Level Increase	DMRB Magnitude	EPA Magnitude of Impact	Significance Rating	Modifier
Less than 1.0 dB	Negligible	Negligible	Imperceptible/ Not Significant	Depends on baseline noise levels, duration, and frequency.
1.0 to 2.9 dB	Minor	Low	Slight/ Moderate	
3.0 to 4.9 dB	Moderate	Medium	Moderate/ Significant	
Greater than or equal to 5.0 dB	Major	High	Significant/ Very Significant Very Significant/ Profound	

14.4.4.3 Construction Vibration

Section 14.4.3.5 outlines guidance on effects of vibration levels on humans and limits of transient vibration, above which cosmetic damage could occur. For assessing the significance of effect, reference is made to the DMRB which states:

“Construction vibration shall constitute a significant effect where it is determined that a major or moderate magnitude of impact will occur for a duration exceeding:

- 1) *10 or more days or nights in any 15 consecutive days or nights;*
- 2) *a total number of days exceeding 40 in any 6 consecutive months”* (Highways England, 2020).

Table 14-10 presents the construction vibration significance rating.

Table 14-10: Construction Vibration – Significance of Effects

Vibration Level	DMRB Magnitude	EPA Magnitude of Impact	Significance Rating	Modifier
Less than 0.3 mm/s	Negligible	Negligible	Imperceptible/ Not Significant	Depends on duration, occurrence, and frequency.
Greater than or equal to 0.3 mm/s and less than 1.0 mm/s	Minor	Low	Slight/ Moderate	
Greater than or equal to 1.0 mm/s and less than 10 mm/s	Moderate	Medium	Moderate/ Significant	
Greater than or equal to 10 mm/s	Major	High	Very Significant / Profound	

Construction activity can result in varying degrees of ground vibration, depending on the equipment and methods employed. Operation of construction equipment causes ground vibrations that spread through the ground and diminish in strength with distance. Buildings founded on the soil near the construction site respond to these vibrations with varying results, ranging from no perceptible effects at the lowest levels to slight damage at the highest levels. While ground vibrations from construction activities do not often reach the levels that can damage structures, fragile buildings must receive special consideration. The construction vibration criteria must include consideration of the building condition.

14.4.4.4 Operational Noise

As outlined in Section 14.4.3.7, TII (2004) and TII (2014) guidance specifies a 60 dB L_{den} design goal for receptors.

Road traffic noise can result in direct health effects at high levels but is more prevalent at levels that cause annoyance and sleep disturbance. There is strong evidence that both annoyance and sleep disturbance increase with increasing noise levels. The nature of road traffic noise is such that significant changes in road traffic are required on existing roads to change noise levels whereas the introduction of a new road in a greenfield area can result in a significant change in noise levels. The DMRB distinguishes between short-term and long-term impacts on the basis that receptors habituate to road traffic noise and annoyance/sleep disturbance effects reduce over time. For this assessment, habituation to road traffic noise has not been considered and effects will be assessed in both opening and design years using the DMRB short term magnitudes.

In the case of the Proposed Development, road traffic noise will be reduced somewhat on existing main routes providing reduced levels for a large number of residents, while noise levels will increase in open areas where new roads are constructed. The aim is to avoid significant adverse impacts on health and quality of life from noise as a result of the Proposed Development. Where operational road traffic noise is below the TII design goal of 60 dB L_{den} , the initial significance of effect is determined to be not significant. Where operational traffic noise levels are above the design goal, the impact rating is dependent on the magnitude above the design goal and the increase above the baseline noise environment.

Where pre-existing noise levels are already high (well above the design goal), a small change in noise levels will not be noticeable and a larger change may cause disturbance and be significant. The scale of the impact will depend on the degree of noise change. If the ambient noise level is currently low (below the threshold), then the scale of impact is dependent on the extent to which the predicted noise levels exceed the thresholds. The noise level criteria, associated magnitude of impact and initial significance rating for high sensitivity receptors are summarised in Table 14-11.

Table 14-11: Operational Noise – Significance of Effects

Predicted Noise Level above the TII Design Goal and Baseline Noise Levels, and a change in RTN of:	DMRB Magnitude	EPA Magnitude of Impact	Initial Significance Rating	Modifiers
Less than 1.0 dB	Negligible	Negligible	Imperceptible / Not Significant	TII three criteria assessment, absolute level, acoustic context, difference in noise level and likely perception of change by residents regarding noise levels, duration, and frequency.
1.0 to 2.9 dB	Minor	Low	Slight / Moderate	
3.0 to 4.9 dB	Moderate	Medium	Significant / Very Significant	
Greater than or equal to 5.0 dB	Major	High	Very Significant / Profound	

Where the sensitivity of a receptor is medium or low, the magnitude of impact reduces and initial significance rating changes.

14.5 Receiving Environment

14.5.1 Section 1

Ballybofey/ Stranorlar are two towns connected over the River Finn by a multi-span arch bridge carrying the existing N15 through the centre of the Twin Towns. The N15 meets the N13 at a junction north of the River Finn in Stranorlar. From there, the N15 proceeds east toward Killygordan and on to Lifford, while the N13 proceeds north towards Letterkenny. Section 1 of the Proposed Development is approximately 9.7 km long and runs to the west and north of Ballybofey/ Stranorlar. Additionally, there are two proposed link roads located to the south and the north of the towns. The Ballybofey Link Road connects the Proposed Development to the R252 and the existing N15 in the townland of Cappry. The N15 Primary Road Connector provides a Link from the proposed Teevickmoy Junction on the mainline to the existing N13 at the proposed Tircallen junction and on to the proposed Treanamullin Junction where it meets the existing N15 Stranorlar to Lifford road. The proposed route will divert traffic to the west and north of Ballybofey and Stranorlar, reducing traffic flow through the urban area which has a significant concentration of NSLs. The Proposed Development will increase noise levels in rural areas close to the new road.

14.5.2 Section 2

Section 2 is approximately 9 km long. The existing N56 enters Letterkenny from the north as a single carriageway route that traverses around the eastern outskirts of the town (and west of the River Swilly) and widens to a two-lane carriageway on approach to the Polestar roundabout. From the Polestar roundabout, traffic travels eastwards over a bridge on the River Swilly using a four-lane road (N56) as far as the Dry Arch Roundabout where it meets the N13 from Stranorlar and the N13 from Manorcunningham. A section of dual-carriageway (N13) connects the Dry Arch Roundabout with the Pluck Roundabout. Section 2 also includes the section of the N13 from the Dry Arch Roundabout, south to the top of the hill at Listellian.

Traffic will be diverted from the N13 and N56 roads to the Proposed Development that includes a new bridge over the River Swilly between Bonagee and Ballyraine from the proposed Dromore Junction. The Proposed Development includes improvements to the existing dual carriageway between the existing Dry Arch Roundabout and the N13/N14 Pluck roundabout (interface with Section 3). Section 2 finishes approximately 300m west of the existing N13/N14 Pluck roundabout. The Proposed Development will lead to a reduction in noise levels for the majority of NSLs.

14.5.3 Section 3

Section 3 is approximately 18.1 km long and extends from approximately 0.3 km west of the proposed N13/N14 Pluck Roundabout (interface with Section 2) to the border with Northern Ireland on the River Finn to the south of Lifford.

Section 3 involves the construction of a new N13/ N14 Pluck Roundabout which will link back to the existing N13 dual carriageway improvement works undertaken as part of the Section 2 works. From the N13/ N14 Pluck Roundabout, Section 3 follows an alignment close to the existing N14 to Mulnaveagh, where it runs southwest of the existing N14 to bypass Lifford to the south at the N14/N15 Lifford Junction. Section 3 includes a link from the N14/N15 Lifford Junction to the border with Northern Ireland which includes a new river bridge over the River Finn, i.e. the N14/N15 to A5 Link. This link connects to a proposed Trunk Road T3 in Northern Ireland which in turn connects to the proposed A5 WTC, both to be pursued by the Northern Ireland Department for Infrastructure.

14.5.4 Baseline Noise Surveys

Baseline noise monitoring was undertaken between 23rd and 26th April, between 7th and 10th May, between 15th and 16th May and on 12th June 2024. A total of 14 noise monitoring locations (NMLs) were surveyed using 24-hour noise monitoring stations and a further 55 NMLs were surveyed using the shortened measurement procedure outlined in the TII 2014 guidance (TII, 2014). Monitoring was carried out at locations in proximity to the Proposed Development, as well as along the existing N13, N14, N15 and N56.

14.5.4.1 Noise Monitoring Methodology

Class 1 sound level meters in accordance with IEC 61672-1:2013 were used for all measurements (IEC, 2013). Table 14-12 summarises the measurement equipment used over the four survey periods.

Table 14-12: Noise Monitoring Equipment

Description	Manufacturer	Model	Serial Number
Sound Level Meter	Brüel & Kjær	2250	2611593
Sound Level Meter	Brüel & Kjær	2250	2690265
Sound Level Meter	Brüel & Kjær	2250	3006559
Sound Level Meter	Brüel & Kjær	2250	3008423
Sound Level Meter	Svantek	SV307A	119015
Sound Level Meter	Svantek	SV977D	99026
Acoustic Calibrator	Brüel & Kjær	4231	2022652
Acoustic Calibrator	Svantek	SV36	124177

Laboratory calibration certificates for the equipment used are provided in Appendix C14.1: Equipment Calibration Certificates. A calibration check of each sound level meter was conducted before and after every survey period, with all calibration deviations being within the acceptable range of 0.5 dB deviation, as per ISO 1996-2 (ISO, 2017).

During the shortened measurement procedure surveys, sound level meters were mounted on portable tripods at heights of 1.5 m above ground level. Brüel & Kjær UA-0237 windshields were used to mitigate wind noise, although none of the monitoring data were collected during periods of high winds. Baseline noise levels were monitored in 15-minute periods at each of the 55 NMLs selected for the shortened procedure. For the 24-hour noise measurements, sound level meters were mounted at either 1.5 or 4 m above ground level, depending on the floor count of the nearest NSL. All measurements were taken at least 3.5 m from all reflecting surfaces, excluding the ground, where possible.

Baseline noise monitoring across all sections was conducted in both urban and rural areas. A total of 69 NMLs were chosen from across the entire Proposed Development. Certain criteria were taken into account

in choosing the NMLs, such as noise sensitivity, amenity, proximity to the Proposed Development and location along the existing routes through Ballybofey, Stranorlar, Letterkenny and Lifford. The monitoring of noise at sites with different baseline noise levels ensures a representative sample of baseline data is used to describe the existing environment. Details and coordinates of all NMLs are presented in Table 14-13 below. Photographs of the unattended equipment in-situ are presented in Appendix C14.2 Photographs of Unattended Noise Monitoring Locations.

Table 14-13: Baseline NMLs with Coordinates in Irish Transverse Mercator (ITM)

NML ID	Survey Type	Description	Easting (ITM)	Northing (ITM)
Section 1				
S1 A	Unattended	4 m high installation at a residential property in Cappry, c. 700 m from the N15.	611428	894195
S1 A1	Attended	Adjacent to a residential property in Cappry, c. 100 m from the N15.	611267	893520
S1 A2	Attended	Adjacent to a residential property in Dooish, c. 140 m from the N15.	610698	893231
S1 B	Unattended	1.5 m high installation at a residential property in Cappry, c. 200 m from Glenfin Rd (R252).	612509	894772
S1 B1	Attended	Adjacent to residential properties in Ballybofey along the N15.	613325	894229
S1 B2	Attended	Residential property in Cappry, c. 320 m from the R252.	612115	894695
S1 B3	Attended	Between two residential properties in Cappry along the R252.	612561	894947
S1 B4	Attended	Residential property in Cappry along the R252.	611822	895027
S1 B5	Attended	Residential property along the Drumboe Cottages road.	612976	895519
S1 B6	Attended	Residential property in Drumboe Lower, c. 300 m from the Drumboe Cottages road.	613606	895522
S1 C	Unattended	1.5 m high installation at a residential property in Mullandrait along the N15.	616353	895215
S1 C1	Attended	Terraced residential properties in Stranorlar along the N13.	614874	895356
S1 C2	Attended	Adjacent to a residential property on Drumboe Avenue, Stranorlar, along the N15.	614521	894975
S1 C3	Attended	At the entrance to Woodlawn housing estate in Stranorlar, along the N15.	615110	895183
S1 C4	Attended	Residential properties along a local road in Castlebane, c. 800 m from the N13.	616361	896396
S1 D	Unattended	4 m high installation at a residential property in Drumboe Upper, c. 230 m from the Drumboe Cottages road.	614017	896487
S1 D1	Attended	Residential property in Dunwiley Upper, c. 600 m from the Drumboe Cottages Road and c. 1.1 km from the N13.	614370	896643
S1 E1	Attended	Along a local road in Tircallan c. 30 m from the N13.	615993	897348
S1 E2	Attended	Adjacent to a residential property in Dunwiley, c. 630 m from the N13.	615120	897279
S1 E3	Attended	Along Letterkenny Road in Teevickmoy. Proxy location for nearby NSL.	615013	898102
S1 F	Unattended	1.5 m high installation at a residential property in Meenavoy, c. 50 m from the N13.	615912	899709
S1 F1	Attended	Residential property in Tivockmoy, c. 270 m from the N13.	615934	898946
S1 F2	Attended	Along an access track in Callan, c. 20 m from the N13. Proxy location for nearby NSL.	616072	900433
Section 2				
S2 A	Unattended	1.5 m high installation at a residential property along the L1114 in Dromore, adjacent to the N13.	620204	910721

NML ID	Survey Type	Description	Easting (ITM)	Northing (ITM)
S2 A1	Attended	Residential property in Dromore c. 50 m from the N13.	620248	910829
S2 A2	Attended	Residential property along the L1114 in Dromore, c. 25 m from the N13.	620490	910803
S2 A3	Attended	Residential property along the L1114 in Dromore, c. 60 m from the N13.	620036	910632
S2 A4	Attended	Footpath between a residential property and Robert Kee Power Equipment in Bonagee, c. 15 m from the N56.	619091	910848
S2 A5	Attended	Residential property along the N56 in Ballyrairie.	618615	912102
S2 A6	Attended	Letterkenny Glass in Dromore, c. 80 m from the N13.	620157	910838
S2 B	Unattended	4 m high installation at a residential property along the N13 in Correnagh.	619583	909247
S2 B1	Unattended	1.5 m high installation at a residential property in Listillion, c. 230 m from the N13.	619646	907758
S2 B2	Attended	St Patrick's National School along the N13.	619522	909414
S2 B3	Attended	Residential property in Correnagh c. 160 m from the N13.	619354	909046
S2 B4	Attended	Along a local road in Listillion c. 250 m from the N13.	619752	908757
S2 C	Attended	Donegal Animal Hospital c. 70 m from the N13.	619557	910004
S2 C1	Attended	Residential property in Drumany, c. 630 m from the N13.	620109	909904
S2 C2	Attended	Residential property along the N13 near Dry Arc Roundabout.	619444	910492
S2 C3	Attended	Adjacent to residential properties in Drumany, c. 210 m from the N13.	619983	910452
S2 D	Unattended	1.5 m high installation at a residential property in Trimragh, c. 170 m from the N13.	621439	911291
S2 D1	Attended	Along a local road in Drumreggan c. 60 m from the N13.	621000	911034
S2 D2	Attended	Adjacent to a residential property in Rossbracken, c. 40 m from the N13.	622797	910927
S2 D3	Attended	Along a local road in Trimragh, c. 65 m from the N13.	622006	911622
S2 D4	Attended	Residential property in Trimragh, c. 30 m from the N13.	621474	911606
Section 3				
S3 A	Unattended	1.5 m high installation at a residential property along the N14 in Drumcairn.	625489	909666
S3 A1	Attended	Residential property in Raymoghly c. 270 m from the N14.	623788	910811
S3 A2	Attended	At the entrance to a local road in Manorcunningham along the N14. Proxy location for residential property further south-east.	624427	910302
S3 A3	Attended	Residential property in Carrickballydoeey, c. 170 m from the N14.	624824	910142
S3 A4	Attended	Residential property in Drumoghill, c. 150 m from the N14.	625316	909941
S3 B	Unattended	1.5 m high installation at a residential property in Doorabble, c. 35 m from the N14.	626701	908141
S3 B1	Attended	Adjacent to residential properties in Mondooy Lower, c. 210 m from the N14.	625904	908783
S3 B2	Attended	Residential property in Ballyholey, c. 65 m from the N14.	627279	906905
S3 B3	Attended	Residential property in Slievebuck, c. 50 m from the N14.	627993	906039
S3 C	Unattended	4 m high installation at a residential property along Dromore Park, c. 65 m from the N14.	628740	903926
S3 C1	Attended	Adjacent to a residential property in Mullanaveigh, c. 900 m from the N14.	629976	901622

NML ID	Survey Type	Description	Easting (ITM)	Northing (ITM)
S3 C2	Attended	Access point along a local road in Tullyrap, c. 550 m from the N14. Proxy location for residential property opposite.	629331	902601
S3 C3	Attended	Adjacent to a residential property along the N14 at junction with the R236.	628216	905587
S3 D	Unattended	1.5 m high installation at a residential property in Ballindrait, c. 470 m from the R264.	630845	900017
S3 D1	Attended	Adjacent to a residential property in Tamnawood, c. 1 km from the N14.	630607	900930
S3 D2	Attended	Adjacent to residential properties off Rossgier Close, c. 170 m from the N14.	631790	900393
S3 D3	Attended	Residential property in Orchard Park, c. 840 m from the N14.	631510	899056
S3 D4	Attended	Residential property along the R264 in Murlough, c. 850 m from the N14.	631332	899566
S3 D5	Attended	Residential property in Tyleford, c. 840 m from the N14.	631211	900072
S3 E	Unattended	4 m high installation at a residential property along Beechwood Grove, c. 35 m from the N15.	632444	897507
S3 E1	Attended	Layby along Carriclea Road, c. 650 m from the N15. Proxy location for nearby residential property.	632483	896659
S3 E2	Attended	Adjacent to residential properties in the Glenfinn Park housing estate off Urney Road, c. 585 m from the N15.	632899	897060
S3 E3	Attended	Adjacent to residential properties in the Coneyburrow estate, c. 230 m from the N15.	632690	898010
S3 E4	Attended	Green area adjacent to roundabout with N14, N15 and Butcher Street in Lifford.	633204	898354
S3 E5	Attended	Adjacent to residential properties along Croaghan Heights, c. 370 m from the N14.	632453	898718

14.5.4.2 Meteorological Conditions

During the survey period from 23rd to 26th April 2024, weather conditions were mild and dry with temperatures ranging from 8 to 13 °C. Average wind speeds were generally low with some increased winds on 25th April. However, no wind speeds greater than 3 m/s were observed during any day. Cloud cover varied over the survey period, with approximate cover ranging from 10 to 90% over the four days.

From 7th to 10th May 2024, weather conditions were generally warm and dry with temperatures ranging from 13 to 19 °C. Average wind speeds were less than 2.5 m/s on all days. Cloud cover varied over the survey period, with approximate cover ranging from 30 to 90% over the four days.

On 15th and 16th May 2024, weather conditions were warm and dry with temperatures ranging from 14 to 18 °C. Average wind speeds were generally low and less than 2.0 m/s on both days. Cloud cover ranged from approximately 30 to 90% on the 15th May and 10 to 20% on the 16th May.

On 12th June 2024, weather conditions were warm and dry, with temperatures ranging from 10 to 15 °C. Average wind speeds were less than 2.0 m/s throughout the survey period. Cloud cover ranged from approximately 70 to 90%.

14.5.4.3 Section 1 Baseline Noise Monitoring Results

Baseline noise monitoring at Section 1 (Ballybofey and Stranorlar) was carried out at 23 different locations. Five of these locations were surveyed using 24-hour noise monitors and the remaining 18 NMLs were surveyed using the shortened measurement procedure (TII, 2014). The locations of all section 1 NMLs are shown on Figure 14-2. The majority of the locations are located near the proposed new route and its side roads. S1 C1, C2 and C3 are located in Ballybofey and Stranorlar.

Section 1 baseline noise survey results are presented in Table 14-14 and Table 14-15 below. For the 24-hour measurements, a measured L_{den} is reported. For the short-term measurements, the L_{den} was derived. Further information on the noise survey data is presented in Appendix C14.3 Baseline Noise Survey Data.

Table 14-14: Section 1 Baseline Noise Survey Results – 24-hour Measurements

NML ID	Measured L_{den}
S1 A	54
S1 B	48
S1 C	67
S1 D	55
S1 F	63

Table 14-15: Section 1 Baseline Noise Survey Results – Short-term Measurements

NML ID	Derived L_{den}
S1 A1	51
S1 A2	51
S1 B1	71
S1 B2	55
S1 B3	60
S1 B4	57
S1 B5	49
S1 B6	43
S1 C1	74
S1 C2	64
S1 C3	64
S1 C4	54
S1 D1	49
S1 E1	64
S1 E2	48
S1 E3	43
S1 F1	56
S1 F2	67

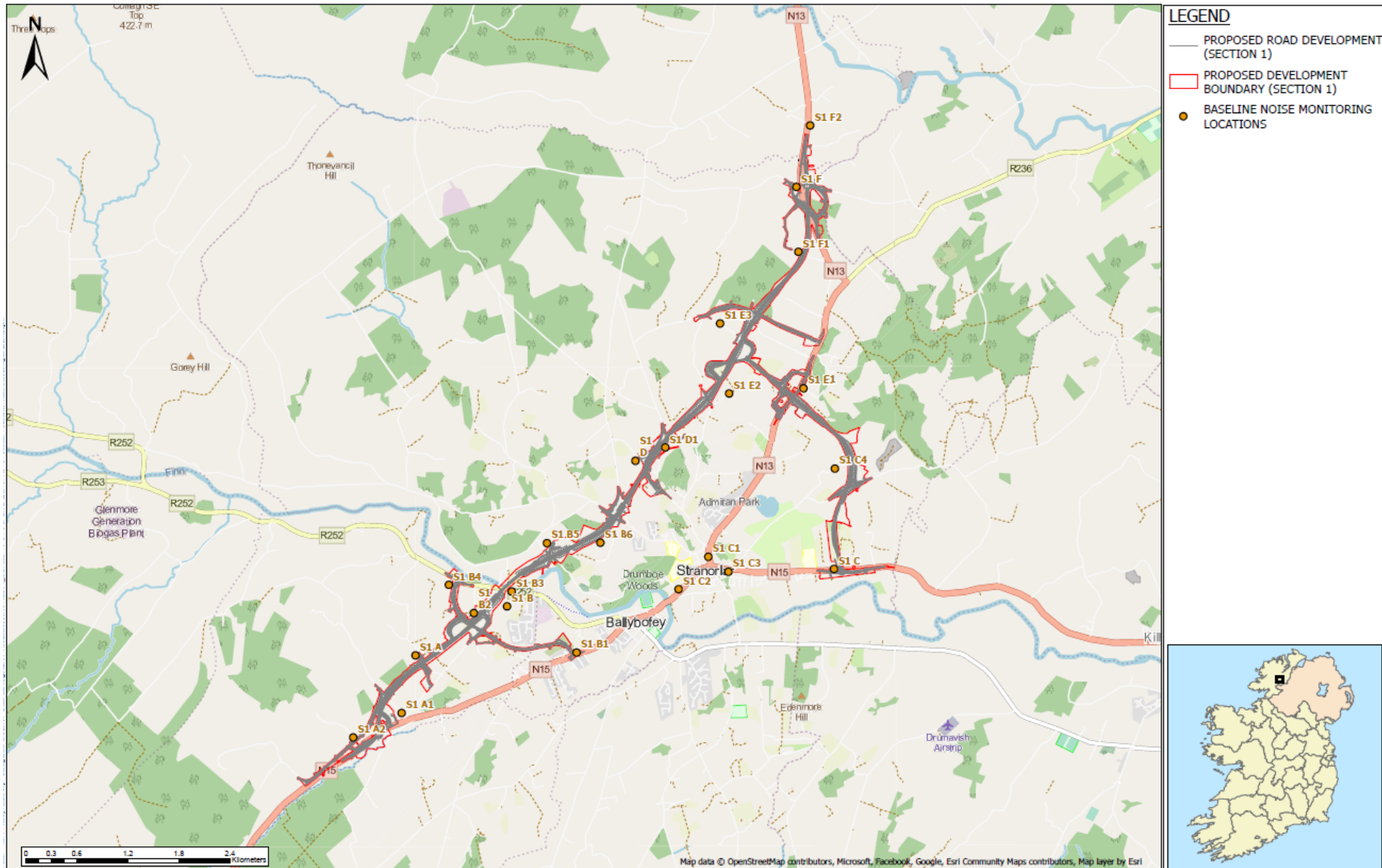


Figure 14-2: Section 1 Baseline NMLs

14.5.4.4 Section 2 Baseline Noise Monitoring Results

Baseline noise monitoring at Section 2 (Letterkenny) was carried out at 21 different locations. Four of these locations were surveyed using 24-hour noise monitors and the remaining 17 NMLs were surveyed using the shortened measurement procedure (TII, 2014). All section 2 NMLs are shown on Figure 14-3. The majority of the locations are located near the Proposed Development and existing roads (N13 and N56).

Section 2 baseline noise survey results are presented in Table 14-16 and Table 14-17 below.

Table 14-16: Section 2 Baseline Noise Survey Results – 24-hour Measurements

NML ID	Measured L _{den}
S2 A	70
S2 B	66
S2 B1	60
S2 D	63

Table 14-17: Section 2 Baseline Noise Survey Results – Short-term Measurements

NML ID	Derived L _{den}
S2 A1	61
S2 A2	68
S2 A3	64
S2 A4	71
S2 A5	64
S2 A6	63
S2 B2	68
S2 B3	55
S2 B4	55
S2 C	57
S2 C1	49
S2 C2	64
S2 C3	59
S2 D1	69
S2 D2	69
S2 D3	56
S2 D4	62

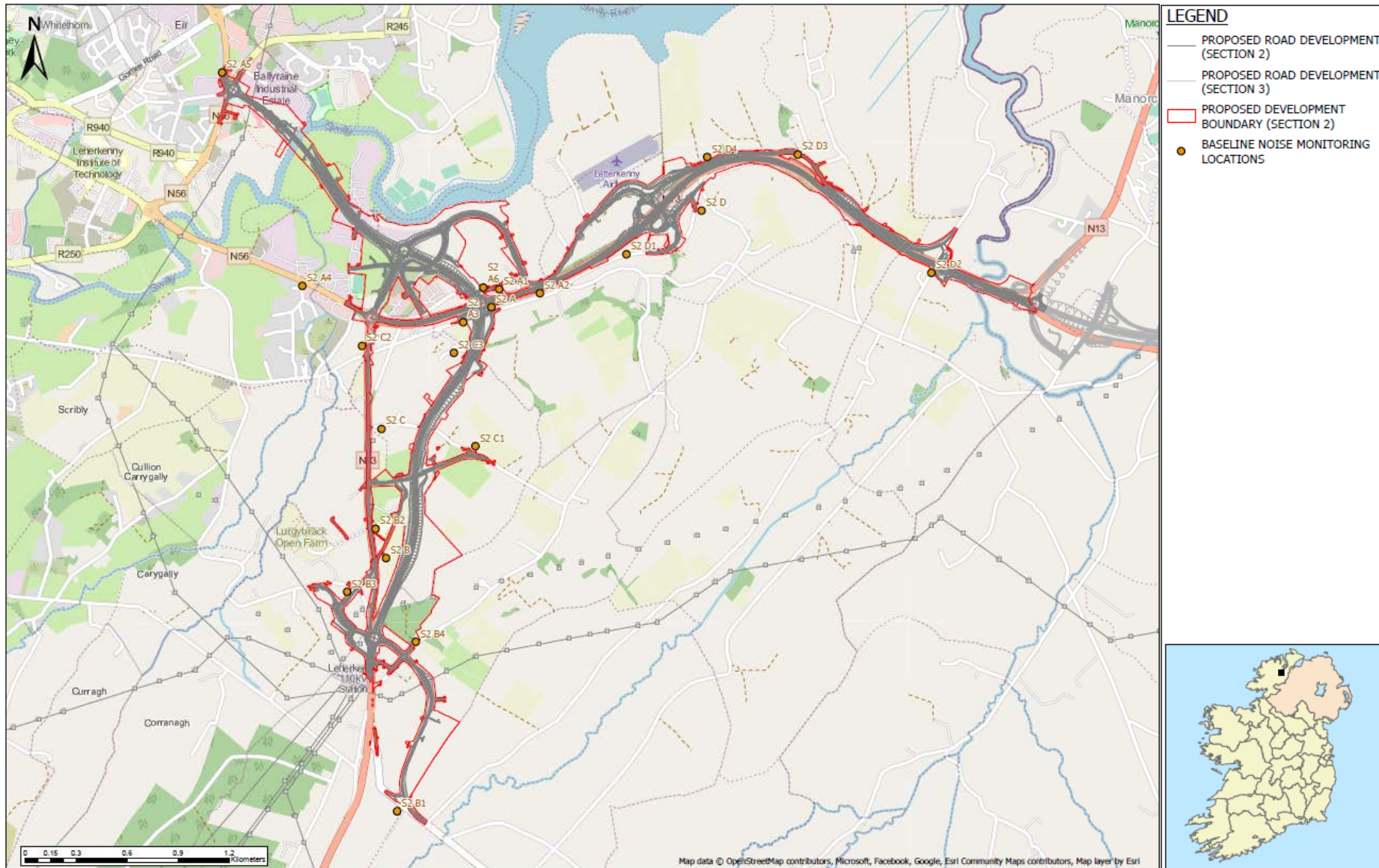


Figure 14-3: Section 2 Baseline NMLs

14.5.4.5 Section 3 Baseline Noise Monitoring Results

Baseline noise monitoring at Section 3 (Letterkenny – Lifford) was carried out at 25 different locations. Five of these locations were surveyed using 24-hour noise monitors and the remaining 20 NMLs were surveyed using the shortened measurement procedure (TII, 2014). All Section 3 NMLs are shown on Figure 14-4. The majority of the locations are located near the Proposed Development and existing roads (N14 and N15).

Section 3 baseline noise survey results are presented in Table 14-18 and Table 14-19.

Table 14-18: Section 3 Baseline Noise Survey Results – 24-hour Measurements

NML ID	Measured L_{den}
S3 A	71
S3 B	65
S3 C	61
S3 D	60
S3 E	63

Table 14-19: Section 3 Baseline Noise Survey Results – Short-term Measurements

NML ID	Derived L_{den}
S3 A1	56
S3 A2	76
S3 A3	54
S3 A4	50
S3 B1	47
S3 B2	58
S3 B3	56
S3 C1	51
S3 C2	47
S3 C3	69
S3 D1	49
S3 D2	49
S3 D3	48
S3 D4	62
S3 D5	51
S3 E1	52
S3 E2	55
S3 E3	55
S3 E4	70
S3 E5	49

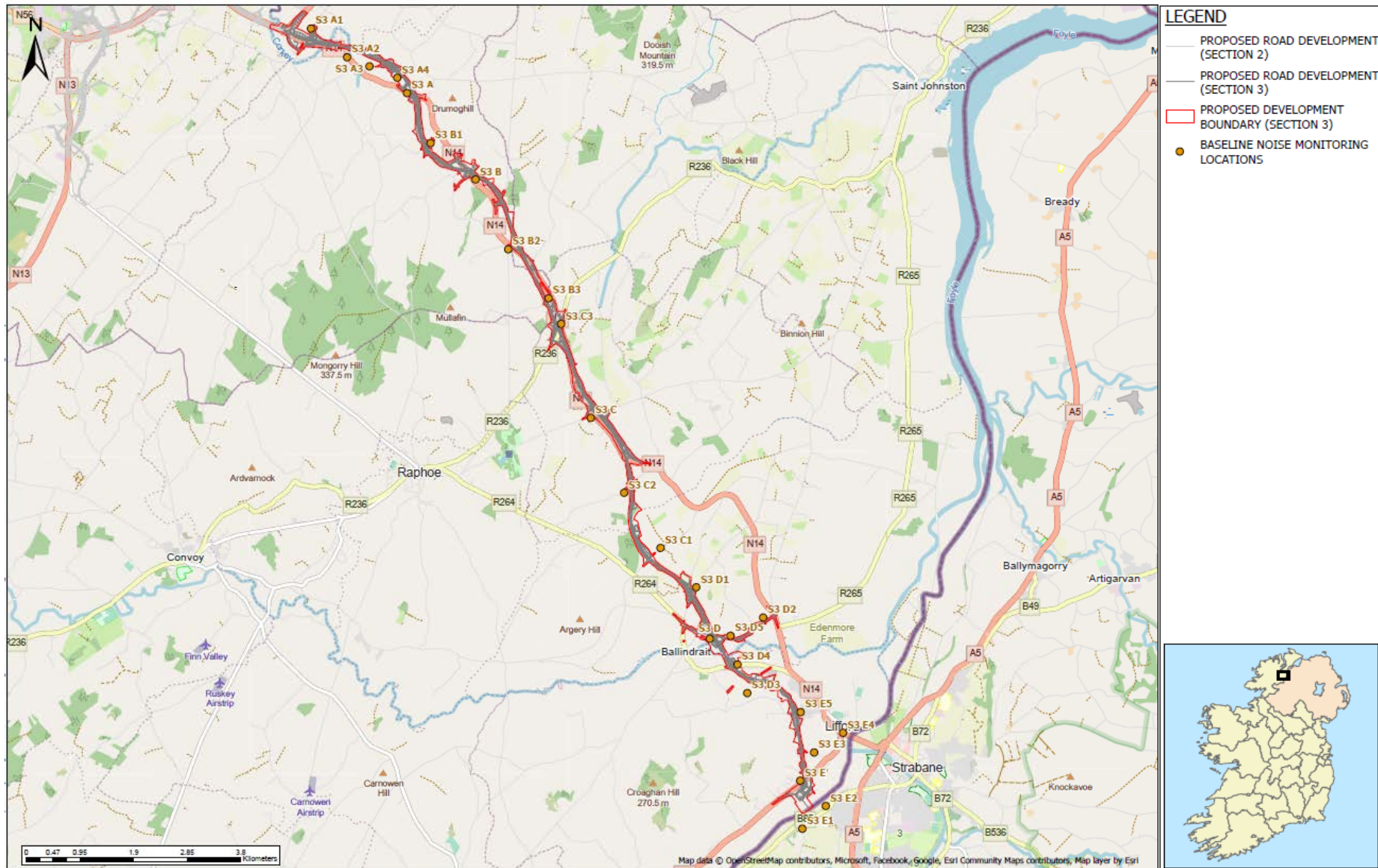


Figure 14-4: Section 3 Baseline NMLs

14.6 Construction Phase Impacts

Momentary, brief, temporary and short-term increases in noise impacts will occur during the construction phase of the Proposed Development due to the requirement to use heavy plant and machinery. The key activities during the construction phase will be:

- Excavation including rock extraction.
- Construction of the road carriageway.

There is generally a higher tolerance for short-term construction related noise than that which causes annoyance over the long term. This is reflected in the construction noise guidelines summarised in Section 14.4.3.2.

Construction works will typically be undertaken on a six-day working week:

- Monday to Friday between 07:00 and 19:00; and
- Saturdays between 08:00 and 16:00.

No construction works, save for emergency works and/or dewatering, will be permitted outside of these hours or on Sundays or Public Holidays without the prior agreement of Donegal County Council. Examples of where agreement may be reached to work outside of the above hours include

- Transport, delivery and lifting into place of large construction elements manufactured off-site, e.g. bridge beams.
- Road or lane closures to facilitate utilities diversions.
- Other activities, e.g. office-based work, walkover surveys and/or inspections.

In addition, under certain circumstances, e.g. storm or bad weather events, construction related activity may have to take place outside of the above hours to protect the public, the environment, the works, plant, machinery, etc.

Construction activities associated with road developments can be classified as particular types of activity, as shown in Table 14-20. The Proposed Development is linear in nature and construction activity will be mobile over the course of the proposed works (i.e., works will not be taking place at any one location permanently). Activities will vary in intensity and duration throughout the course of the works. This variation in location, intensity, and duration results in significant variation in the noise levels experienced at any NSL.

Table 14-20: Construction Activities – Description

Activity	Description	Classification
Site Enabling Works	Typically comprising fencing and utility diversions, construction of site compounds and site clearance. Equipment includes excavators, lorries, dump trucks and pavement finishing equipment.	Mobile works
	Demolitions will arise in the case of buildings or old structures. Equipment includes cranes, dumpers, lorries, and concrete breaking equipment.	Static works
Earthworks	Earthworks involves the extraction of soil and stone materials to foundation level or rock level along the length of the Proposed Development. Earthworks will also take place at material extraction and deposition areas. Equipment includes excavators, dump trucks and in some cases, road lorries, where material must be hauled outside the site boundary.	Mobile works
Rock Extraction	Rock extraction will be carried out using excavation and ripping techniques where possible. Rock blasting may be required at some locations. Where rock is extracted for use on the project, crushing and screening operations will be required so that the material is reused on the project.	Mobile and static works
Overpass and Bridge Structures	The construction of overpasses, underpasses or bridges will involve removal of unsuitable material, placement of suitable material and erection of concrete structures. Equipment includes excavator's dumper trucks and concreting equipment.	Static works
Watercourse Works	Watercourse works will include watercourse diversions, construction of culverts and attenuation ponds and similar works along the length of the	Static works

Activity	Description	Classification
	Proposed Development. Equipment includes excavators and plant for installing pre-cast units.	
Road Formation	Road formation includes the foundations, base and surface layers of the proposed carriageway along the length of the Proposed Development. Equipment includes excavators, dumpers, trucks and rollers to place materials.	Mobile works
Park and Share	The proposed park and share facilities include a surfaced area, fencing and signage at specific locations in each section. Proposed works will comprise site enabling works, earthworks and road formation works.	Static works
Signage and Lighting	Signage and lighting include the erection of safety and acoustic barriers. Activities include foundation works and erection of barriers, lights and signs with some works being carried out at height. Equipment includes small earthworks equipment and mobile lifting equipment.	Mobile works
Landscaping	Landscaping is usually completed towards the end of the project when heavy construction is completed. Equipment includes tractors, excavators and dump trucks.	Mobile works

Noise levels at a given NSL are influenced by the intensity of the source, proximity to the source and any screening effect between the source and the NSL. Construction of a project of this scale means that sources are moving regularly. During both the excavation and construction activities, works such as cuttings, material stockpiles and embankments will provide screening at some NSLs.

The assessment has considered the specific works which are significantly mobile, such as rock extraction and road formation, and static works, such as crushing and screening, demolition works and works at structures. Mobile works are unlikely to impact at a specific NSL for long periods of time, while static works will require intense activity for short periods close to some NSLs. At static locations such as structures or overpasses, the impact of the works can be significantly reduced by screening effects.

As some of the construction works may need to be carried out over the length of the Proposed Development, the assessment has been carried out by considering the distance between the nearest NSL to the potential construction activities. The predicted noise levels at various distances are tabulated. The modelled noise level will be further reduced as the distance to the NSL increases or screening effects arise.

The noisiest activities have been considered as part of the assessment and if compliance can be demonstrated for these noisiest activities then compliance will be demonstrated from other less intrusive activities. Plant items such as generators, pumps, temporary lighting, and hand tools amongst others have the potential to generate noise albeit at much lower levels than the plant items modelled in the construction tasks described in the subsequent sections.

14.6.1 Site Enabling Works

It is intended that the works will include for a full site clearance of vegetation within the lands required for construction of the Proposed Development. This is a mobile activity which will be carried out over the length of the Proposed Development. Temporary lands will be required for some aspects of the construction and for the proposed site compounds. Temporary stockpile areas for topsoil and other earthworks materials (e.g., rock to be processed for re-use in the construction) have been included in the Proposed Development.

14.6.1.1 Site Enabling Works – Noise Modelling

Site enabling works at the construction compounds have been modelled and Table 14-21 presents the plant required as well as the duty cycle modelled as part of the activity.

Table 14-21: Plant for Site Enabling Works – Site Compounds

Plant	BS 5228 Ref.	Description	Duty Cycle / No. of Trips
Tracked excavator	C.2.5	Clearing Site	50%
Road lorry (full)*	C.6.21	Delivery / Removal of Material	Three loads per hour
Dump truck (tipping fill)	C.2.30	Tipping Fill	10%
Lorry with lifting boom	C.4.53	Lifting material	25%
Dozer	C.5.12	Spreading Chipping and Fill	50%
Vibratory Roller	C.5.28	Rolling and Compaction	50%
Chainsaw ¹	Manufacturer's Datasheet	Stihl MS461 Chainsaw	50%
Mulcher ¹	Manufacturer's Datasheet	BE TMS 2300 Mulcher	25%
Woodchipper ¹	Manufacturer's Datasheet	QuadTrak 160	60%

* Drive-by maximum sound level.

¹ Will only be required where vegetation and trees are to be removed.

Once the site compounds have been established, they will be used to provide office and welfare facilities for site staff. The construction compound will also provide facilities for material storage, laydown, maintenance of construction plant and possibly material testing. The noise emissions from these activities will be less than those associated with the site enabling works.

As noted above, it is intended that the site enabling works will include for a full site clearance of vegetation within the lands required for construction of the proposed works. This is a mobile activity which will be carried out over the length of the Proposed Development. Table 14-22 presents the plant required as well as the duty cycle modelled as part of the activity. This phase of works is expected to last six months. However, the distance between the site enabling works and NSLs will vary throughout that period.

Table 14-22: Plant for Site Enabling Works – Site Clearance

Plant	BS 5228 Ref.	Description	Duty Cycle / No. of Trips
Tracked excavator	C.4.63	Ground excavation/earthworks/trenching	75%
Road lorry (full)*	C.6.21	Distribution of Material	Three loads per hour
Articulated dump truck*	C.6.18	Distribution of Material	Three loads per hour
Dozer*	C.2.1	Clearance/Earthworks	50%
Chainsaw ¹	Manufacturer's Datasheet	Stihl MS461 Chainsaw	50%
Mulcher ¹	Manufacturer's Datasheet	BE TMS 2300 Mulcher	25%
Woodchipper ¹	Manufacturer's Datasheet	QuadTrak 160	60%

* Drive-by maximum sound level.

¹ Will only be required where vegetation and trees are to be removed.

Site Compounds

There are two proposed site compounds in Section 1: one at Trenamullin adjacent to the proposed N15 Primary Road Connector c. 270 m north of the tie-in with the N15 west of Stranorlar town and the second location at Capry adjacent to the Mainline Ch 1+500 – 1+750 (three adjacent sites MED01, MED04 and the proposed Park & Share facility). The closest NSLs to the construction compounds are c. 100 m from the Capry site compound and c. 170 m from the Trenamullin site compound.

There are two proposed site compounds in Section 2, one at Lurgy at the southern end, accessed from the L-1064, and one at Bonagee, north of the Dry Arch Roundabout. The closest NSLs to the construction compounds are c. 210 m away from the Lurgy site compound and c. 25 m from the Bonagee site compound.

There are two proposed site compounds in Section 3, one southeast of the Pluck Roundabout accessed from the L-1294 Manorcunningham local road and one on the R236, adjacent to the mainline at Ch. 7+900. The closest NSLs to the construction compounds are <10 m away from the Pluck Roundabout site compound and c. 145 m from the R236 site compound.

The predicted noise levels at various distances from the activities associated with the establishment of the site compounds are presented in Table 14-23.

Table 14-23: Predicted Noise Levels for Site Compounds

Activity	Predicted Noise Level, L_{Aeq} (dB) at Various Distances				
	10 m	25 m	50 m	75 m	100 m
Site Compounds	76	71	67	64	63
Site Compounds (Excluding Tree Felling and Processing Activities)	62	59	56	54	53

Noise levels associated with the establishment of the site compounds are predicted to exceed the TII construction noise threshold of 70 dB $L_{Aeq,1hr}$ when activities occur within 28 m from NSLs.

The plant items with the potential for greatest impact are the tree felling and processing activities (i.e., the chainsaw, mulcher and woodchipper). When these activities are not occurring, noise levels at every NSL across the Proposed Development are predicted to be below the TII construction noise threshold. In practice, tree felling and processing will not be required in the majority of locations. It is likely that where removal is required, durations of elevated noise levels at NSLs will be relatively short.

When tree felling and processing are required, the magnitude of impact for the establishment of site compounds for NSLs within 28 m of the activity ranges from medium to high, depending on location, indicating a **potential significant** significance of effect. For NSLs outside this range, the magnitude of impact is low, indicating a **slight to moderate** significance of effect, depending on location.

Where tree felling and processing are not required, the magnitude of impact for the establishment of site compounds is low, indicating a **slight to moderate** significance of effect, depending on location.

Given the proximity of the compound locations to receptor locations, mitigation measures for when tree felling and processing are required are provided in Section 14.8.1. Mitigation measures post establishment of the site compounds are also presented.

Site Clearance

The noise levels at the majority of NSLs are generally below the TII construction noise threshold. However, there are several NSLs within 66 m of the site clearance activity where there is potential for the construction noise threshold to be exceeded. Predicted noise levels at various distances from the site clearance activity are presented in Table 14-24.

Table 14-24: Predicted Noise Levels for Site Clearance

Activity	Predicted Noise Level, L_{Aeq} (dB) at Various Distances				
	10 m	25 m	50 m	75 m	100 m
Site Clearance	83	77	72	69	67
Site Clearance (Excluding Tree Felling and Processing Activities)	73	67	62	59	57

Noise levels associated with the site clearance activity are predicted to exceed the TII construction noise threshold of 70 dB $L_{Aeq,1hr}$ when activities occur within 66 m of NSLs.

As with the predicted noise levels for the site compounds, the plant items with the potential for greatest impact are the tree felling and processing activities. When these activities are not occurring, noise levels for

site clearance are predicted to exceed the construction noise threshold when activities occur within 15 m of NSLs.

The site clearance activity will be mobile along the entire footprint of the Proposed Development and for the majority of this footprint, tree felling and processing will not be required. It is likely that where removal is required, durations of elevated noise levels at NSLs will be relatively short. Furthermore, exceedances of the construction noise threshold will not be experienced by all NSLs within the stated ranges, as unique screening from topography and other buildings will decrease the incident noise level.

When tree felling and processing are required, the magnitude of impact for site clearance and fencing for NSLs within approximately 66 m of the activity ranges from medium to high, depending on location, indicating a **potential significant or very significant** significance of effect. For NSLs outside this range, the magnitude of impact is low, indicating a **slight to moderate** significance of effect, depending on location.

Where tree felling and processing are not required, the magnitude of impact for site clearance and fencing for NSLs within approximately 15 m ranges from medium to high, depending on location, indicating a **moderate to significant** significance of effect. For NSLs outside this range, the magnitude of impact is low, indicating a **slight to moderate** significance of effect, depending on location.

Mitigation measures for the site clearance activity are provided in Section 14.8.1.

14.6.1.2 Demolitions

Demolition is classified as a static activity. Details on the acquisition of dwellings, commercial buildings and outbuildings required for the construction of the Proposed Development are presented in Chapter 4: Project Description.

The closest NSL (80490723) to the demolition of buildings is in Section 1, less than 5 m away from the demolition of a private dwelling adjacent to the LX-1005 Ballyboffey Link Road tie-in with the N15 east of Ballyboffey. There is also an NSL (80483620) c. 7m away from demolition works in Dromore. Table 14-25 presents the plant required as well as the duty cycle modelled as part of the scenario associated with this activity.

Table 14-25: Plant for Building Demolition Works

Plant	BS 5228 Ref.	Description	Duty Cycle / No. of Trips
Pulverizer mounted on excavator	C.1.4	Demolition of structure	75%
Wheeled excavator	C.5.11	Loading of material	75%
Road lorry (full)*	C.6.21	Lorry for removal of waste material	One load per hour
Backhoe mounted hydraulic breaker	C.5.1	Breaking foundations	25%

* Drive-by maximum sound level.

Predicted noise levels at various distances from the building demolition works are presented in Table 14-26.

Table 14-26: Predicted Noise Levels for Building Demolition Works

Activity	Predicted Noise Level, L_{Aeq} (dB) at Various Distances				
	10 m	25 m	50 m	75 m	100 m
Demolitions	82	74	68	64	62

Noise levels associated with the building demolition works are predicted to exceed the TII construction noise threshold of 70 dB $L_{Aeq,1hr}$ when activities occur within 39 m of NSLs, indicating a **potential significant** or **very significant** significance of effect at NSLs within this range.

This phase of works is expected to last several days per location. The noisiest individual item of plant is the backhoe mounted hydraulic breaker, which has the potential to generate high levels of noise. However, the backhoe mounted hydraulic breaker is likely to be used only sporadically. Furthermore, it is unlikely that all plant will be operating simultaneously and the actual noise level will be lower than that shown in Table 14-26 for the majority of the time.

Overall, the magnitude of impact for building demolition works is medium to high for NSLs located within 39 m of the activities, indicating a **potential moderate or significant** significance of effect when the duration of the activity is considered. Outside of this range, the magnitude of impact is low, indicating a **slight to moderate** significance of effect, depending on location.

To mitigate the noise impact from this activity, several measures are proposed in Section 14.8.1.

14.6.2 Earthworks

Earthworks will form a significant part of the construction programme. This is a mobile activity which will be carried out over the length of the Proposed Development. There is an earthworks balance within the development, and that all requirements to extract and deposit material can be met within the Proposed Development boundary by the utilisation of proposed Material Extraction and/or Deposition (MED) areas that have been identified within the Proposed Development boundary, as shown in the general arrangement EIA Drawings 4.1 (Section 1), 4.2 (Section 2) and 4.3 (Section 3) in Volume D: Book of Drawings. Accordingly, there will be no net import or export of earthworks material to or from any section.

Table 14-27 presents the plant required as well as the duty cycle modelled as part of the scenario associated with this activity.

Table 14-27: Plant for Earthworks

Plant	BS 5228 Ref.	Description	Duty Cycle / No. of Trips
Tracked excavator	C.4.63 (x3)	Ground excavation / earthworks / trenching	75%
Road lorry (full)*	C.6.21	Distribution of Material	Five loads per hour
Articulated dump truck*	C.6.18	Distribution of Material	Five loads per hour
Vibratory roller	C.5.25	Rolling and Compaction	50%
Dozer*	C.2.1	Earthworks	50%

* Drive-by maximum sound level.

Predicted noise levels at various distances from the earthworks activity are presented in Table 14-28.

Table 14-28: Predicted Noise Levels for Earthworks

Activity	Predicted Noise Level, L_{Aeq} (dB) at Various Distances				
	10 m	25 m	50 m	75 m	100 m
Earthworks	78	72	67	64	62

Noise levels associated with the earthworks activity are predicted to exceed the TII construction noise threshold of 70 dB $L_{Aeq,1hr}$ when activities occur within 32 m of NSLs, indicating a **potential significant** significance of effect at NSLs within this range. However, the distance to NSLs will vary throughout the earthworks activity period as this activity will be mobile along the length of the Proposed Development. As works progress along the mainline, noise levels experienced by NSLs vary and will decrease as the

distance between the works and NSL increases. It is also important to note that the scenario modelled assumes no attenuation from cuttings. Where activities are occurring within a cut, the topography will attenuate the noise propagating towards NSLs from other earthworks activities.

The magnitude of impact for earthworks for NSLs within 32 m of the activity is high, indicating a **potential significant** or **very significant** significance of effect. For NSLs outside this range, the magnitude of impact is low, indicating a **slight to moderate** significance of effect, depending on location. Mitigation measures for earthworks are provided in Section 14.8.1.

14.6.3 Rock Extraction, Blasting and Processing

The rock underlying the soil across the Proposed Development is a variety of types including Precambrian quartzites and schists as described in Chapter 10: Land, Soil & Hydrogeology. It is expected that the rock is intact in places and it may be necessary to employ blasting at depth in some cases. Where significant quantities of rock are extracted for re-use on the project, some rock processing such as crushing and screening will be required.

14.6.3.1 Rock Extraction

Table 14-29 presents the plant required as well as the duty cycle modelled as part of the scenario associated with rock extraction. This is a mobile activity which will be carried out at several locations within the development boundary. This phase of works is expected to last 24 months over different locations, the bulk of the activity will be completed in 12 months. However, the distance to NSLs will vary depending on the deposit being extracted.

Table 14-29: Plant for Rock Extraction

Plant	BS 5228 Ref.	Description	Duty Cycle / No. of Trips
Tracked mobile drilling rig	C.9.1	Drilling for blasting	25%
Tracked excavator	C.6.8	Breaking out and Loading	75%
Dozer	C.2.10	Ripping Rock	50%
Wheeled excavator	C.5.11	Removing broken road surface	75%
Tracked excavator	C.5.35	Trenching	75%
Excavator Mounted Rock breaker	C.9.11	Rock Breaking	10%
Articulated dump truck*	C.6.18	Distribution of Material	Five loads per hour

* Drive-by maximum sound level.

Predicted noise levels at various distances from the rock extraction activity are presented in Table 14-30.

Table 14-30: Predicted Noise Levels for Rock Extraction

Activity	Predicted Noise Level, L_{Aeq} (dB) at Various Distances				
	10 m	25 m	50 m	75 m	100 m
Rock Extraction	85	77	71	68	65

Noise levels due to rock extraction are predicted to exceed the TII construction noise threshold of 70 dB $L_{Aeq,1hr}$ where activities occur within 56 m of NSLs. There are several NSLs within this range across the three sections of the Proposed Development.

The scenario modelled assumes that rock is on the surface. In practice, rock is likely to be encountered below the current ground level¹ and this will mean that direct line of sight will be obscured, and the predicted noise impact will be lower. As the rock is excavated, the acoustic screening from topography will also increase. In addition, the frequency of the noisiest activities is expected to be considerably less than the more typical break-out and loading activities that will be undertaken daily. The combination of expected acoustic screening, lower frequency of activities, and shorter durations makes significant effects at any given NSL unlikely for the majority of NSLs.

The magnitude of impact for rock extraction is medium to high for NSLs located within 56 m of the activities, indicating a **potential moderate** to **very significant** significance of effect, depending on location. Outside of this range, the magnitude of impact is low, indicating a **slight to moderate** significance of effect, depending on location.

Mitigation measures will be required to avoid significant effects where there is direct line of sight between the activity and the NSL and the distance is less than 56 m. Details of mitigation measures are given in Section 14.8.1.

14.6.3.2 Rock Blasting

Rock blasting will be required in cuttings where excavation and ripping techniques are not effective. Rock blasting allows large volumes of rock to be removed in an efficient manner, avoiding the need for extended rock breaking activity with associated noise levels. Rock blasting is strictly controlled and can only be carried out between Monday and Friday, usually in the afternoons. Formal safety and notification procedures will be adopted and all blasting will be monitored for noise and vibration levels.

Due to the nature of blasting, site specific characteristics can vary significantly. This requires a cautious approach at each location. Initial test blasting will be required at each proposed location incorporating low levels of charge in a limited area. When site characteristics are known, the blast design will be fine-tuned to ensure the noise and vibration design goals set out in Section 14.4.3.5 will be adhered to at all times at sensitive locations.

14.6.3.3 Rock Processing

The granular fill requirements of the project will be met using materials arising from excavations. Therefore, processing of rock will be necessary and temporary areas on-site are required where rock processing, including crushing, grading and stockpiling will take place. It is proposed that rock processing will occur close to locations where the material is being extracted, provided there is sufficient separation distance between the activity and the nearest noise sensitive receptors. Table 14-31 presents the plant required as well as the duty cycle modelled as part of the scenario associated with this activity.

Table 14-31: Plant for Rock Processing

Plant	BS 5228 Ref.	Description	Duty Cycle / No. of Trips
Tracked crusher	C.1.14	Crushing Rock	75%
Screen stockpiler	C.10.15	Screen and grading of material	75%
Articulated dump truck	C.6.26	Dumping Load	10%
Articulated dump truck*	C.6.18	Distribution of Material	Five loads per hour
Wheeled loader	C.10.5	Loading material	50%

* Drive-by maximum sound level.

Predicted noise levels at various distances from the rock processing activity are presented in Table 14-32.

¹ Section 1 - Intact bedrock was encountered in the rotary core boreholes at depths varying from 1.1 m to 12 m b.g.l.

Section 2 - Intact bedrock was encountered in the rotary core boreholes at depths varying from 0.7 m to 36.5 mbgl

Section 3 - The average reported depth to weathered rock and bedrock was approximately 6.5 m and 11.5 m, respectively.

Table 14-32: Predicted Noise Levels for Rock Processing

Activity	Predicted Noise Level, L_{Aeq} (dB) at Various Distances				
	10 m	25 m	50 m	75 m	100 m
Rock Processing	-	66	63	61	59

Given that rock processing activities will be continuing for the majority of any given day, a setback distance of 50 m from NSLs has been assumed at a minimum. Taking this into account, the magnitude of impact for rock processing is low, indicating a **slight to moderate** significance of effect, depending on the distance between a given NSL and the activity.

14.6.4 Structures

The Proposed Development includes major river bridges, overbridges, underbridges, underpasses and accommodation underpasses as outlined in Chapter 4: Project Description. The construction of these structures is a static activity with significant screening opportunities during the course of the works. Limited piling will be required at some of these locations, in particular the River Finn bridge in Section 1, the River Swilly bridge in Section 2, the River Deele bridge in Section 3, and the N14/N15 to A5 Link bridge over the River Finn in Section 3. Piling will also be required for other river crossings such as the Cloghroe River bridge on Section 1, River Swilly tributary in Section 2 and the Swilly Burn bridge in Section 3.

Table 14-33 presents the plant required as well as the duty cycle modelled as part of the scenario associated with this activity. This phase of works is expected to be substantially complete after 12 months at each structure and 24 months at each bridge.

Table 14-33: Plant for Construction of Structures

Plant	BS 5228 Ref.	Description	Duty Cycle / No. of Trips
Tracked excavator	C.5.35	Trenching/Excavation/Earthworks	50%
Road lorry (full)*	C.6.21	Distribution of Material	Three loads per hour
Vibratory roller*	C.5.21	Rolling and Compaction	25%
Wheeled mobile crane	C.5.37	Lifting materials	20%
Poker vibrator	C.4.34	Vibrate concrete	15%
Vibratory plate (petrol)	C.2.41	Compaction	25%
Truck mounted concrete pump + boom arm	C.4.30	Pumping concrete	60%

* Drive-by maximum sound level.

Predicted noise levels at various distances from the construction of structures are presented in Table 14-34.

Table 14-34: Predicted Noise Levels for Structure Construction

Activity	Predicted Noise Level, L_{Aeq} (dB) at Various Distances				
	10 m	25 m	50 m	75 m	100 m
Structure Construction	74	68	64	62	60

Noise levels due to the construction of structures are predicted to exceed the TII construction noise threshold of 70 dB $L_{Aeq,1hr}$ where activities occur within 18 m of NSLs. For NSLs outside of this range, noise levels are predicted to be below the construction noise threshold. The closest structures are c. 30 m away from NSLs and predicted levels are below the TII construction noise threshold.

The magnitude of impact is low, indicating a **slight to moderate** significance of effect, depending on location.

14.6.4.1 Bridge Construction

The proposed new bridge structures are comprised of long spans between abutments with a reinforced concrete deck slab. This is a static activity with the distance to NSLs depending on the specific structure. The substructure consists of cast in-situ reinforced concrete bearing shelves and columns supported by bored pile foundations at the piers. The abutments consist of cast in-situ reinforced concrete walls supported by bored pile foundations. There are several construction stages including provision of hard standings, substructure and superstructure. Each of these construction stages was modelled. In addition to the construction stages outlined above, installation of sheet piles is required for the River Finn bridge in Section 1 and the River Swilly bridge in Section 2. The sheet piles are to be installed using a hydraulic press method with low noise and vibration emissions and this activity will not result in significant effects and has not been considered further.

For the purpose of this assessment, activity at the River Finn Crossing (N15R024) in Section 1, the River Swilly Bridge (N56R005) in Section 2 and the N14O161 Overbridge in Section 3 has been modelled. The N14/N15 to A5 Link bridge over the River Finn in Section 3 was not modelled as there are no NSLs given the distance from the works to the nearest residences.

Table 14-35 presents the plant required as well as the duty cycle modelled as part of the modelled scenarios. This phase of works is expected to last 24 months.

Table 14-35: Plant for Bridge Construction Works

Task	Plant	BS 5228 Ref.	Description	Duty Cycle / No. of Trips
Preparation of Hardstanding Areas	Road lorry (full)*	C.6.21	Distribution of material	Four loads per hour
	Dump truck (tipping fill)	C.2.30	Tipping fill	10%
	Tracked excavator	C.2.19	Ground excavation / earthworks	40%
	Dozer	C.5.12	Spreading chipping / fill	40%
	Vibratory roller	C.5.27	Rolling and Compaction	40%
	Tracked excavator	C.4.65	Trenching	40%
Substructure	Tracked excavator	C.5.35	Trenching / Excavation / Earthworks	50%
	Road lorry (full)*	C.6.21	Distribution of Material	Two loads per hour
	Road roller*	C.5.19	Rolling and Compaction	10%
	Crawler mounted rig	C.3.22	Continuous flight auger piling – cast in situ	80%
	Lorry with lifting boom	C.4.53	Lifting material	25%
	Wheeled mobile crane	C.5.37	Lifting	50%
	Truck mounted concrete pump + boom arm	C.4.30	Pumping concrete	60%
	Hand-held circular saw (petrol-cutting concrete)	C.4.72	Cutting Concrete	10%
Superstructure	Lorry with lifting boom	C.4.53	Lifting material	30%
	Wheeled mobile crane	C.5.37	Lifting	30%
	Tracked mobile crane	C.4.50	Lifting	50%

Task	Plant	BS 5228 Ref.	Description	Duty Cycle / No. of Trips
	Truck mounted concrete pump + boom arm	C.4.30	Pumping Concrete	60%
	Hand-held pneumatic breaker	C.1.6	Breaking concrete	10%
	Hand-held circular saw (petrol-cutting concrete)	C.4.72	Cutting concrete	10%
	Poker vibrator	C.4.34	Vibrate concrete	15%
	Road lorry (full)*	C.6.21	Delivery of material	Two loads per hour

* Drive-by maximum sound level.

Predicted noise levels at various distances from each aspect of the bridge construction works are presented in Table 14-36.

Noise levels associated with the hardstanding aspect of the bridge construction are predicted to exceed the TII construction noise criteria of 70 dB $L_{Aeq,1hr}$ when activities occur within 11 m of NSLs. For the substructure and superstructure works, the TII construction noise threshold is predicted to be exceeded when activities occur within 30 and 27 m of NSLs, respectively. However, there are no NSLs within these ranges to any bridge construction across the three sections and all modelled NSLs show predicted levels of below 70 dB $L_{Aeq,1hr}$.

Table 14-36: Predicted Noise Levels for Bridge Construction Works at Nearest NSL

Activity	Predicted Noise Level, L_{Aeq} (dB) at Various Distances				
	10 m	25 m	50 m	75 m	100 m
Hardstanding	-	65	61	58	56
Substructure	-	71	66	63	61
Superstructure	-	71	65	62	60

The magnitude of impact for bridge construction works is low, indicating a **slight to moderate** significance of effect, depending on location.

14.6.5 Culverts

The proposed alignment crosses several existing watercourses and agricultural drains. Further details can be found in the description of the Proposed Development in Chapter 4: Project Description.

Culvert construction is considered to be a static activity. Construction noise modelling was undertaken for 11 culverts across the three sections of the Proposed Development, with the closest culvert to an NSL being c. 31 m away at culvert S1-CUL.03. The other modelled culverts are setback at greater distances.

Table 14-37 presents the plant required as well as the duty cycle modelled as part of the scenario associated with this activity. This phase of works is expected to take 26 weeks at each culvert. However, the distance to NSLs will vary depending on the culvert under construction.

Table 14-37: Plant for Culvert Works

Plant	BS 5228 Ref.	Description	Duty Cycle / No. of Trips
Tracked excavator	C.5.35	Trenching/Earthworks	50%
Vibratory roller*	C.5.21	Rolling and Compaction	25%
Lorry with lifting boom	C.4.53	Lifting material	35%
Concrete mixer truck	C.4.27	Pouring concrete	50%
Wheeled mobile crane	C.5.37	lifting material	50%
Vibratory plate (petrol)	C.2.41	Compaction	25%

* Drive-by maximum sound level.

Predicted noise levels at various distances from the culvert construction activity are presented in Table 14-38.

Table 14-38: Predicted Noise Levels for Culvert Construction

Activity	Predicted Noise Level, L_{Aeq} (dB) at Various Distances				
	10 m	25 m	50 m	75 m	100 m
Culvert Construction	-	74	67	64	61

For the majority of NSLs, the predicted noise levels from the culvert construction works will be below the TII construction noise threshold of 70 dB $L_{Aeq,1hr}$. Noise levels are predicted to exceed the construction noise threshold when activities occur within 37 m of NSLs.

There are three NSLs within this range across the three sections. In section 1, NSL 80491544 is located c. 31 m from S1-CUL.37, with predicted noise levels of 73 dB $L_{Aeq,1hr}$. In section 2, NSL 80483473 is located c. 35 m from S2-CUL.33 and NSL 36598446 is located c. 36 m from S2-CUL.01. Predicted noise levels at these locations are 70 and 71 dB $L_{Aeq,1hr}$, respectively.

The magnitude of impact for culvert construction at the closest NSLs is medium, indicating a **potential significant** significance of effect. However, it is unlikely that all plant will be operating simultaneously and the actual noise level will be lower than that shown in Table 14-38 reducing to a **moderate** significance of effect. For all other NSLs, the magnitude of impact is low, indicating a **slight to moderate** significance of effect, depending on location.

14.6.6 Road Formation and Paving

The road formation works comprise surface-finished earthworks on which a road pavement is constructed. It includes the earthworks and the general shaping of the road. This is a mobile activity which will be carried out over the length of the Proposed Development. Once the surface beneath the road has been prepared with a compact sub-base, the top layers are laid.

Table 14-39 presents the plant required as well as the duty cycle modelled as part of the scenario associated with this activity. This phase of works is expected to last 12 months, however, the distance between the works and NSLs will vary throughout that period.

Table 14-39: Plant for Road Formation and Paving

Plant	BS 5228 Ref.	Description	Duty Cycle / No. of Trips
Dozer	C.5.12	Spreading Chipping	50%
Road lorry (full)*	C.6.21	Distribution of Material	Five loads per hour
Grader*	C.6.31	Levelling road	30%
Tracked excavator	C.5.35	Trenching	50%
Road roller*	C.5.19	Rolling and Compaction	40%
Articulated dump truck*	C.6.18	Distribution of Material	Five loads per hour
Asphalt paver (+ tipper lorry)*	C.5.32	Paving	30%
Vibratory roller (not vibrating)*	C.5.23	Rolling and Compaction	30%
Wheeled excavator	C.5.11	Removing material	30%
Road sweeper	C.4.90	Sweeping and dust suppression	10%
Loading gravel to lorry	C.10.10	Loading material from stockpile area	40%

* Drive-by maximum sound level.

Predicted noise levels at various distances from the road formation activity are presented in Table 14-40.

Table 14-40: Predicted Noise Levels for Road Formation and Paving

Activity	Predicted Noise Level, L_{Aeq} (dB) at Various Distances				
	10 m	25 m	50 m	75 m	100 m
Road Formation and Paving	76	71	66	64	62

Noise levels associated with road formation and paving are predicted to exceed the TII construction noise threshold of 70 dB $L_{Aeq,1hr}$ when activities occur within 28 m of NSLs, which impacts several NSLs across the Proposed Development.

In practice, noise levels are likely to be lower than those predicted as not all plant will be operating simultaneously. The activity will be mobile along the length of the proposed developed over 12 months, meaning activities will not be taking place at any one NSL for extended periods of time. As works progress along the mainline, noise levels experienced by NSLs will reduce as the distance between the works and NSL increases. Furthermore, line of sight to the activity will be blocked for some NSLs where activities are undertaken in cuttings, with a corresponding reduction in noise levels.

However, for NSLs located within 28 m of the activity that are on or below grade, or for NSLs within this range where line of sight is not fully blocked by cuttings, mitigation measures will be necessary to avoid significant effects and are detailed in Section 14.8.1.

The magnitude of impact for road formation and paving for NSLs within 28 m of the activity is medium to high, indicating a **potential significant** significance of effect. For NSLs outside of this range, the magnitude of impact is low, indicating a **slight to moderate** significance of effect.

14.6.7 Park and Share

Park and Share/Cycle facilities form hubs at which motorists can park their own car and car share with other motorists to complete an ongoing journey or park their car while they utilise the cycleway/footway facilities for exercise or amenity usage. The park and share/cycle facilities are equipped with car parking spaces, cycles stands and landscape picnic areas. There are three park share facilities proposed for Section 1 of the Proposed Development at Ch 1+100 m, Ch 1+750 m and 8+550 m. There is one park and share facility

proposed at Section 2 of the Proposed Development adjacent to the Dry Arch Roundabout at Ch 0+200 m. There are four park and share facilities proposed for Section 3 of the Proposed Development at Ch 0+100 m, 7+600 m, 14+000 and 17+500 m.

The construction works will comprise site enabling works, earthworks and road formation works. Table 14-41 presents the plant required as well as the duty cycle modelled as part of the scenario associated with this activity. This phase of works is expected to take 12 months. The distance to NSLs will vary depending on the park and share facility under construction.

Table 14-41: Plant for Park and Share Facility Construction

Plant	BS 5228 Ref.	Description	Duty Cycle / No. of Trips
Dozer	C.5.12	Spreading Chipping	50%
Road lorry (full)*	C.6.21	Distribution of Material	Two loads per hour
Grader*	C.6.31	Levelling road	30%
Tracked excavator	C.5.35	Trenching	50%
Road roller*	C.5.19	Rolling and Compaction	40%
Articulated dump truck*	C.6.18	Distribution of Material	Two loads per hour
Asphalt paver (+ tipper lorry)*	C.5.32	Paving	30%
Vibratory roller (not vibrating)*	C.5.23	Rolling and Compaction	30%
Wheeled excavator	C.5.11	Removing material	30%
Road sweeper	C.4.90	Sweeping and dust suppression	10%
Loading gravel to lorry	C.10.10	Loading material from stockpile area	40%

* Drive-by maximum sound level.

Predicted noise levels at various distances from the construction of the park and share facilities are presented in Table 14-42.

Table 14-42: Predicted Noise Levels for Park and Share Facility Construction

Activity	Predicted Noise Level, L_{Aeq} (dB) at Various Distances				
	10 m	25 m	50 m	75 m	100 m
Park and Share Facility Construction	75	69	65	63	61

Noise levels associated with the construction of the park and share facilities are predicted to exceed the TII construction noise threshold of 70 dB $L_{Aeq,1hr}$ when activities occur within 22 m of NSLs. There is one receptor in Section 2 (ref: 80485168) that is at a distance of c. 7 m from a proposed park and share facility. However, this receptor is a commercial property and is not considered to be noise sensitive. Other than this, there is one other receptor (ref: 27127400) in Section 3 located c. 13m from the park and share facility boundary. There will be limited construction activities at the nearest location and nearest pavement works are c. 28 m away with predicted noise levels below the TII construction noise threshold of 70 dB $L_{Aeq,1hr}$.

For all NSLs across the three sections of the Proposed Development, the magnitude of impact is low, indicating a **slight to moderate** significance of effect, depending on location.

14.6.8 Signage and Lighting

This is a static activity which will be carried out at specific junctions and slip roads along the length of the Proposed Development. It is assumed that some mini-piling may be required for equipment bases in soft ground.

Table 14-43 presents the plant required as well as the duty cycle modelled as part of the scenario associated with this activity. This phase of works is expected to last six months.

Table 14-43: Plant for Signage and Lighting

Plant	BS 5228 Ref.	Description	Duty Cycle / No. of Trips
Lorry with lifting boom	C.4.53	Lifting material	30%
Lifting platform	C.4.57	Accessing raised areas	50%
Wheeled excavator	C.5.11	removal of broken road surface or soil	20%
Mini piling rig	C.3.17	Piling lighting columns or signage supports	30%
Compressor for mini piling	C.3.19	Compressor for mini piling rig	30%

* Drive-by maximum sound level.

Predicted noise levels at various distances from lighting activities are presented in **Table 14-44**.

Table 14-44: Predicted Noise Levels for Installation of Signage and Lighting

Activity	Predicted Noise Level, L_{Aeq} (dB) at Various Distances				
	10 m	25 m	50 m	75 m	100 m
Installation of Signage and Lighting	76	68	62	59	56

Noise levels associated with the installation of signage and lighting are predicted to equal or exceed the TII construction noise threshold of 70 dB $L_{Aeq,1hr}$ when activities occur within 20 m of NSLs, which impacts several receptors across the Proposed Development. Given the nature and short duration of the works at a location, exceedances of the TII construction noise threshold at the closest NSLs will likely be brief. Furthermore, it is unlikely that all items of plant will be operating simultaneously.

The magnitude of impact for the installation of signage and lighting is medium to high for NSLs located within 20 m of the activities. Given the nature of the works and the duration of this activity at this closest location will be brief, there will be **moderate** significance of effect at the nearest noise sensitive locations.

Outside of this range, the magnitude of impact is low, indicating a **slight to moderate** significance of effect, depending on location. No specific mitigation measures are recommended.

14.6.9 Landscaping

Table 14-45 presents the plant required as well as the duty cycle modelled as part of the scenario associated with this activity. This is a mobile activity which will be carried out over the length of the proposed works. This phase of works is expected to last 12 months.

Table 14-45: Plant for Landscaping

Plant	BS 5228 Ref.	Description	Duty Cycle / No. of Trips
Tractor (towing equipment)	C.4.74	Moving equipment	70%
Tracked excavator	C.5.35	Trenching	30%
Articulated dump truck*	C.6.18	Distribution of Material	Five loads per hour
Articulated dump truck	C.6.26	Dumping Load	10%
Loading sand to lorry	C.10.7	Loading Soil	50%

* Drive-by maximum sound level.

Predicted noise levels at various distances from landscaping activities are presented in Table 14-46.

Table 14-46: Predicted Noise Levels for Landscaping

Activity	Predicted Noise Level, L_{Aeq} (dB) at Various Distances				
	10 m	25 m	50 m	75 m	100 m
Landscaping	74	68	63	60	58

Noise levels associated with landscaping are predicted to exceed the TII construction noise threshold of 70 dB $L_{Aeq,1hr}$ when activities occur within 18 m of NSLs.

The activity will be mobile along the length of the proposed developed over 12 months, meaning activities will not be taking place at any one NSL for extended periods of time. As works progress along the mainline, noise levels experienced by NSLs will reduce as the distance between the works and NSL increases. In practice, it is unlikely that all plant will be operating in proximity of a NSL and the actual noise levels will be lower than those presented in Table 14-46.

The magnitude of impact for landscaping is medium for NSLs located within 18 m of the activity, indicating a **potential significant** significance of effect. Outside of this range, the magnitude is low, indicating a **slight to moderate** significance of effect, depending on location.

Mitigation measures which will be utilised to avoid significant effects are detailed in Section 14.8.1.

14.6.10 Construction Traffic

Information on construction traffic is available in Chapter 4: Project Description and Chapter 6: Traffic & Transportation. To summarise, additional Light Goods Vehicles (LGV) travelling to and from the site during the construction phase are expected to peak during the morning (arrival of contractors at the site) and evening (departure of contractors from the site) and are envisaged not to be a continuous source of noise emissions from the site during a typical working day. The noise impact from construction personnel movements to and from the site is expected to be low.

All traffic to the site will only be through designated access points which are shown in the Proposed Haulage Routes drawings in EIA Drawings 4.47 (Section 1), 4.48 (Section 2) and 4.49 (Section 3) in Volume D: Book of Drawings. The location of proposed construction compounds, internal and external haulage routes are also shown on the general arrangement EIA Drawings 4.1 (Section 1), 4.2 (Section 2) and 4.3 (Section 3).

Most earthworks movements will be carried out using internal haul roads. There is no planned haulage of material between sections of the Proposed Development. Truck movements are only required on public roads where the material balance for the section requires material to be hauled to/ from different locations at a stage of the construction where internal haulage is not feasible, i.e., where physical or natural barriers prevent longitudinal movement along the internal part of the Proposed Development. The most significant truck movements on public roads are the materials required for the embankment south of the River Finn at Ballybofey in Section 1 of the Proposed Development and the materials required for the embankments east of the River Swilly crossing in Section 2 of the Proposed Development. No significant earthworks haulage is required on public roads in Section 3 of the Proposed Development.

The peak period of daily traffic on public roads is predicted to occur due to the pavement installation. This will result in increased traffic volumes on national roads, regional roads and local roads to a lesser extent. The predicted change in noise from construction traffic was calculated using Calculation of Road Traffic Noise (CRTN), Department of Transport Welsh Office, HMSO 1988. The change in noise levels associated with construction traffic for all three sections of the Proposed Development are presented in Table 14-47 to Table 14-49.

Table 14-47: Change in Noise Level associated with Construction Traffic – Section 1

Road Name	Baseline Traffic		Baseline plus Construction Traffic		Change in Noise Level (dB)	Significance Rating
	AADT	%HGVs	AADT	%HGVs		
N15 South (Dooish Junction)	9558	4.0	10062	8.8	1.1	Slight
N15 North (Dooish Junction)	8872	4.0	9376	9.2	1.6	Slight
R252 West (Ballyboffey Link Road)	2730	6.0	2831	9.4	0.8	Not Significant
R252 East (Ballyboffey Link Road)	2033	7.0	2134	11.4	1.2	Slight
N15 (Ballyboffey Link Road)	8749	5.0	9253	10.2	1.5	Slight
N15 (Trenamullin Tie-in)	10560	3.0	11064	7.4	1.5	Slight
N13 (N15 Primary Road Connector)	10758	6.0	11262	10.2	1.1	Slight
N13 (L7084 Connector)	10758	6.0	11262	10.2	1.1	Slight
N13 (L6674 Connector)	8614	5.0	9118	10.3	1.1	Slight
N13 (Tie-in north)	8614	5.0	9118	10.3	1.1	Slight

Table 14-48: Change in Noise Level associated with Construction Traffic – Section 2

Road Name	Baseline Traffic		Baseline plus Construction Traffic		Change in Noise Level (dB)	Significance Rating
	AADT	%HGVs	AADT	%HGVs		
N13 (Southern Tie-in)	13418	4.0	13708	6.0	0.5	Not Significant
N56 East (Dry Arch Roundabout)	16164	4.0	16454	5.7	0.7	Not Significant
N56 West (Dry Arch Roundabout)	16449	3.0	16739	4.7	0.8	Not Significant
N13 South (Dry Arch Roundabout)	16278	4.0	16568	5.7	0.6	Not Significant
N13 West (Dry Arch)	10943	4.0	11088	5.3	0.3	Imperceptible
N13 East (Dry Arch)	11059	4.0	11204	5.2	0.3	Imperceptible
N56 South (N56 North tie-in)	24154	4.0	24444	5.1	0.6	Not Significant
N56 North (N56 North tie-in)	13751	4.0	14041	6.0	0.8	Not Significant
R245 (N56 North tie-in)	12975	3.0	13265	5.1	0.8	Not Significant
N13 West S2/S3 Intersection (Pluck Junction)	11081	4.0	11226	5.2	0.3	Imperceptible
N13 East S2/S3 Intersection (Pluck Junction)	11169	5.0	11314	6.2	0.3	Imperceptible
N13 North S2/S3 Intersection (Pluck Junction)	14144	5.0	14434	6.9	0.6	Not Significant
N14 S2/S3 Intersection (Pluck Junction)	8105	4.0	8395	7.3	1.0	Slight

Table 14-49: Change in Noise Level associated with Construction Traffic – Section 3

Road Name	Baseline Traffic		Baseline plus Construction Traffic		Change in Noise Level (dB)	Significance Rating
	AADT	%HGVs	AADT	%HGVs		
N13 West S2/S3 Intersection (Pluck Junction)	11081	4.0	11181	4.9	0.3	Imperceptible
N13 East S2/S3 Intersection (Pluck Junction)	11169	5.0	11269	5.8	0.2	Imperceptible
N13 North S2/S3 Intersection (Pluck Junction)	14144	5.0	14343	6.3	0.4	Imperceptible
N14 S2/S3 Intersection (Pluck Junction)	8105	4.0	8304	6.3	0.7	Not Significant
L1214 (Intersection with N14)	1435	4.0	1535	10.2	2.0	Moderate
R236	3276	4.0	3376	6.8	0.8	Not Significant
R264 South	2051	4.0	2151	8.5	1.5	Slight
R264 West	2051	4.0	2151	8.5	1.2	Slight
Rossgier Cl	783	4.0	883	14.8	3.1	Moderate
N14 North of Rossgier**	4883	7.0	5082	10.6	0.8	Not Significant
R264	2734	3.0	2834	6.4	1.0	Slight
N15	3565	4.0	3764	9.1	1.4	Slight

** - Construction traffic will travel along multiple locations along the N14. The baseline AADT used here is the lowest levels along the N14 resulting in a conservative assessment.

The significance of effect varies depending on the road link. Given the low predicted impacts of construction traffic noise the expected effects range in significance from **imperceptible** to **slight** except for Rossgier Cl in Section 3 with a **moderate** adverse effect during the pavement installation. The significance of effect will reduce to **slight** or lower during other construction activities.

Should the construction of all three sections occur concurrently, there is potential for increased traffic volumes on public roads. The area with the greatest potential for this to occur is where construction works are occurring in proximity to intersection of Section 2 and Section 3. The cumulative expected effects range in significance from **not significant** to **slight** at this location.

Although there will be an increase in road traffic during the construction phase, where roads are in good condition, it is not expected that there will be any vibration problems. Therefore, permitted haulage routes should be in good condition and maintained over the course of the construction works to minimise the potential for vibration impacts.

14.6.11 Construction Vibration Levels

Construction vibration levels arise during blasting, pile driving, and use of heavy construction equipment close to sensitive properties. Construction vibrations propagate through the ground to a receiver by means of surface and to a lesser extent by shear and compressional waves. The amplitude of the waves decreases rapidly with distance from the source. The attenuation is due to geometrical spreading and energy losses within the ground (material damping).

Wiss (1981) presented a methodology and typical values for vibrations due to construction activities. Geometric spreading means that vibration levels decrease exponentially as the distance from the source increases. The exponent value lies between 1.0 and 2.0 and Wiss (1981) suggests a relatively common value of 1.5. Typical construction activities on this project include pile driving, rock-breaking and earthmoving. Table 14-50 shows a range of vibration source levels at 7.6 m.

Table 14-50: Vibration Source Levels for Construction Equipment

Equipment	PPV at 7.6 m (mm/s)
Bored Piling**	2.16
Vibratory Roller	5.3
Large Rock-Breaker	2.3
Large Bulldozer	2.3
Auger piling	2.3
Loaded trucks	1.9
Jackhammer	0.9
Small bulldozer	0.1

**BS 5228 provides data indicating that the PPV level associated with a 600 mm diameter bored pile was 0.54 mm/s. Scaling this up for a 1,200 mm diameter pile the PPV level is expected to be 2.16 mm/s at 5 m.

Using a conservative approach where losses due to material damping are ignored, vibration levels can therefore be estimated at a distance using the following formula:

$$PPV_{NSR} = PPV_{Source} \times \left[\frac{7.6}{D} \right]^{1.5}$$

Where D = distance from the source to the Noise Sensitive Receptor (NSR) in metres.

As outlined in Section 14.4.3.5, construction vibrations need to be assessed for property damage and the impact on humans. The usual criteria applied for construction vibration effects on buildings from road projects are those published in the TII Guidelines and shown in Section 14.4.3.5. Given the distance between plant items and the nearest buildings, construction vibration levels from work on the proposed mainline are below the TII criteria and are below the threshold of perception for the majority of the nearest sensitive locations.

Construction works on some side roads and tie-in to existing roads occur at short distances to sensitive receptors and the vibratory roller used for rolling and compaction is the plant item with the greatest potential to generate vibration associated with these works. Vibration levels are predicted to be below the TII criteria. However, the vibration levels experienced at some sensitive locations are likely to be greater than 1 mm/s and are likely to result in a brief moderate significance of effect. It is likely that vibration of this level in residential environments will cause complaint but can be tolerated if prior warning and explanation has been given to residents. To put the vibration levels presented in Table 14-50 in context, some examples of PPV levels in a modern masonry dwelling house are presented in New (1986). The PPV levels are reproduced Table 14-51.

Table 14-51: Typical Vibration Levels in a Modern Residence

Vibration Source	Resultant PPV (mm/s)
Normal footfalls	0.05 - 0.5
Foot stamping	0.3 – 3.0
Door slams	11 - 17
Percussive drilling	10 - 20

14.6.12 Summary

Construction activities associated with the Proposed Development have been assessed. The noisiest activities have been considered as part of the assessment and if compliance can be demonstrated for these noisiest activities, then compliance will be demonstrated from other less intrusive activities. For ease of presentation the assessment has presented the Proposed Development by describing the three sections.

Noise levels at a given NSL are influenced by the intensity of the source, proximity to the source and any screening effect between the source and the NSL. Construction of a project of this scale means that sources are moving regularly.

As some of the construction works may need to be carried out over the length of the Proposed Development, the assessment has been carried out by considering the distance between the nearest NSL to the potential construction activities. The predicted noise levels at various distances were tabulated.

For the majority of the construction activities, when works are in close proximity to NSLs there is potential for likely significant effects. The distance where this occurs is dependent on the construction activity under consideration. In all instances, as the distance between the construction activity and the NSLs increase, the predicted noise impact reduces as does the significance rating.

To mitigate the noise impact from the construction activities, several measures are proposed in Section 14.8.1.

14.7 Operational Phase Impacts

14.7.1 Operational Noise Modelling Overview

Predictor LimA noise modelling software was used to predict the noise impact from the Proposed Development. 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 TII *Guidelines for the treatment of Noise and Vibration in National Road Schemes* (2004) and the updated advice on using CRTN recommended in the TII *Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes* (March 2014). The CRTN method of predicting noise from a road scheme consists of the following five elements:

- i. Divide the road development into segments so that the variation of noise within this segment is small.
- ii. Calculate the basic noise level at a reference distance of 10 metres from the nearside carriageway edge for each segment.
- iii. Assess for each segment the noise level at the reception point taking into account distance attenuation and screening of the source line.
- iv. Correct the noise level at the reception point to take account of site layout features including reflections from buildings and facades, and the size of source segment.
- v. Combine the contributions from all segments to give the predicted noise level at the receiver location for the whole road development.

14.7.2 Inputs to the Operational Phase Noise Model

The noise model was prepared using the following data:

- Road alignments based on the latest design and Ordnance Survey mapping.
- Topographical data was informed by site specific survey data.
- Ordnance Survey mapping was used for identifying building footprints, existing roads including centrelines and road extents.
- Road surfaces were modelled as acoustically hard ($G = 0$). All other surfaces were modelled as $G = 0.5$ representing a mix of acoustically hard and soft ground.

- 2025 GeoDirectory data was used to identify noise sensitive receptor locations. This was supplemented with a review of aerial imagery and site visits to identify the receptor height (single storey, two storey or other).
- Receiver locations are offset 1m from building façades and model the free-field road traffic noise levels.
- Traffic volumes, percentage Heavy Commercial Vehicles (HCVs) and free-flow speeds used in the noise model were provided by the traffic modelling team. For the purpose of noise modelling the 'high-growth' scenario has been drawn upon for data on volumes. Traffic volumes with a cross-border link with the proposed A5 WTC (the N14/N15 to A5 Link and a proposed Trunk Road T3) have been modelled. See Appendix C14.4 Road Traffic Maps for figures showing the road traffic links included in the operational noise models. Further details on the traffic and transportation are set out in Chapter 6: Traffic & Transportation.
- The road surfaces modelled were based on road surfaces observed during site visits in May 2022 and road surface data provided by Donegal County Council in October 2025.

Noise predictions were undertaken for 4,585 receptor locations. At some of these locations, predictions were undertaken adjacent to multiple façades and elevations (depending on the number of storeys) as the most exposed façade is not obvious. In some instances, the most exposed façade varied between the Do-Minimum and Do-Something scenarios and, for completeness, where this occurred both façades have been included in the assessment.

The prediction method takes the following factors into account: hourly traffic flow rate, free-flow traffic speed, percentage of HCVs. Other information required for the calculation includes road surface and gradient, ground type, height of noise source, shielding of barriers and cuttings, reflections at façades and from nearby buildings, and angle of view of the road.

In accordance with TII (2014), the extent of the noise model not only includes the Proposed Development, it also includes areas where traffic flows are reduced by 20% or more, and where existing flows are increased by 25% or more.

All newly constructed roads were modelled as low noise road surfaces. A low noise road surface is defined as a road surface that can provide a minimum noise reduction of 2.5 dB(A) when compared to a standard Hot Rolled Asphalt (HRA) road surface.

14.7.3 Operational Noise Model Verification

The purpose of validating the noise model is to ensure the input data is correct and to confirm the noise modelling software is correctly interpreting the input data. TII (2004) state:

"... whilst there is no need for further validation of the established CRTN 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."

To validate the traffic noise model, the baseline noise survey results at eight locations were compared with the predicted results obtained using traffic data that was representative of the conditions during the period when the survey was conducted.

Table 14-52 presents the predicted noise levels against the measured noise levels. In all instances, the predicted and measured noise levels are within 3 dB. There is good agreement between the noise model and measurements, and it is considered that the noise modelling software is correctly interpreting the input data.

Table 14-52: Measured vs Modelled Noise Levels

Survey Location	Location Description	Measured L _{den} , dB	Predicted L _{den} , dB	Difference
S1 C	1.5 m high installation at a residential property in Mullandrait along the N15.	67	66	-1
S1 F	1.5 m high installation at a residential property in Meenavoy, c. 50 m from the N13.	60*	60	0
S2 A	1.5 m high installation at a residential property along the L1114 in Dromore, adjacent to the N13.	70	71	1
S2 D	1.5 m high installation at a residential property in Trimragh, c. 170 m from the N13.	63	60	-3
S3 A	1.5 m high installation at a residential property along the N14 in Drumcairn.	71	70	-1
S3 B	1.5 m high installation at a residential property in Doorable, c. 35 m from the N14.	65	62	-3
S3 C	4 m high installation at a residential property along Dromore Park, c. 65 m from the N14.	61	60	-1
S3 D	1.5 m high installation at a residential property in Ballindrait, c. 470 m from the R264.	60	60	0

* Noise data likely attributable local sources was removed from the baseline measurements i.e. activity at the residence.

14.7.4 Operational Results

Noise has been predicted for sensitive receptors along the route of the Proposed Development, adjacent to existing roads in proximity to the Proposed Development, 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 Development.

Free-field road traffic noise levels have been predicted at a total of 4,585 receptors. For some receptors several locations around the building have been modelled given their proximity to both existing roads and the Proposed Development. All receivers have been modelled at heights of 1.5 and 4.0 m above ground level corresponding to ground floor and first floor levels, respectively. In some instance, some receptors are single storey and only results predicted for the 1.5m height have been considered for those locations. For all others the highest predicted noise level from each case (i.e., 1.5 m and 4 m height receiver point) has been presented.

The following scenarios were modelled for all three sections of the Proposed Development:

- **Base Year 2024**
- **Opening Year 2032:** Do-Minimum and Do-Something scenarios.
- **Design Year 2047:** Do-Minimum and Do-Something scenarios.
- **Design Year 2047:** Do-Something scenario with mitigation.

The Proposed Development comprises three sections and for ease of presentation, operational results for each of the three sections are presented in Sections 14.7.4.1 through 14.7.4.3. Results from the Entire Development are presented in Section 14.7.4.4.

Given the large number of receptor locations modelled, only receptors where mitigation is required or where significant effects are predicted without mitigation are presented. Significance of effects has been assessed in line with the methodology detailed in Section 14.4.

14.7.4.1 Section 1

The current road comprises the N15 from Meencarrigagh, through the centre of Ballybofey and Stranorlar where it meets the junction of the N13. The N15 then continues east towards Killygordon. From the N13/N15 junction in Stranorlar, the N13 proceeds northwards to the junction with the R236 where the N13 then turns left and proceeds to Drumkeen and on to Letterkenny.

The Proposed Development departs from the existing N15 at Dooish Junction and proceeds in a northerly direction, approximately parallel to the existing N15, crossing the River Finn on a new bridge west of Ballybofey/ Stranorlar. The Proposed Development continues north of Dromboe Woods through the proposed Teevickmoy Junction to the proposed Meenavoy Junction after which it will tie-in with the existing N13. The Ballybofey Link Road North/South joins the Proposed Development to the R252 and the existing N15 from a grade-separated junction in Cappry. The N15 Primary Road Connector from the mainline proceeds in a southeasterly direction from Teevickmoy Junction to cross the existing N13 at Tircallan Junction and re-joins the existing N15 at Treanamullin Junction.

The number of receptors with noise levels greater than 60 dB L_{den} within the study area for both the Do-Minimum and Do-Something opening year and design year scenarios for Section 1 is presented in Table 14-53. It is observed, based on the modelling results, that the Proposed Development results in an overall positive impact with a decrease in the number of receptors with predicted noise levels greater than 60 dB L_{den} .

The Proposed Development will divert traffic north of Ballybofey/ Stranorlar reducing traffic noise in the town centres and consequently introducing a new road noise source near the new alignment. The proposed route has 13 minor road crossings along the route and is close to residences in the section between Meencarrigagh and Cappry, through relatively open country to another cluster of residences at Magherapaste and then into open country again until near to the existing N13 where there is another cluster of houses at Meenavoy Lower.

The cluster of houses at Meencarrigagh/ Cappry are close to the existing N15, R252 and are linked by the Cappry Road. The cluster at Magherapaste is divided by the Ballynaglack, Drumboe Lower and Dunwiley roads with local traffic. The cluster at Meenavoy Lower is near to the existing N13.

Table 14-53: Predicted Traffic Noise Levels Greater than 60 dB L_{den} – Section 1

Receptor Description	Opening Year (2032)		Design Year (2047)	
	Do-Minimum	Do-Something	Do-Minimum	Do-Something
All Property Types	800	589	842	623
Residential (incl Farms)	620	432	653	459
Educational and Childcare Facilities	4	3	4	3
Hotels and Accommodation	9	9	9	9
Activities of Religious Organisations	3	3	4	3
Healthcare Facilities	6	4	7	5
Residential Care	0	0	0	0

Table 14-54 presents the predicted noise levels for the Do-Minimum and Do-Something opening year (2032) and design year (2047) for the Proposed Development and compares the calculated results against the three conditions for noise mitigation as outlined in TII (2004) and TII (2014).

All NSLs were assessed for road traffic noise. Eleven² NSLs have been identified as meeting the TII criteria for mitigation. In addition to the eleven NSLs presented in Table 14-54, four NSLs (ref: 38523354/38523354a, 80491481, 80491483 and 80491504) met the criteria for mitigation. However, these locations are being acquired by Compulsory Purchase Order (CPO) and therefore no targeted mitigation measures have been provided for them.

There are several NSLs along the proposed alignment where the traffic noise levels increase but these do not meet the TII noise mitigation criteria set out in Section 14.4.3.7. Further details on the operational phase mitigation measures are discussed in Section 14.8 including the suitability and/or practicality of noise mitigation for each location.

² For some receptors several locations around the building have been modelled given their proximity to both existing roads and the proposed development and these locations have been denoted with letters 'a', 'b' etc. depending on the number of locations around the building.

Table 14-54: Predicted Traffic Noise Levels – Section 1

Receptor ID*	Description	Predicted Noise Levels Opening Year (2032)		Condition for Noise Mitigation Satisfied?			Mitigation Required?	Predicted Noise Levels Design Year (2047)		TII Condition for Noise Mitigation Satisfied?			Mitigation Required?
		Do-Minimum	Do-Something	(a)	(b)	(c)		Do-Minimum	Do-Something	(a)	(b)	(c)	
27272332	Residential	52	61	Yes	Yes	Yes	Yes	53	61	Yes	Yes	Yes	Yes
27272335	Residential	49	60	No	Yes	Yes	No	49	61	Yes	Yes	Yes	Yes
27272336	Residential	49	59	No	Yes	Yes	No	49	60	No	Yes	Yes	No
27272337	Residential	47	59	No	Yes	Yes	No	47	60	No	Yes	Yes	No
27272338	Residential	48	60	No	Yes	Yes	No	49	61	Yes	Yes	Yes	Yes
27272339	Residential	46	60	No	Yes	Yes	No	47	60	No	Yes	Yes	No
27297671	Residential	59	62	Yes	Yes	Yes	Yes	59	63	Yes	Yes	Yes	Yes
27297671a	Residential	65	60	No	No	No	No	65	61	Yes	No	No	No
27358138	Residential	39	64	Yes	Yes	Yes	Yes	39	65	Yes	Yes	Yes	Yes
35445888	Residential	48	63	Yes	Yes	Yes	Yes	49	63	Yes	Yes	Yes	Yes
37676924	Residential	45	61	Yes	Yes	Yes	Yes	46	62	Yes	Yes	Yes	Yes
80490721	Residential	47	60	No	Yes	Yes	No	48	61	Yes	Yes	Yes	Yes
80490721a	Residential	59	63	Yes	Yes	Yes	Yes	59	63	Yes	Yes	Yes	Yes
80490723	Residential	68	66	Yes	No	No	No	69	67	Yes	No	No	No
80490723a	Residential	58	61	Yes	Yes	Yes	Yes	59	62	Yes	Yes	Yes	Yes
80491373	Residential / Commercial	53	62	Yes	Yes	Yes	Yes	54	63	Yes	Yes	Yes	Yes
80491488	Residential	44	60	No	Yes	Yes	No	45	60	No	Yes	Yes	No
80506471	Residential / Commercial	62	63	Yes	Yes	Yes	Yes	62	64	Yes	Yes	Yes	Yes

* **Note:** For some receptors several locations around the building have been modelled given their proximity to both existing roads and the Proposed Development and these locations have been denoted with letters 'a', 'b' etc. depending on the number of locations around the building.

14.7.4.2 Section 2

The existing N56 enters Letterkenny from the north as a single carriageway route that traverses around the eastern outskirts of the town (and west of the River Swilly) and widens to a two-lane carriageway on approach to the Polestar roundabout. From the Polestar roundabout, traffic travels eastwards over a bridge on the River Swilly using a four-lane road (N56) as far as the Dry Arch Roundabout where it meets the N13 from Stranorlar and the N13 from Manorcunningham. A section of dual-carriageway (N13) connects the Dry Arch Roundabout with the Pluck Roundabout. Section 2 also includes the section of the N13 from the Dry Arch Roundabout, south to the top of the hill at Listellian

The Proposed Development in Section 2 includes approximately 4.1 km of new road between Listellian Junction and Ballyraine Junction (existing N56/R245 Creamery Roundabout) with intermediate junctions at Dromore Junction and Bonagee Junction and also including a new bridge over the River Swilly. There is an additional 0.4 km between the proposed Bonagee Junction and the existing Dry Arch Roundabout (Bonagee Link). The existing dual carriageway between Dry Arch Roundabout and Pluck Roundabout will be upgraded and improved including a new grade separated junction at Trimragh Junction. Section 2 works include works up to approximate chainage Ch 3+450 on Mainline Section 2.4 just to the west of the existing Pluck Roundabout. The proposed new N13/N14 Pluck Roundabout, including all tie-ins, will be constructed as part of the Section 3 works.

The number of receptors with noise levels greater than 60 dB L_{den} within the study area for both the Do-Minimum and Do-Something opening year and design year scenarios for Section 2 is presented in Table 14-55. It is observed that the Proposed Development results in an overall positive impact with a decrease in the number of receptors with predicted noise levels greater than 60 dB L_{den} . The Proposed Development will divert traffic from the N13 and N56 roads to the new Proposed Development and new River Swilly bridge. The Proposed Development will closely follow the existing N13 dual carriageway to the Pluck Roundabout.

Table 14-55: Predicted Traffic Noise Levels Greater than 60 dB L_{den} – Section 2

Receptor Description	Opening Year (2032)		Design Year (2047)	
	Do-Minimum	Do-Something	Do-Minimum	Do-Something
All Property Types	337	319	366	344
Residential (incl Farms)	261	235	288	258
Educational and Childcare Facilities	4	3	4	3
Hotels and Accommodation	0	0	0	0
Activities of Religious Organisations	0	0	0	1
Healthcare Facilities	5	6	5	6
Residential Care	1	1	1	1

Table 14-56 presents the predicted noise levels for the Do-Minimum and Do-Something opening year (2032) and design year (2047) for the Proposed Development and compares the calculated results against the three conditions for noise mitigation as outlined in TII (2004) and TII (2014).

All NSLs were assessed for road traffic noise. Sixteen³ NSLs have been identified as meeting the TII criteria for mitigation. In addition to the sixteen NSLs presented in Table 14-56, one NSL (80483772) met the criteria for mitigation but this location is being acquired by CPO and no targeted mitigation measures have been provided for this location.

There are several NSLs on the L-1114 and the N56 north of the development where the traffic noise levels increase but these do not meet the TII noise mitigation criteria set out in Section 14.4.3.7. Further details on the operational phase mitigation measures are discussed in Section 14.8.2 including the suitability and/or practicality of noise mitigation for each location.

³ For some receptors several locations around the building have been modelled given their proximity to both existing roads and the proposed development and these locations have been denoted with letters 'a', 'b' etc. depending on the number of locations around the building.

Table 14-56: Predicted Traffic Noise Levels – Section 2

Receptor ID*	Description	Predicted Noise Levels Opening Year (2032)		Condition for Noise Mitigation Satisfied?			Mitigation Required?	Predicted Noise Levels Design Year (2047)		TII Condition for Noise Mitigation Satisfied?			Mitigation Required?
		Do-Minimum	Do-Something	(a)	(b)	(c)		Do-Minimum	Do-Something	(a)	(b)	(c)	
27339832	Residential	59	61	Yes	Yes	Yes	Yes	60	62	Yes	Yes	Yes	Yes
36515964	Healthcare Facilities	50	63	Yes	Yes	Yes	Yes	50	64	Yes	Yes	Yes	Yes
36515983	Residential	60	61	Yes	Yes	Yes	Yes	61	62	Yes	Yes	No	No
55015545	Residential	67	68	Yes	Yes	No	No	67	69	Yes	Yes	Yes	Yes
55015546	Residential	67	69	Yes	Yes	Yes	Yes	68	69	Yes	Yes	Yes	Yes
80483452	Residential	69	50	No	No	No	No	70	51	No	No	No	No
80483452a	Residential	51	60	No	Yes	Yes	No	52	61	Yes	Yes	Yes	Yes
80483612	Residential	54	62	Yes	Yes	Yes	Yes	55	63	Yes	Yes	Yes	Yes
80483612a	Residential	58	62	Yes	Yes	Yes	Yes	58	63	Yes	Yes	Yes	Yes
80483613	Residential	53	60	No	Yes	Yes	No	54	61	Yes	Yes	Yes	Yes
80483619	Residential	47	61	Yes	Yes	Yes	Yes	48	62	Yes	Yes	Yes	Yes
80483619a	Residential	56	61	Yes	Yes	Yes	Yes	56	61	Yes	Yes	Yes	Yes
80483620	Residential	54	63	Yes	Yes	Yes	Yes	55	64	Yes	Yes	Yes	Yes
80483620a	Residential	57	61	Yes	Yes	Yes	Yes	58	62	Yes	Yes	Yes	Yes
80483638	Residential	60	64	Yes	Yes	Yes	Yes	64	65	Yes	Yes	No	No
80483638a	Residential	64	67	Yes	Yes	No	No	69	67	Yes	No	No	No
80483732	Residential	64	65	Yes	Yes	Yes	Yes	65	66	Yes	Yes	No	No
80483759	Residential /Commercial	56	60	No	Yes	Yes	No	57	61	Yes	Yes	Yes	Yes
80483775	Residential	50	63	Yes	Yes	Yes	Yes	50	64	Yes	Yes	Yes	Yes
80483815	Residential	70	71	Yes	Yes	No	No	70	71	Yes	Yes	Yes	Yes
80483817	Residential	67	68	Yes	Yes	Yes	Yes	68	69	Yes	Yes	Yes	Yes

* Note: For some receptors several locations around the building have been modelled given their proximity to both existing roads and the Proposed Development and these locations have been denoted with letters 'a', 'b' etc. depending on the number of locations around the building.

14.7.4.3 Section 3

The Section 3 mainline route corridor is approximately 18.1 km long and extends from approximately 0.3 km west of the proposed N13/N14 Pluck Roundabout (interface with Section 2) to the border with Northern Ireland on the River Finn to the south of Lifford. The N14/N15 to A5 Link to the border with Northern Ireland connects to a proposed Trunk Road T3 then in turn connects to the proposed A5 WTC in Northern Ireland.

The Proposed Development is relatively close to the route of the existing N14 from Pluck Roundabout (interface with Section 2) to Mulnaveagh, where it runs southwest of the existing N14 to bypass Lifford to the south and connect to the N15 at the proposed N14/N15 Lifford Junction. From this junction, the N14/N15 to A5 Link will be constructed to the border with Northern Ireland and includes a section of the River Finn Bridge. The assessment of the Proposed Development includes the N14/N15 to A5 Link as well as the consequences of the proposed sections of road in Northern Ireland, i.e. Trunk Road T3 and the A5 WTC.

The number of receptors with noise levels greater than 60 dB L_{den} within the study area for both the Do-Minimum and Do-Something opening year and design year scenarios for Section 3 is presented in Table 14-57. It is observed that the Proposed Development results in an overall positive impact with a decrease in the number of receptors with predicted noise levels greater than 60 dB L_{den} . The Proposed Development will divert traffic from the N14 road to the Proposed Development which provides an improved alignment and a low noise surface.

Table 14-57: Predicted Traffic Noise Levels Greater than 60 dB L_{den} – Section 3

Receptor Description	Opening Year (2032)		Design Year (2047)	
	Do-Minimum	Do-Something	Do-Minimum	Do-Something
All Property Types	390	283	425	298
Residential (incl. Farms)	346	253	376	263
Educational and Childcare Facilities	4	3	5	3
Hotels and Accommodation	0	0	0	0
Activities of Religious Organisations	2	0	2	0
Healthcare Facilities	4	4	4	4
Residential Care	0	0	0	0

Table 14-58 presents the predicted noise levels for the Do-Minimum and Do-Something opening year (2032) and design year (2047) for the Proposed Development and compares the calculated results against the three conditions for noise mitigation as outlined in TII (2004) and TII (2014).

All noise sensitive receptors were assessed for road traffic noise. Nine noise sensitive receptor locations have been identified as meeting the TII criteria for mitigation. In addition to the nine NSLs presented in Table 14-58, one NSL (80492709) met the criteria for mitigation but this location is being acquired by CPO and no targeted mitigation measures have been provided for this location.

Further details on the operational phase mitigation measures are discussed in Section 14.8.2 including the suitability and/or practicality of noise mitigation for each location.

Table 14-58: Predicted Traffic Noise Levels – Section 3

Receptor ID*	Description	Predicted Noise Levels		Condition for Noise Mitigation Satisfied?			Mitigation Required?	Predicted Noise Levels		TII Condition for Noise Mitigation Satisfied?			Mitigation Required?
		Opening Year (2032)		(a)	(b)	(c)		Design Year (2047)		(a)	(b)	(c)	
		Do-Minimum	Do-Something					Do-Minimum	Do-Something				
36724783	Residential	55	60	No	Yes	Yes	No	56	61	Yes	Yes	Yes	Yes
36724783a	Residential	57	60	No	Yes	Yes	No	58	61	Yes	Yes	Yes	Yes
36839482	Residential	57	63	Yes	Yes	No	No	57	63	Yes	Yes	No	No
36839482a	Residential	55	61	Yes	Yes	Yes	Yes	56	61	Yes	Yes	Yes	Yes
37055928	Residential	53	60	No	Yes	Yes	No	54	61	Yes	Yes	Yes	Yes
38466720	Residential	61	63	Yes	Yes	Yes	Yes	61	63	Yes	Yes	Yes	Yes
38466720a	Residential	61	61	Yes	No	No	No	61	62	Yes	Yes	Yes	Yes
80492710	Residential	51	62	Yes	Yes	Yes	Yes	52	63	Yes	Yes	Yes	Yes
80492710a	Residential	63	60	No	No	No	No	64	61	Yes	No	No	No
80492712	Residential	64	62	Yes	No	No	No	65	63	Yes	No	No	No
80492712a	Residential	63	66	Yes	Yes	Yes	Yes	63	67	Yes	Yes	Yes	Yes
80492712b	Residential	53	65	Yes	Yes	Yes	Yes	53	66	Yes	Yes	Yes	Yes
80492715	Residential	64	65	Yes	Yes	No	No	65	66	Yes	Yes	No	No
80493104	Residential	56	60	No	Yes	Yes	No	57	61	Yes	Yes	Yes	Yes
80523886	Residential	58	64	Yes	Yes	No	No	58	64	Yes	Yes	Yes	Yes
80523886a	Residential	57	62	Yes	Yes	No	No	58	62	Yes	Yes	Yes	Yes
80524306	Residential	50	60	No	Yes	Yes	No	50	61	Yes	Yes	Yes	Yes
80524306a	Residential	57	60	No	Yes	Yes	No	58	61	Yes	Yes	Yes	Yes
80985572	Residential	65	66	Yes	Yes	No	No	66	66	Yes	No	No	No

* **Note:** For some receptors several locations around the building have been modelled given their proximity to both existing roads and the Proposed Development and these locations have been denoted with letters 'a', 'b' etc. depending on the number of locations around the building

14.7.4.4 Entire Development

The Proposed Development comprises three sections and for ease of presentation, operational results for each of the three sections are presented in the previous Sections 14.7.4.1 through 14.7.4.3.

The number of receptors with noise levels greater than 60 dB L_{den} within the study area for both the Do-Minimum and Do-Something opening year and design year scenarios for the Proposed Development is presented in Table 14-59. It is observed, based on the modelling results, that the Proposed Development results in an overall positive impact with a 22% decrease in the number of receptors with predicted noise levels greater than 60 dB L_{den}. Therefore, the Proposed Development as a whole is judged to have a **significant positive** effect for RTN within the study area.

Table 14-59: Predicted Traffic Noise Levels Greater than 60 dB L_{den} – Entire Development

Receptor Description	Opening Year (2032)		Design Year (2047)	
	Do-Minimum	Do-Something	Do-Minimum	Do-Something
All Property Types	1527	1191	1633	1265
Residential (incl. Farms)	1227	920	1317	980
Educational and Childcare Facilities	12	9	13	9
Hotels and Accommodation	9	9	9	9
Activities of Religious Organisations	5	3	6	4
Healthcare Facilities	15	14	16	15
Residential Care	1	1	1	1

All noise sensitive receptors were assessed for road traffic noise. Thirty-six (36) noise sensitive receptor locations have been identified as meeting the TII criteria for mitigation. In addition to the 36 NSLs, six NSLs met the criteria for mitigation but these locations are being acquired by CPO and no targeted mitigation measures have been provided for them.

Further details on the operational phase mitigation measures are discussed in Section 14.8.2 including the suitability and/or practicality of noise mitigation for each location.

14.7.5 Donegal Draft Noise Action Plan (DNAP)

Detailed modelling for this project has identified 1,633 NSLs where road traffic noise levels exceed the DNAP 60 dB(A) exposure thresholds in the design year Do-Minimum scenario. Where the properties are located inside the Proposed Development boundary, mitigation works will be undertaken as part of this development. This reduces to 1,265 properties in the design year Do-Something scenario, a significant reduction in exposure at population level.

14.7.6 Operational Vibration Impacts

As stated in Section 14.4.3.8, no operational vibration impacts are predicted by the assessment.

14.8 Mitigation Measures

14.8.1 Construction Phase

In line with international best practice, controlled hours of operation will be adopted for the construction phase (See Section 4.10.1.1 in Chapter 4: Project Description).

The following specific mitigation measures will be implemented during the construction works:

- Construction will be phased to minimise the duration of activities in each area.
- Contractors likely to generate significant levels of noise and vibration will employ the Best Practicable Means to minimise noise and vibration emissions and will be obliged to comply with the general recommendations of BS 5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Part 1: Noise* and BS 5228-2:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration* (together referred to as BS 5228).
 - “Best Practicable Means” include:
 - Limiting the hours during which site activities likely to create high levels of vibration are permitted. Any work outside normal working hours shall only take place with the written permission of the local authority.
 - Establishing channels of communication between the Contractor/developer, Local Authority and residents.
- Where works need to be completed outside normal working hours or the Contractor’s method statement for any proposed works indicates that the levels set out in Table 14-4 may be exceeded, permission for these works must be sought from the Local Authority in advance of any works taking place. The application for such works will require a detailed noise control plan and follow-up report to be prepared. This plan will include:
 - (i) a justification for the works being carried out in the manner proposed,
 - (ii) an assessment indicating what alternatives have been considered,
 - (iii) a statement of the noise control measures from BS 5228 to be adopted and how Best Practicable Means will be used to control noise,
 - (iv) an activity specific noise monitoring programme including contact details for persons with the authority to cease working if required by the Local Authority.

Each follow up report will include details of any complaints received and the action taken to address such complaints.

- All properties specified for such in Table 17 68: Summary of Potential Environment Effects, Mitigation and Monitoring in Chapter 17: Cultural Heritage will be subject to a pre-construction and post-construction phase condition survey and stabilised pre-construction if deemed necessary.
- Vibration monitoring, if required, will be carried out during the course of construction at the properties specified for such in Table 17 68: Summary of Potential Environment Effects, Mitigation and Monitoring in Chapter 17: Cultural Heritage.
 - If vibration levels above the thresholds are detected, the contractor will utilise alternative equipment and/or methods which result in vibration levels below the threshold for building damage.
- Noise barriers will be constructed as early as practicable during the construction phase. The Contractor will be required to set out an additional acoustic barrier construction schedule to maximise acoustic screening for the construction phase. Local absorptive noise barriers will be used to screen noisy equipment when works are located close to NSLs.
- A noise and vibration monitoring programme will be implemented for the duration of the construction phase. Monitoring will assess compliance of the construction works with the noise design goals set out in Table 14-3 and Table 14-4.
- For signage and lighting, and other activities occurring close to NSLs, noise emissions will be reduced by avoiding simultaneous use of noisiest items of plant in the same location.

- Permitted haulage routes should be in good condition and maintained over the course of the construction works to minimise the potential for vibration impacts.
- As part of the implementation of mitigation, the EOP will include the following measures:
 - Channels of communication between the Contractor/developer, the Local Authority and residents will be established.
 - Records of any noise complaints relating to the construction operations will be and investigated as soon as possible and reported to the Local Authority'.
 - Plant such as pumps and generators used on or near sensitive locations will be contained within an acoustic enclosure and comply with the noise levels in Section 14.4.3.
 - Plant and machinery used on-site will comply with the European Commission (Construction Plant and Equipment) Permissible, Noise Levels Regulations, 1988 (S.I. No. 320 of 1988).
 - All noise producing equipment will comply with the European Communities (Noise Emission by Equipment for Use Outdoors) Regulations 2001 (S.I. No 632 of 2001).
- Blasting will only be permitted between 09:00 and 18:00 hrs Monday to Friday inclusive. Blasting will not be permitted on weekends or public holidays.
- In advance of any blasting operation the Contractor will inform occupants of all dwellings within 500 m of the blast that blasting will take place and the duration of blasting operations.
- Air overpressure from any blast will not exceed 125 dB (linear) max peak, with a 95% confidence limit when measured at the nearest air overpressure sensitive location. No individual air overpressure value shall exceed the limit value by more than 5 dB (Lin).
- Vibration from blasting activities will not exceed the PPV levels in Section 14.4.3.6. The applicable vibration level is dependent on the frequency of the blasting.
- Full details of the Contractor's provision for noise and vibration monitoring and procedures in relation to public notice will be made available to the Local Authority.

Site Compounds

When tree processing activities are occurring on site, the woodchipper will be located as far away as possible from NSLs. Some of the site compound boundaries are less than 25m from NSLs. Noise barriers are proposed in those instances with details below:

- Section 2: Bonagee site compound: 2.4m high noise barrier along the boundary adjacent to commercial premise (38344081).
- Section 3: Pluck roundabout site compound: 3.6m high noise barrier along the boundary adjacent to NSL 80523887.

Site Clearance

When undertaking tree felling and processing during site clearance works, the distance between tree felling and processing plant required for site clearance and the nearest NSLs shall be maximised. Where this is not practical, the use of temporary noise barriers should be used to mitigate the noise impacts.

Where extensive tree removal is required in close proximity to NSLs, the use of tree shears should be implemented where practicable.

It is recommended that a 2.4 m high noise barrier (reflective) shall be installed and maintained for the duration of the construction phase along the site compound boundary adjacent to NSL 80523887.

Demolitions

The noisiest individual item of plant associated with the demolition works is the backhoe mounted hydraulic breaker, which has the potential to generate high levels of noise. Where a hydraulic breaker is required, the following measures shall be implemented:

- Fit suitably designed muffler or sound reduction equipment to reduce noise without impairing machine efficiency.
- Use dampened bit to eliminate ringing.

Given that the demolition activity is occurring less than 5 m away from NSL 80490723, the use of a temporary noise barriers/screen of 2.4 m in height shall be implemented. For all other NSLs, where works are occurring within 39 m and over an extended period, the use of temporary noise barriers/screens of 2.4 m height shall be implemented where practicable.

Rock Extraction and Processing

Mitigation measures will be required to avoid significant effects where there is direct line of sight between the activity and the NSL and the distance is less than 56 m.

Overburden to be retained at the borrow pit location shall be located to block line of sight to the nearest NSLs where practicable. Where NSLs are less than 56 m away from borrow pits, retained overburden shall be used to block line of sight. Where this is not possible a 2.4 m – 3.6 m noise barrier shall be installed along the boundary adjacent to NSLs. Plant shall be located as far away as possible from NSLs.

For rock extraction along the proposed alignment, a 3.6m high noise barrier shall be installed along the development boundary between Mainline S2.2 West Ch 2+000 – 2+150.

Rock processing plant should be located at a minimum setback distance of 50 m from NSLs where practicable.

Earthworks

Predicted noise levels above the construction noise threshold predominately occur at locations where there are tie-ins with existing roads or where local access has been provided. The nature of these works will be less intensive than mainline works. However, there are also several locations along mainlines for all three sections where predicted noise levels are above the construction noise threshold. For these NSLs, noise barriers shall be installed as early as possible within the construction programme. Noise barriers shall be at least 2.4 m in height and up to 3.6 m in some locations to ensure they block line of sight.

Section 1:

- Multiple NSLs (Ballyboffey link road south Ch 1+750 – 1+915)
- Adjacent to NSLs:
 - 35778842 (Mainline 1.1).
 - 38532571 and 80491790 (L-6674 Connector).
 - 80491461 (LX-1004)
 - 80491483 and 80506471 (Mainline 1.2).
 - 80491777 and 8049178 (L-2724).
 - 80506397 (L-6584 Connector Tie-in with N15).
- Multiple locations where local access is provided. Temporary noise barrier adjacent to NSLs to be provided where practicable when works are within 50 m of the NSL.

Section 2:

Noise barrier requirement:

- 3659822 (L-1094 Connector).
- 37407420 and 40158857 (L-1094 Connector and LX-2004).
- 80483601 (LX-2004).
- 36398477 and 36398476 where practicable (LX-2013).
- 55015546, 55015545 and 38281649 (N56 Tie-in and AR2.16 local access).
- 80483695, 80985221 and 80483637 (L1114 Connector west of Mainline 2.2).
- 55015599 (Mainline S2.6 East Ch 70 – 170).
- Multiple NSLs (Mainline 2.2 North Ch 2+250 – 2+350 and Mainline 2.4 South Ch 0+035 – 0+230).
- 80483611 and 80483609 (Mainline 2.4 North Ch 0+130 – 0+220).
- 37399064 and 8048365 (Mainline 2.4 South Ch 3+050 – 3+170).

- Multiple NSLs (Mainline 2.4 North 2+000 – 2+200).
- 38344105 (LX-2005 West Ch 610 - 690).
- 80483773 and 80483613 (Mainline 2.3 North Ch 0+420 – 0+520).
- Localised noise barriers for 40286141, 2733830, 27339831 (L-5494 Connector).

Section 3

Noise barrier requirement:

- 80523887 (L1294 Ch 0+135 – 0+200).
- 27355848 (Mainline Ch 3+500 – 3+650 and L5574 and local access roads Ch 0+120 – 0+280).
- 80524241 and 36839479 (LX-3014 temporary noise barrier when works are within 50m).
- 80524306 (Mainline Ch 7+085 – 7+170).
- Multiple NSLs (Mainline Ch 16+000 – 16+150).
- Multiple NSLs (Mainline Ch 17+100 – 17+300).
- Localised noise barriers:
 - 80524614, 80524615 and 80524716 (Mainline Ch 9+400 and L2374 Tie-in).
 - 80524712 and 80524713 (Mainline Ch 7+650, AR3.32 and R236 Tie-in East).
 - 80523888 (L1294).
 - 38473106, 60194342 and 40307726 (L2374 and LX-3024 Tie-in).
 - 80524614, 80524615 and 80524616 (L2374).
 - 80524634 (Mainline Ch 10+700 and L6104).
 - 80525004 (Mainline Ch 13+110 and L2414).
 - 80525115 (L2414).
 - Multiple NSLs adjacent to R264 from Ch 0+000 – 0+310.
 - 38466720 (R264).
 - 36649876 (L2384 Tie-in).
 - 27127400 (Mainline Ch 14+010 and R264 Ch 0+770).

Road formations

The noise barriers recommended for the earthworks are also applicable for road formation construction activities.

14.8.2 Operational Phase

14.8.2.1 Overview

To reduce road traffic noise for as many properties as possible, all newly constructed roads on all sections of the Proposed Development are specified as low noise road surfaces which forms part of embedded mitigation measures. A low noise road surface is defined as a road surface that can provide a minimum noise reduction of 2.5 dB(A) when compared to a standard HRA road surface. The low noise surface modelled in this assessment is limited to a reduction of 2.5 dB(A) in accordance with TII guidance. However, even with a low noise road surface installed on the Project, the requirement for further mitigation was identified at many of the NSLs as described below.

The effectiveness of a low noise surface performance is limited in the modelling to -2.5 dB despite the limit being based on data that is 20 years old. Current low noise surface designs offer much better validated noise reductions. In a technical report aimed to develop interim road correction factors for national roads in Ireland, TII (2022) found that at 50 km/h CPX-measurements recorded noise levels ranging from 90.5 dB(A) to 96.3 dB(A), while at 80 km/h CPX-measurements recorded levels ranging from 97.8 to 103.6 dB(A) depending on the road surface. Of the varieties of road surface assessed new stone mastic asphalt with rubber filler (RARX), old stone mastic asphalt 10, and SMA 14 were found to be the quietest road surfaces, while old hot rolled asphalt in 'poor' condition, old hot rolled asphalt in 'good' condition, and old porous asphalt were found to be the loudest (TII, 2022). In some instances (New HRA vs New RARX) improvements of 3.6 dB were observed at 50 km/hr and 3.8 dB reported at 80 km/hr.

In addition, the Government under the Climate Action Plan 2024 and 2025 has targets of 845,000 private Electric Vehicles (EVs) and 95,000 commercial EVs by 2030. These targets are likely to be exceeded by the design year 2047 and such vehicles will produce lower noise levels while accelerating in lower speed ranges. At higher speeds tyre noise dominates vehicle noise emissions and the EU has introduced new tyre labelling requirements from May 2021 which has put commercial pressure on tyre manufacturers to reduce tyre noise. This is evidenced by the current marketing of the 'quietness' of electric vehicles. The lower noise output of electric vehicles and improved tyre noise characteristics have not been considered in this assessment.

The combination of these factors provides a high degree of confidence that the road traffic noise levels will not exceed, and should be lower than, predictions in the longer term.

Note: The noise mitigation measures presented in the sections below account for traffic volumes with and without a cross-border link, i.e. the N14/N15 to A5 Link part of the Proposed Development to a proposed Trunk Road T3 and the proposed A5 WTC in Northern Ireland. The noise impact without these sections of road is presented in Appendix C14.5 Operational Results without Cross-border Link.

14.8.2.2 Section 1

In Section 14.7.4.1, eleven NSLs within the Proposed Development boundary were identified as meeting the criteria for mitigation either in the opening year, design year or both as defined in TII (2004) and TII (2014) guidance documents. Table 14-60 presents the details of noise reducing measures in addition to the use of a low noise road surface within the development boundary. The location, length and height of the noise barriers proposed are also presented in Table 14-60. The table refers to 'Noise Barriers', this may take the form of walls, earthen berms and other landscaping features providing the required acoustic screening and meeting all other technical specifications.

Table 14-60: Details of Noise Mitigation Measures – Section 1

Receptor ID*	Barrier ID	Location	Chainage	Description	Length	Height
80506471	S1 NB001	Mainline 1.2 North	Ch 1+822 -1+985	2 m high noise barrier	163 m	2 m
27272332 27272335 to 27272339 80490721 80490721a	S1 NB002	Ballybofey Link Road LX-1003	Ch 1+750 – 1+915 Ch 0+000 - 0+025	2.5 m high noise barrier	144 m	2.5 m
80490723a	S1 NB003	Ballybofey Link Road	Ch 1+950	1.5 m high Garden Wall at dwelling boundary	16 m	1.5 m
80491488	S1 NB004	Mainline 1.2 North	Ch 2+690 – Ch 3+306	2 m high noise barrier	616 m	2 m
35445888	S1 NB005	Mainline 1.2 South	Ch 3+520 – 3+740	3.5 m high noise barrier	220 m	3.5 m
37676924	S1 NB006	Mainline 1.2 North	Ch 4+487 – 4+780	3 m high absorptive noise barrier	294 m	3 m
27358138	S1 NB007	Mainline 1.2 South	Ch 4+827 – 4+980	3 m bund with a 2 m noise barrier atop	153 m	5 m
27297671	S1 NB008	N15 Primary Road Connector Treanamullin Tie in	Ch 2+960 – 3+075 Ch 0+250 and 0+275	2 m high noise barrier	125 m	2 m
80491373	S1 NB009	Mainline 1.2 North	Ch 7+655 – 7+870	2.5 m high noise barrier	215 m	2.5 m

* **Note:** For some receptors several locations around the building have been modelled given their proximity to both existing roads and the Proposed Development and these locations have been denoted with letters 'a', 'b' etc. depending on the number of locations around the building.

The proposed noise barrier locations and pertinent NSLs for Section 1 are presented in Figure 14-5. Further details are set out in EIAR Drawing 14.04 in Volume D: Book of Drawings.

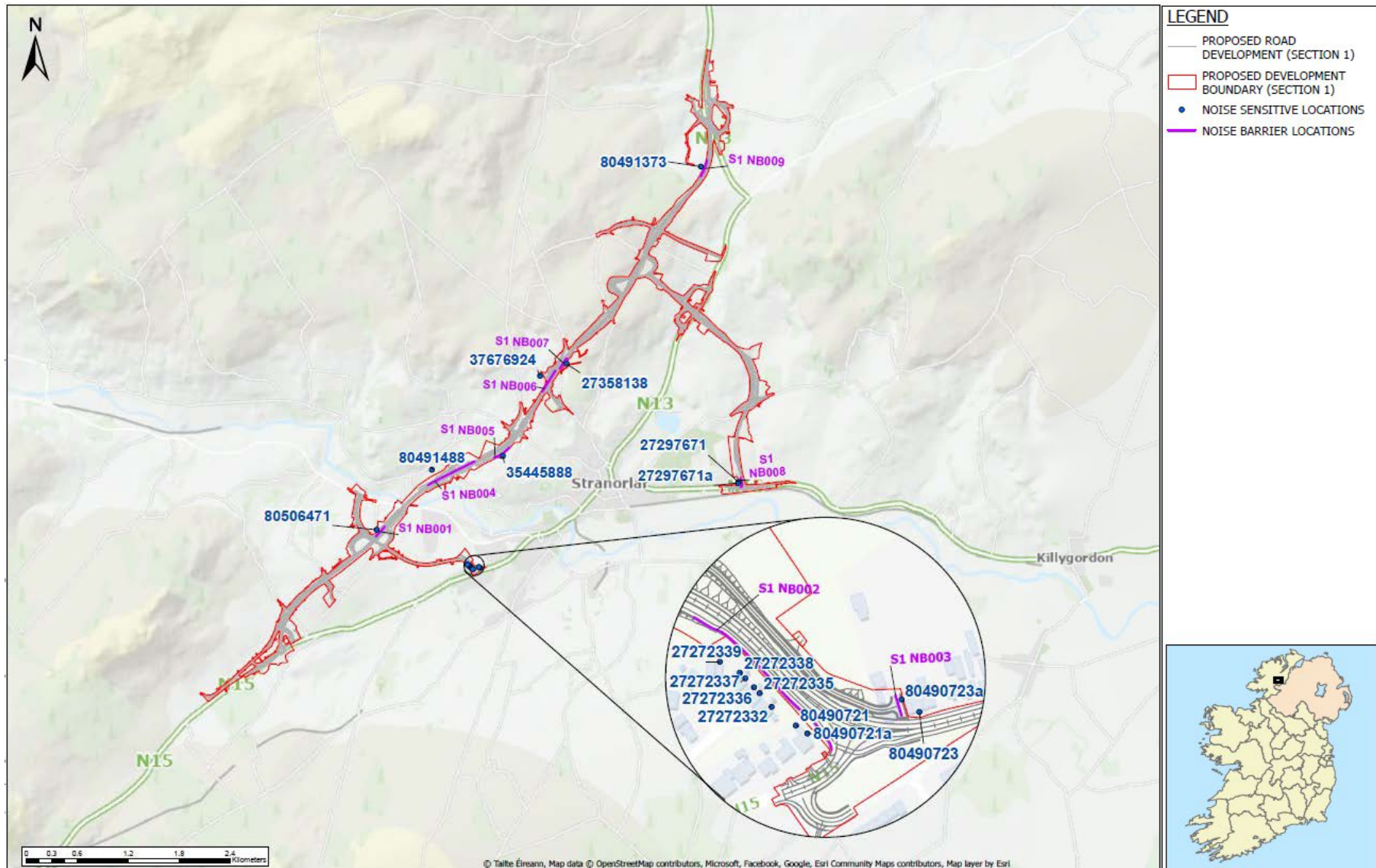


Figure 14-5: Noise Barrier Locations - Section 1

With mitigation measures in place, all eleven of the NSLs that met the criteria for mitigation were either at or below the TII design goal of 60 dB L_{den} or below Do-Minimum noise levels. Table 14-61 presents the predicted noise levels at the NSLs following mitigation. The significance of effect is also presented.

Table 14-61: Predicted Traffic Noise Levels with Mitigation – Section 1

Receptor ID*	Description	Predicted L _{den} Noise Levels		Predicted L _{den} Noise Levels		Significance of Effect
		Opening Year (2032)		Design Year (2047)		
		Do-Minimum	Do-Something with Mitigation	Do-Minimum	Do-Something with Mitigation	
27272332	Residential	52	59	53	60	Moderate
27272335	Residential	49	58	49	59	Moderate
27272336	Residential	49	58	49	59	Moderate
27272337	Residential	47	58	47	58	Moderate
27272338	Residential	48	59	49	59	Moderate
27272339	Residential	46	58	47	59	Moderate
27297671	Residential	59	59	59	60	Significant (Positive)
27297671a	Residential	65	57	65	58	
27358138	Residential	39	59	39	60	Moderate
35445888	Residential	48	60	49	60	Moderate
37676924	Residential	45	60	46	60	Moderate
80490721	Residential	47	55	48	56	Not significant (Positive)
80490721a	Residential	59	57	59	58	
80490723	Residential	68	66	69	67	Slight (Positive)
80490723a	Residential	58	59	59	60	
80491373	Residential / Commercial	53	59	54	60	Moderate
80491488	Residential	44	56	45	57	Moderate
80506471	Residential / Commercial	62	58	62	58	Significant (Positive)

* **Note:** For some receptors several locations around the building have been modelled given their proximity to both existing roads and the Proposed Development and these locations have been denoted with letters 'a', 'b' etc. depending on the number of locations around the building.

14.8.2.3 Section 2

In Section 14.7.4.2, sixteen NSLs were identified as meeting the criteria for mitigation either in the opening year, design year or both as defined in TII (2004) and TII (2014) guidance documents. Table 14-62 presents the details of noise reducing measures in addition to the use of a low noise road surface within the development boundary. The location, length and height of the noise barriers proposed are also presented. Where the table refers to 'Noise Barriers', these may take the form of walls, earthen berms and other landscaping features providing the required acoustic screening and meeting all other technical specifications.

Table 14-62: Details of Noise Mitigation Measures – Section 2

Receptor ID*	Barrier ID	Location	Chainage	Description	Length	Height
80483619 80483619a 80483620 80483620a 80483775	S2 NB001	Mainline S2.2 North	Ch 1+945 – 2+170	3 m high noise barrier	225 m	3 m
80483638 80483815 80483817 80483759	S2 NB002	Roundabout intersection Mainline S2.2 and S2.4 Mainline S2.4 South	- Ch 0+035 – 0+158	3.5 m high noise barrier	175 m	3.5 m
80483612 80483612a 80483613	S2 NB003	Mainline S2.5 West	Ch 0+320 – 0+515	2.5 m high noise barrier	195 m	2.5 m
36515964	S2 NB004	Mainline S2.6 East	Ch 0+130 – 0+235	2 m high noise barrier / bund or false cut	105 m	2 m
27339832 36515983 80483732	S2 NB005	Mainline S2.4 North	Ch 1+970 – 2+320	2 m high absorptive noise barrier	355 m	2 m

* **Note:** For some receptors several locations around the building have been modelled given their proximity to both existing roads and the Proposed Development and these locations have been denoted with letters 'a', 'b' etc. depending on the number of locations around the building.

The proposed noise barrier locations and pertinent NSLs for Section 2 are presented in Figure 14-6. Further details are set out in EIAR Drawing 14.05 in Volume D: Book of Drawings.

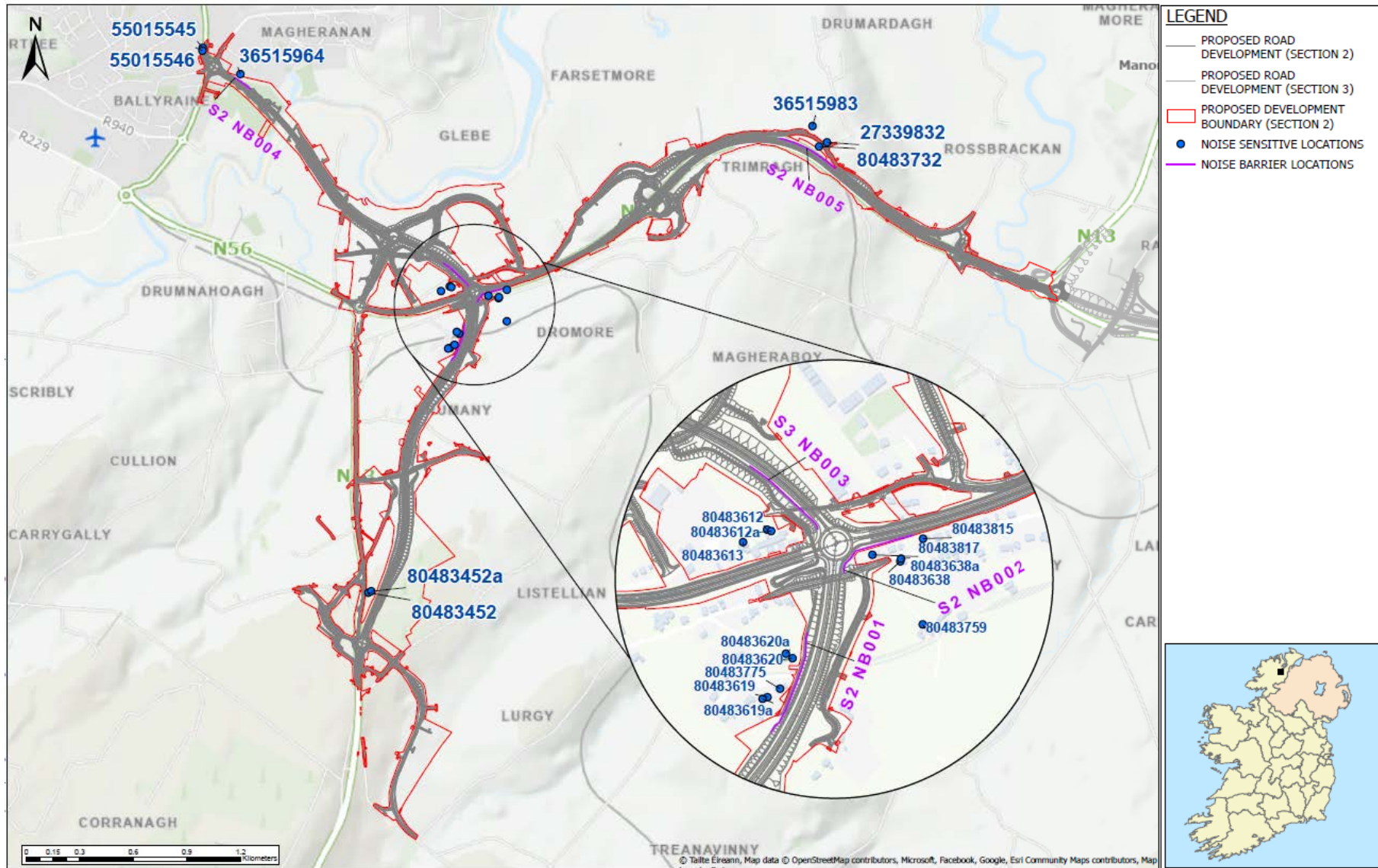


Figure 14-6: Noise Barrier Locations - Section 2

With mitigation measures in place, thirteen of the sixteen NSLs that met the criteria for mitigation were either at or below the TII design goal of 60 dB L_{den} or below Do-Minimum noise levels.

Location 80483452a met the criteria for mitigation, however, as there is an overall net positive benefit at this noise sensitive location (80483452/ 80483452a) because of the development, no further mitigation is provided.

Location 55015545 and 55015546 are located near the tie in with N56 National Road. Several noise barrier configurations within the Proposed Development boundary were assessed as well as the extension of the low noise road surface 150 m to the north of the tie in with the N56 National Road. However, there was limited benefit to mitigation measures assessed, with a negligible reduction in noise level predicted. Table 14-63 presents the predicted noise levels at the NSLs following mitigation. The significance of effect is also presented.

Table 14-63: Predicted Traffic Noise Levels with Mitigation – Section 2

Receptor ID*	Description	Predicted L _{den} Noise Levels		Predicted L _{den} Noise Levels		Significance of Effect
		Design Year (2032)		Design Year (2047)		
		Do-Minimum	Do-Something with Mitigation	Do-Minimum	Do-Something with Mitigation	
27339832	Residential	59	58	60	59	Not Significant (Positive)
36515964	Healthcare Facilities	50	58	50	59	Moderate
36515983	Residential	60	59	61	60	Not Significant (Positive)
55015545	Residential	67	68	67	69	Moderate
55015546	Residential	67	69	68	69	Moderate
80483452	Residential	69	50	70	51	Significant (Positive)
80483452a	Residential	51	60	52	61	
80483612	Residential	54	60	55	60	Moderate
80483612a	Residential	58	59	58	60	
80483613	Residential	53	58	54	59	Moderate
80483619	Residential	47	59	48	59	Moderate
80483619a	Residential	56	60	56	60	
80483620	Residential	54	59	55	60	Moderate
80483620a	Residential	57	60	58	61	
80483638	Residential	60	62	64	62	Slight
80483638a	Residential	64	66	69	65	

Receptor ID*	Description	Predicted L _{den} Noise Levels		Predicted L _{den} Noise Levels		Significance of Effect
		Design Year (2032)		Design Year (2047)		
		Do-Minimum	Do-Something with Mitigation	Do-Minimum	Do-Something with Mitigation	
80483732	Residential	64	63	65	63	Slight (Positive)
80483759	Residential /Commercial	56	59	57	60	Moderate
80483775	Residential	50	59	50	60	Moderate
80483815	Residential	70	70	70	70	Neutral
80483817	Residential	67	63	68	63	Significant (Positive)

* **Note:** For some receptors several locations around the building have been modelled given their proximity to both existing roads and the Proposed Development and these locations have been denoted with letters 'a', 'b' etc. depending on the number of locations around the building.

14.8.2.4 Section 3

In Section 14.7.4.3, nine NSLs were identified as meeting the criteria for mitigation either in the opening year, design year or both as defined in TII (2004) and TII (2014) guidance documents.

Table 14-64 presents the details of noise reducing measures in addition to the use of a low noise road surface within the scheme boundary. The location, length and height of the noise barriers proposed are also presented in Table 14-64. The table refers to 'Noise Barriers', these may take the form of walls, earthen berms and other landscaping features providing the required acoustic screening and meeting all other technical specifications. Other mitigation measures such as the extension of a low noise road surface and a reduction in speed are also recommended. The locations of noise mitigation measures are shown on Table 14-64.

Noise Barriers S3 NB002a, S3 NB002b and S3 NB005 have been provided in the event that the Proposed Development proceeds without a cross-border link with the proposed A5 WTC (the N14/N15 to A5 Link) that will join with a proposed Trunk Road T3 in Northern Ireland.

Table 14-64: Details of Noise Mitigation Measures – Section 3

Receptor ID*	Barrier ID	Location	Chainage	Description	Length	Height
80524306 80524306a	S3 NB001	Mainline East	Ch 7+065 – 7+195	2 m high noise barrier	130 m	3 m
	S3 NB002a**	LX-0000 (R264)	Ch 1+875 – Ch 1+935	2.85 m high noise barrier	63 m	2.85 m
38466720 38466720a	S3 NB002b**	LX-0000 (R264)	Ch 1+940 – Ch 1+970	2.85 m high noise barrier	32 m	2.85 m
	-	LX-0000 (R264)	-	LX-0000 (R264) ties in with the N14 reduce speed to 60 kph 200m from intersection	200 m	-
80492710 80492712a 80492712b	S3 NB003	Mainline East	Ch 17+140 – 17+350	3.25 m high absorptive noise barrier	210 m	3.25 m
36724783 36724783a 80493104	S3 NB004	Mainline West	Ch 17+200 – 17+400	2 m high absorptive noise barrier	200 m	2 m
80492715 80985572	S3 NB005**	N15 Lifford Tie in East	Ch 0+398 – 0+506	2 m high absorptive noise barrier	108m	2 m

Receptor ID*	Barrier ID	Location	Chainage	Description	Length	Height
36839482a						
80523886	-	L1154 (Pluck) tie-in	-	Extended low noise road surface 130 m beyond the end of the scheme.	130 m	-
80523886a						

* **Note:** For some receptors several locations around the building have been modelled given their proximity to both existing roads and the Proposed Development and these locations have been denoted with letters 'a', 'b' etc. depending on the number of locations around the building.

** These noise barriers are provided in the event that the Proposed Development proceeds without a cross-border link with the proposed A5 WTC (the N14/N15 to A5 Link) that will join with a proposed Trunk Road T3 in Northern Ireland.

The proposed noise barrier locations and pertinent NSLs for Section 3 are presented in Figure 14-7. Further details are set out in EIAR Drawing 14.06 in Volume D: Book of Drawings.

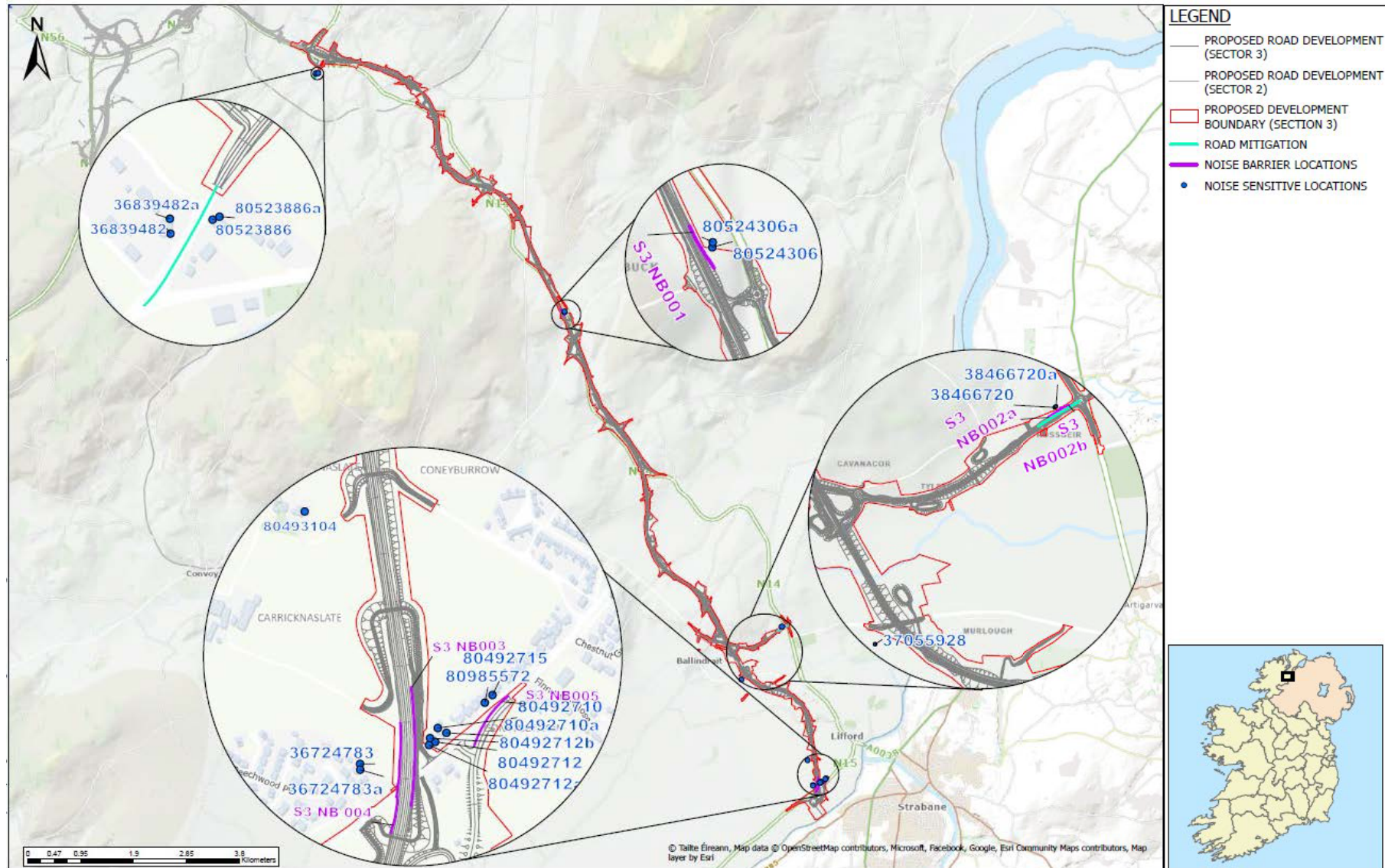


Figure 14-7: Noise Barrier Locations - Section 3

With mitigation measures in place, seven of the nine NSLs that met the criteria for mitigation were either at or below the TII design goal of 60 dB L_{den}, or below Do-Minimum noise levels.

For receptor location 37055928 predicted noise levels in the opening year do not exceed the TII 60 dB L_{den} design goal. There is a marginal exceedance in the design year. This NSL is located approximately 115 m away from the nearest carriageway and effectiveness of a noise barrier is limited. One of the mitigation measures considered was a 130 m long, 2 m high noise barrier which reduces the predicted noise levels to 60 dB L_{den}. In practice, this change in noise level would not be perceptible, the mitigation measure would not be considered a sustainable approach and the Do-Something noise level in the design year remains above the design goal at this location.

Receptor 80523886/ 80523886a is located along the L1154 (Pluck) tie-in. Mitigation measures in the form of an extension of the low noise road surface 130m beyond the end of the Proposed Development has been proposed. With the mitigation measures proposed, significant residual effects remained. Several noise barrier configurations within the Proposed Development boundary were examined but there was limited benefit to mitigation measures assessed, with a negligible reduction in noise level predicted as the main source of noise is the increase in traffic volumes on the L1154.

Table 14-65 presents the predicted noise levels at the NSLs following mitigation. The significance of effect is also presented.

Table 14-65: Predicted Traffic Noise Levels with Mitigation – Section 3

Receptor ID*	Description	Predicted L _{den} Noise Levels		Predicted L _{den} Noise Levels		Significance of Effect
		Opening Year (2032)		Design Year (2047)		
		Do-Minimum	Do-Something with Mitigation	Do-Minimum	Do-Something with Mitigation	
36724783	Residential	55	58	56	59	Slight
36724783a	Residential	57	58	58	59	
36839482	Residential	57	62	57	61	Significant
36839482a	Residential	55	60	56	60	
37055928	Residential	53	60	54	61	Significant
38466720	Residential	61	59	61	59	Moderate (Positive)
38466720a	Residential	61	56	61	57	
80492710	Residential	51	57	52	58	Moderate (Positive)
80492710a	Residential	63	58	64	59	
80492712	Residential	64	61	65	61	Slight (Positive)
80492712a	Residential	63	60	63	61	

Receptor ID*	Description	Predicted L _{den} Noise Levels		Predicted L _{den} Noise Levels		Significance of Effect
		Opening Year (2032)		Design Year (2047)		
		Do-Minimum	Do-Something with Mitigation	Do-Minimum	Do-Something with Mitigation	
80492712b	Residential	53	59	53	60	
80492715	Residential	64	62	65	63	Slight (Positive)
80493104	Residential	56	60	57	60	Moderate
80523886	Residential	58	63	58	63	Significant
80523886a	Residential	57	62	58	62	
80524306	Residential	50	56	50	57	Moderate
80524306a	Residential	57	57	58	58	
80985572	Residential	65	63	66	63	Slight (Positive)

* **Note:** For some receptors several locations around the building have been modelled given their proximity to both existing roads and the Proposed Development and these locations have been denoted with letters 'a', 'b' etc. depending on the number of locations around the building.

14.9 Residual Effects

14.9.1 Construction Phase

With the implementation of the construction-phase mitigation measures set out in Section 14.8.1 and with construction-phase noise and vibration monitoring as described in Section 14.13.1, the residual noise impacts from the construction works are expected to be similar in character to other national road schemes: temporary to short-term in duration and generally localised in extent. The majority of noise-sensitive locations are predicted to experience short-term moderate adverse residual noise impacts during general construction activities. However, during periods of high-intensity work immediately adjacent to sensitive receptors (for example site clearance, demolition, earthworks, rock-breakout or plant-intensive periods), there is potential for temporary significant adverse residual impacts at some noise sensitive locations within 25 m of construction works. Given the linear nature of the Proposed Development, construction activity will be mobile over the course of the proposed works and intensity of works will vary.

Residual noise impacts from construction traffic using the designated haul routes is generally predicted to be short-term and either not significant or imperceptible for the majority of routes.

No significant vibration impacts are predicted with construction-phase vibration impacts generally limited in extent and duration.

14.9.2 Operational Phase

A total of 4,585 properties were considered during the noise modelling carried out as part of this EIAR. The majority of NSLs will either have reduced noise levels or be in line with the TII design goal. However, a limited number of properties will experience a residual noise effect as a result of the Proposed Development, despite the application of a structured approach through the consideration of various mitigation measures.

Reducing traffic noise levels to or below 60 dB L_{den} and/or below the Do-Minimum noise levels at these properties would require substantial additional mitigation (e.g. installation of barriers or extension of the boundary walls adjacent to the receptors) over and above those already proposed in order to achieve a negligible change to the overall noise level at a property.

With respect to achieving the 60 dB L_{den} design goal, TII (2014) state that “... *in some cases the attainment of the design goal may not be possible by sustainable means*”. The guidance goes on to state “... *It may be unsustainable to increase barrier dimensions significantly where the result would be a reduction of 1 dB 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.*”

The residual impacts for each section are presented in two formats, (a) The Environmental Noise Directive (END) noise mapping bands and (b) Assessment of Change.

14.9.2.1 Section 1 Residual Effects

The residual impacts for Section 1 are examined under both the END noise mapping noise level bands and the Assessment of Change.

Section 1 - END Noise Mapping

A summary of the Do-Minimum and the Do-Something with mitigation outcomes in the opening year and the design year are outlined in Table 14-66. One property that would otherwise be subject to road traffic noise levels in excess of 75 dB is mitigated in the Do-Something design year scenario. As can be seen from the table, the number of properties predicted to be within the 70 - 74 dB L_{den} and 75+ dB L_{den} bands for the design year have reduced substantially. For all bands between 65 dB and 75+ dB, the Proposed Development (Do-Something) has a lower number of properties in the band than the Do-Minimum option. The number of receptors in the <55 dB band also increases in the Do-Something with mitigation scenario when compared to the Do-Minimum scenario. This presents a clear downward trend in noise exposure for the properties assessed in the EIAR. The aggregate residual effect under the END Noise Mapping criteria is positive.

Table 14-66: Opening and Design Year L_{den} Noise Level Bands – Section 1

Noise Level Range (dB)	Opening Year 2032		Design Year 2047	
	Do-Minimum	Do-Something with Mitigation	Do-Minimum	Do-Something with Mitigation
<55	1210	1338	1142	1274
55 – 59	258	324	280	342
60 – 64	245	225	238	245
65 – 69	338	236	337	235
70 - 74	97	25	150	52
75+	0	0	1	0

Section 1 - Assessment of Change

A summary of the Do-Minimum and the Do-Something with mitigation L_{den} outcomes with respect to the change in noise levels in the opening year and design year are outlined in Table 14-67 and Table 14-68.

For the opening year, the Proposed Development results in decreased NSL numbers in the low, medium and high impact rating bands, meaning the Proposed Development results in a higher number of NSLs experiencing positive effects. There is, however, a larger number of NSLs experiencing a negligible increase in noise levels than those experiencing a negligible decrease in noise levels.

For the design year, the Proposed Development results in decreased NSL numbers in the low, medium and high impact rating bands, meaning the Proposed Development results in a higher number of NSLs experiencing positive effects. However, there is a larger number of NSLs with a negligible change in noise levels. The aggregate residual effects under the Assessment of Change criteria is positive.

In summary, the Proposed Development will result in a positive aggregate residual effect under the END Noise Mapping and the Assessment of Change. This will result in beneficial environmental and health effects on the general population in the study area.

No significant residual vibration effects are predicted as a result of the operational phase.

Table 14-67: Change in Opening Year L_{den} Noise Levels – Section 1

Change in Noise Level (dB)	DMRB Magnitude	EPA Magnitude of Impact	All Receptors	Residential (incl Farms)	Educational and Childcare Facilities	Hotels and Accommodation	Activities of Religious Organisations	Healthcare Facilities	Residential Care	
Decrease in Noise Level	5.0+	Major	High	389	356	1	3	0	1	0
	3.0 – 4.9	Moderate	Medium	569	431	3	5	4	4	0
	1.0 – 2.9	Minor	Low	680	612	5	2	2	3	0
	0.1 – 0.9	Negligible	Negligible	92	88	0	0	0	1	0
No Change	<i>No Change</i>	<i>No Change</i>	13	11	0	1	0	0	0	0
Increase in Noise Level	0.1 – 0.9	Negligible	Negligible	226	221	1	0	0	0	0
	1.0 – 2.9	Minor	Low	144	135	0	0	0	0	0
	3.0 – 4.9	Moderate	Medium	95	93	0	1	0	0	0
	5.0+	Major	High	169	163	0	0	0	1	0

Table 14-68: Change in Design Year L_{den} Noise Levels – Section 1

Change in Noise Level (dB)	DMRB Magnitude	EPA Magnitude of Impact	All Receptors	Residential (incl Farms)	Educational and Childcare Facilities	Hotels and Accommodation	Activities of Religious Organisations	Healthcare Facilities	Residential Care	
Decrease in Noise Level	5.0+	Major	High	409	374	2	3	1	1	0
	3.0 – 4.9	Moderate	Medium	632	495	3	5	4	4	0
	1.0 – 2.9	Minor	Low	593	531	4	2	1	3	0
	0.1 – 0.9	Negligible	Negligible	106	96	0	1	0	1	0
No Change	<i>No Change</i>	<i>No Change</i>	17	16	0	0	0	0	0	0
Increase in Noise Level	0.1 – 0.9	Negligible	Negligible	220	214	1	0	0	0	0
	1.0 – 2.9	Minor	Low	140	132	0	0	0	0	0
	3.0 – 4.9	Moderate	Medium	87	85	0	1	0	0	0
	5.0+	Major	High	173	167	0	0	0	1	0

14.9.2.2 Section 2 Residual Effects

The residual effects for Section 2 are examined under both the END noise mapping noise level bands and the DMRB impact rating.

Section 2 – END Noise Mapping

A summary of the Do-Minimum and the Do-Something with mitigation outcomes in the opening year and the design year are outlined in Table 14-69. No properties will be subject to road traffic noise levels in excess of 75 dB. The number of properties predicted to be within the 70 - 74 dB L_{den} band for the opening year and design year reduces with the Proposed Development and a similar trend occurs for the 65 – 69 dB band. Looking at the cumulative number of properties with noise levels above 60 dB, it can be seen that the numbers are lower for the Proposed Development versus the Do-Minimum scenario. The number of properties with predicted noise levels less than 60 dB L_{den} increases in the Do-Something with mitigation option when compared to the Do-Minimum scenario. This presents a clear downward trend in noise exposure for the properties assessed in the EIAR. The aggregate residual impact under the END Noise Mapping criteria is positive.

Table 14-69: Opening and Design Year L_{den} Noise Level Bands – Section 2

Noise Level Range (dB)	Opening Year 2032		Design Year 2047	
	Do-Minimum	Do-Something with Mitigation	Do-Minimum	Do-Something with Mitigation
<55	289	296	274	268
55 – 59	197	212	189	226
60 – 64	153	150	136	150
65 – 69	127	114	161	126
70 - 74	19	13	25	15
75+	0	0	0	0

Section 2 – Assessment of Change

A summary of the Do-Minimum and the Do-Something with mitigation L_{den} outcomes with respect to the change in noise levels in the opening year and design year are outlined in Table 14-70 and Table 14-71.

For the opening year and design year, the Proposed Development results in decreased NSL numbers in the negligible, low and high impact rating bands, meaning the Proposed Development results in a higher number of NSLs experiencing positive effects. However, there are a larger number of NSLs with a medium increase in noise levels than those with a medium decrease in noise levels. The aggregate residual effect under the Assessment of Change criteria is positive.

In summary, the Proposed Development will result in a positive aggregate residual effect under the END Noise Mapping and the Assessment of Change. This will result in beneficial environmental and health effects on the general population in the study area.

No significant residual vibration effects are predicted as a result of the operational phase.

Table 14-70: Change in Opening Year L_{den} Noise Levels – Section 2

Change in Noise Level (dB)	DMRB Magnitude	EPA Magnitude of Impact	All Receptors	Residential (incl Farms)	Educational and Childcare Facilities	Hotels and Accommodation	Activities of Religious Organisations	Healthcare Facilities	Residential Care
Decrease in Noise Level	5.0+	Major	41	36	1	0	0	0	0
	3.0 – 4.9	Moderate	17	16	0	0	0	0	0
	1.0 – 2.9	Minor	167	150	1	0	0	1	1
	0.1 – 0.9	Negligible	290	241	1	0	0	3	0
No Change	<i>No Change</i>	<i>No Change</i>	31	26	0	0	0	1	0
Increase in Noise Level	0.1 – 0.9	Negligible	142	118	1	0	1	0	0
	1.0 – 2.9	Minor	138	113	1	0	0	0	0
	3.0 – 4.9	Moderate	58	47	0	0	0	1	0
	5.0+	Major	32	23	0	0	0	2	0

Table 14-71: Change in Design Year L_{den} Noise Levels – Section 2

Change in Noise Level (dB)	DMRB Magnitude	EPA Magnitude of Impact	All Receptors	Residential (incl Farms)	Educational and Childcare Facilities	Hotels and Accommodation	Activities of Religious Organisations	Healthcare Facilities	Residential Care
Decrease in Noise Level	5.0+	Major	42	37	1	0	0	0	0
	3.0 – 4.9	Moderate	21	20	0	0	0	0	0
	1.0 – 2.9	Minor	212	189	1	0	0	1	1
	0.1 – 0.9	Negligible	248	206	1	0	0	0	0
No Change	<i>No Change</i>	<i>No Change</i>	36	30	0	0	0	1	0
Increase in Noise Level	0.1 – 0.9	Negligible	148	122	2	0	1	3	0
	1.0 – 2.9	Minor	118	98	0	0	0	0	0
	3.0 – 4.9	Moderate	56	42	0	0	0	1	0
	5.0+	Major	35	26	0	0	0	2	0

14.9.2.3 Section 3 Residual Effects

The residual impacts for Section 3 are examined under both the END noise mapping noise level bands and the Assessment of Change.

Section 3 - END Noise Mapping

A summary of the Do-Minimum and the Do-Something with mitigation outcomes in the opening year and the design year are outlined in Table 14-72. One property that would otherwise be subject to road traffic noise levels in excess of 75 dB is mitigated in the Do-Something Design Year scenario. The number of properties predicted to be within the 70 - 74 dB L_{den} band for the opening year and design year have reduced substantially. For all bands between 60 dB and 75+ dB the Do-Something with mitigation scenario has a lower number of properties in the band than the Do-Minimum option. The number of NSLs in the 55 – 59 dB and <55 dB bands also increase in the Do-Something with mitigation option when compared to the Do-Minimum scenario. This presents a clear downward trend in noise exposure for the properties assessed in the EIAR. The aggregate residual impact under the END Noise Mapping criteria is positive.

Table 14-72: Opening and Design Year L_{den} Noise Level Bands – Section 3

Noise Level Range (dB)	Opening Year 2032		Design Year 2047	
	Do-Minimum	Do-Something with Mitigation	Do-Minimum	Do-Something with Mitigation
<55	541	626	477	581
55 – 59	264	275	289	323
60 – 64	223	209	221	179
65 – 69	137	81	166	105
70 - 74	30	4	41	7
75+	0	0	1	0

Section 3 – Assessment of Change

A summary of the Do-Minimum and the Do-Something with mitigation L_{den} outcomes with respect to the change in noise levels in the opening year and design year are outlined in Table 14-73 and Table 14-74.

For the opening and design years, the Proposed Development results in decreased NSL numbers in all adverse impact rating bands, meaning the Proposed Development results in a higher number of NSLs experiencing positive effects. The aggregate residual effect under the Assessment of Change criteria is positive.

In summary, the Proposed Development will result in a positive aggregate residual effect under the END Noise Mapping and the Assessment of Change. This will result in beneficial environmental and health effects on the general population in the study area.

No significant residual vibration effects are predicted as a result of the operational phase.

Table 14-73: Change in Opening Year L_{den} Noise Levels – Section 3

Change in Noise Level (dB)	DMRB Magnitude	EPA Magnitude of Impact	All Receptors	Residential (incl Farms)	Educational and Childcare Facilities	Hotels and Accommodation	Activities of Religious Organisations	Healthcare Facilities	Residential Care	
Decrease in Noise Level	5.0+	Major	High	80	70	1	0	2	0	0
	3.0 – 4.9	Moderate	Medium	175	155	2	0	0	1	0
	1.0 – 2.9	Minor	Low	461	399	3	0	1	3	0
	0.1 – 0.9	Negligible	Negligible	202	193	0	0	1	1	0
No Change	<i>No Change</i>	<i>No Change</i>	28	26	0	0	0	0	0	0
Increase in Noise Level	0.1 – 0.9	Negligible	Negligible	175	173	0	0	0	0	0
	1.0 – 2.9	Minor	Low	112	108	0	1	0	0	0
	3.0 – 4.9	Moderate	Medium	34	33	0	0	0	0	0
	5.0+	Major	High	25	22	0	0	0	0	0

Table 14-74: Change in Design Year L_{den} Noise Levels – Section 3

Change in Noise Level (dB)	DMRB Magnitude	EPA Magnitude of Impact	All Receptors	Residential (incl Farms)	Educational and Childcare Facilities	Hotels and Accommodation	Activities of Religious Organisations	Healthcare Facilities	Residential Care	
Decrease in Noise Level	5.0+	Major	High	108	97	1	0	1	0	0
	3.0 – 4.9	Moderate	Medium	210	185	2	0	2	1	0
	1.0 – 2.9	Minor	Low	461	402	3	0	0	3	0
	0.1 – 0.9	Negligible	Negligible	211	201	0	0	1	1	0
No Change	<i>No Change</i>	<i>No Change</i>	25	25	0	0	0	0	0	0
Increase in Noise Level	0.1 – 0.9	Negligible	Negligible	125	124	0	0	0	0	0
	1.0 – 2.9	Minor	Low	97	94	0	1	0	0	0
	3.0 – 4.9	Moderate	Medium	29	28	0	0	0	0	0
	5.0+	Major	High	26	23	0	0	0	0	0

14.9.2.4 Entire Development Residual Effects

The residual impacts for Entire Development are examined under both the END noise mapping noise level bands and the Assessment of Change.

Entire Development - END Noise Mapping

A summary of the Do-Minimum and the Do-Something with mitigation outcomes in the opening year and the design year are outlined in Table 14-75. Two properties that would otherwise be subject to road traffic noise levels in excess of 75 dB are mitigated in the Do-Something Design Year scenario. The number of properties predicted to be within the 70 - 74 dB L_{den} band for the opening year and design year have reduced substantially. For all bands between 60 dB and 75+ dB the Do-Something with mitigation scenario has a lower number of properties in the band than the Do-Minimum option. The number of NSLs in the 55 – 59 dB and <55 dB bands also increases in the Do-Something with mitigation option when compared to the Do-Minimum scenario. This presents a clear downward trend in noise exposure for the properties assessed in the EIAR. The aggregate residual impact under the END Noise Mapping criteria is positive.

Table 14-75: Opening and Design Year L_{den} Noise Level Bands – Entire Development

Noise Level Range (dB)	Do-Minimum	Do-Something with Mitigation	Do-Minimum	Do-Something with Mitigation
	Opening Year 2032		Design Year 2047	
<55	2040	2260	1893	2123
55 – 59	719	811	758	891
60 – 64	621	584	595	574
65 – 69	602	431	664	466
70 - 74	146	42	216	74
75+	0	0	2	0

Entire Development – Assessment of Change

A summary of the Do-Minimum and the Do-Something with mitigation L_{den} outcomes for the Entire Development with respect to the Assessment of Change for the opening year and design year are outlined in Table 14-76 and Table 14-77.

For the opening year and design year, the Proposed Development results in decreased NSL numbers in all impact rating bands, meaning the Proposed Development results in a higher number of NSLs experiencing positive effects (see Table 14-78 and Table 14-79). The aggregate residual effect under the Assessment of Change criteria is positive.

In summary, the Proposed Development will result in a positive aggregate residual effect under the END Noise Mapping and the Assessment of Change criteria. Therefore, the Proposed Development as a whole is judged to have a **significant positive** effect for RTN within the study area. This will result in beneficial environmental and health effects on the general population in the study area.

No significant residual vibration effects are predicted as a result of the operational phase.

Table 14-76: Change in Opening Year L_{den} Noise Levels – Entire Development

Change in Noise Level (dB)		DMRB Magnitude	EPA Magnitude of Impact	All Receptors	Residential (incl Farms)	Educational and Childcare Facilities	Hotels and Accommodation	Activities of Religious Organisations	Healthcare Facilities	Residential Care
Decrease in Noise Level	5.0+	Major	High	510	462	3	3	2	1	0
	3.0 – 4.9	Moderate	Medium	761	602	5	5	4	5	0
	1.0 – 2.9	Minor	Low	1308	1161	9	2	3	7	1
	0.1 – 0.9	Negligible	Negligible	584	522	1	0	1	5	0
No Change		<i>No Change</i>	<i>No Change</i>	72	63	0	1	0	1	0
Increase in Noise Level	0.1 – 0.9	Negligible	Negligible	543	512	2	0	1	0	0
	1.0 – 2.9	Minor	Low	394	356	1	1	0	0	0
	3.0 – 4.9	Moderate	Medium	187	173	0	1	0	1	0
	5.0+	Major	High	226	208	0	0	0	3	0

Table 14-77: Change in Design Year L_{den} Noise Levels – Entire Development

Change in Noise Level (dB)		DMRB Magnitude	EPA Magnitude of Impact	All Receptors	Residential (incl Farms)	Educational and Childcare Facilities	Hotels and Accommodation	Activities of Religious Organisations	Healthcare Facilities	Residential Care
Decrease in Noise Level	5.0+	Major	High	559	508	4	3	2	1	0
	3.0 – 4.9	Moderate	Medium	863	700	5	5	6	5	0
	1.0 – 2.9	Minor	Low	1266	1122	8	2	1	7	1
	0.1 – 0.9	Negligible	Negligible	565	503	1	1	1	2	0
No Change		<i>No Change</i>	<i>No Change</i>	78	71	0	0	0	1	0
Increase in Noise Level	0.1 – 0.9	Negligible	Negligible	493	460	3	0	1	3	0
	1.0 – 2.9	Minor	Low	355	324	0	1	0	0	0
	3.0 – 4.9	Moderate	Medium	172	155	0	1	0	1	0
	5.0+	Major	High	234	216	0	0	0	3	0

Table 14-78: Balance of Opening Year Impacts – Entire Development – Positive numbers indicate more beneficial than adverse impacts

Change in Noise Level (dB)	No. beneficial impacts <u>less</u> No. of adverse impacts						
	All Receptors	Residential (incl Farms)	Educational and Childcare Facilities	Hotels and Accommodation	Activities of Religious Organisations	Healthcare Facilities	Residential Care
5.0+	284	254	3	3	2	-2	0
3.0 – 4.9	574	429	5	4	4	4	0
1.0 – 2.9	914	805	8	1	3	7	1
0.1 – 0.9	41	10	-1	0	0	5	0
% NSLs beneficially impacted	69%	68%	86%	77%	91%	78%	100%
% NSLs adversely impacted	29%	31%	14%	15%	9%	17%	0%

Table 14-79: Balance of Design Year Impacts – Entire Development – Positive numbers indicate more beneficial than adverse impacts

Change in Noise Level (dB)	No. beneficial impacts <u>less</u> No. of adverse impacts						
	All Receptors	Residential (incl Farms)	Educational and Childcare Facilities	Hotels and Accommodation	Activities of Religious Organisations	Healthcare Facilities	Residential Care
5.0+	325	292	4	3	2	-2	0
3.0 – 4.9	691	545	5	4	6	4	0
1.0 – 2.9	911	798	8	1	1	7	1
0.1 – 0.9	72	43	-2	1	0	-1	0
% NSLs beneficially impacted	71%	70%	86%	85%	91%	65%	100%
% NSLs adversely impacted	27%	28%	14%	15%	9%	30%	0%

14.10 Do-Minimum

In the Do-Minimum option for Section 1, traffic will continue to route through the N15/N13 axis through Ballybofey and Stranorlar and congestion will continue to worsen. Research has shown that where congestion occurs, even though traffic moves slower, noise levels increase due to acceleration and deceleration, use of horns and longer presence of HGV traffic caused by delays.

Similarly for Section 2, the Do-Minimum option will continue to route traffic on the N13 to the Dry Arch Roundabout and on to the N56. Westbound traffic volumes and congestion will continue on the N13, N56 and L-1114, along with other local roads to access the Letterkenny.

In Section 3, traffic volumes will continue to grow on the N14 in the Do-Minimum scenario. Due to the relatively high speeds, tyre noise will be the dominant noise source. The nature of the existing N14 requires constant acceleration and deceleration. Traffic volumes will continue to travel close to the centre of the residential areas in Lifford.

Road traffic noise levels are unlikely to decrease for the majority of NSLs in the Do-Minimum scenario, whereas under the Do-Something with mitigation scenario a positive aggregate residual effect under the END Noise Mapping and the DMRB impact rating is predicted. This will result in beneficial environmental and health effects on the general population in the study area.

Given the Proposed Development route would not be developed, there would be no construction or operation phase noise. It is likely, however that traffic trying to avoid the congestion in the towns will use the local road network as 'rat-runs', thus increasing traffic noise in these areas. All three sections are likely to be affected in this way.

14.11 Project Wide Effects

14.11.1 Construction Phase

Two scenarios arise for the construction phase:

- All three sections of the Proposed Development are constructed as one project, or
- Each of the three sections is constructed as a standalone project.

14.11.1.1 Contemporaneous Construction

This assessment is based on each section individually. There is no overlap between Section 1 and either of the other two sections. There is however an overlap between Section 2 and Section 3 just to the west of the proposed N13/N14 Pluck Roundabout. One property is approximately 40 m from Section 2 and 470 m from Section 3, a similar property, south of the Section 3 alignment, is 91 m from Section 3 and 465 m from Section 2. A third property 88 m north of the Section 3 alignment is 467 m from Section 2.

At these separation distances there will be no additional impact arising from Section 2 and Section 3 being constructed at the same time. In addition, there is likely to be efficiencies arising from contemporaneous construction at the Section 2 and Section 3 interface and therefore the impact on the properties at the intersection is likely to be reduced.

Should the construction of all three sections occur concurrently, there is potential for increased traffic volumes on public roads. The area with the greatest potential for this to occur is where construction works are occurring in proximity to the intersection of Section 2 and Section 3. The expected effects range in significance from **not significant** to **slight** at this location.

14.11.1.2 Standalone Construction

In the event that Section 2 and Section 3 are not constructed as a single project there will be some additional noise and vibration impacts at the properties where the two sections meet. This will arise if, for example, Section 2 is constructed first the noise and vibration impacts will be followed by a separate period when the

construction compound and Section 3 are constructed. The impact will be of longer duration than having the two sections constructed at the same time.

There may also be minor 'knock-on' impacts such as traffic queuing spilling over between sections that could be minimised by constructing the two stages at the same time.

14.12 Cumulative Effects

A cumulative impact assessment has been undertaken to consider potential for cumulative impact of the Proposed Development with other relevant plans and projects. The noise and vibration assessment for cumulative impact is presented in Chapter 19: Interactions and Cumulative Effects.

The impact assessment presented in this chapter assesses operational phase noise with the N14/N15 to A5 Link cross-border to a proposed Trunk Road T3 and the proposed A5 WTC in Northern Ireland. The cross-border link has the potential to impact the traffic volumes on the Proposed Development, in particular some roads in and in proximity to Sections 1 and 3 of the Proposed Development. The noise impact without the N14/N15 to A5 Link is presented in Appendix C14.5 Operational Results without Cross-border Link.

14.12.1 Operational Phase

There is approximately 8 km separation distance between the northern end of Section 1 and the southern end of Section 2. This long separation distance, coupled with topography, implies that there will be no operational noise and vibration effects between Section 1 and Section 2. Similarly, Section 3 is sufficiently distant from Section 1 that there will be no noise and vibration effects between the two sections.

Sections 2 and 3 overlap and consequently there will be an expected impact at the interface. Because roads approximate to a line source over longer time periods, noise emissions of road sections immediately adjacent to a location dominate and the difference of impact when compared against Section 2 or Section 3 alone at the interface will tend to be small.

14.13 Monitoring

It is not proposed to carry out any long-term noise or vibration monitoring after the opening year. In order to confirm compliance with construction phase noise design goals and the effectiveness of the mitigation measures proposed for the operation phase, monitoring will be as set out in the following sections.

14.13.1 Construction Phase

During the construction phase all rock blasting activity will be monitored for noise (air overpressure) and vibration (PPV). Monitoring will be carried out at the nearest residence in all cases. If blasting is required within 500 m of: any residence, the Station Masters House and adjacent buildings, The Mill, the Windmill and St. Patrick's Church, vibration monitoring (event data) will be carried out at a representative sample of residences and all of the cultural heritage sites listed in Chapter 17: Cultural Heritage.

Noise monitoring during construction will be carried out continuously at the nearest residence (or other suitable location approved by the planning authority) at each of the following activities for the duration of the construction activity (e.g. rock extraction activity):

- Site clearance.
- Rock extraction.
- Earthworks.

Vibration monitoring (continuous logging) will be carried out during the course of construction at: the Station Masters House and adjacent buildings, The Mill, the Windmill and St. Patrick's Church.

The project monitoring commitments are set out in Table 14-80.

Table 14-80: Project Monitoring Commitments

Environmental effect	Monitoring commitment
Site clearance and earthworks at selected residences within 50 m.	Noise (continuous monitoring)
Rock blasting during construction at selected residences within 500 m of the activity and locations identified as part of the cultural heritage assessment.	Noise & Vibration (event monitoring)
Vibration Monitoring at the locations identified as part of the cultural heritage assessment.	Vibration (Continuous monitoring)
Post-Completion Noise Surveys. Locations are to be approved by the planning authority.	Noise (TII measurement procedure)

14.13.2 Operations Phase

During the operations phase a post completion noise survey will be carried out for each section of the Proposed Development. Noise monitoring will be in accordance with the TII measurement procedure. Locations are to be approved by the local authority, with monitoring to be carried out by a competent person independent of the design and construction teams.

In the event of excessive noise arising during the post-completion noise survey or validated noise complaints, the planning authority may require additional monitoring to be carried out by an independent competent person.

14.14 Proposed Development without the N14/N15 to A5 Link

Appendix C14.5 Operational Results without Cross-border Link details operational noise modelling results, mitigation measures and likely significant effects for the circumstance where the N14/N15 to A5 Link were not to be constructed. As stated in Section 4.9.1 of Chapter 4: Project Description, the proposed N14/N15 to A5 Link, including the proposed bridge over the River Finn, will not be constructed until such time as a proposed Trunk Road T3 / Section 1 of the A5 WTC has been constructed or is under construction. All mitigation measures required for that circumstance have been included in this chapter, thereby ensuring that the Proposed Development will have all required mitigation measures regardless of whether or not the N14/N15 to A5 Link (in Ireland), and a proposed Trunk Road T3 and the proposed A5 WTC (both in Northern Ireland) proceed.

14.15 Transboundary

The Proposed Development redline boundary ends at the border with Northern Ireland and limited transboundary effects will occur. The study area extends into Northern Ireland and baseline noise surveys, construction noise modelling, operational noise modelling and assessment of effects have encompassed NSLs within the study area. Assessment of transboundary effects has therefore been included in this chapter. No significant residual noise and vibration transboundary effects are predicted as a result of the construction and operational phase of the Proposed Development.

14.16 Summary

The Proposed Development has the potential for significant noise and vibration impacts during the construction phase. The Proposed Development as a whole in the operational phase is judged to have a **significant positive** effect for RTN within the study area. Both phases of the project along with other plans and projects (see Chapter 19: Interactions and Cumulative Effects) have been assessed using predicted noise levels in accordance with TII guidelines. Mitigation measures have been built into the design, construction methodology and operating procedures for the Proposed Development. A limited number of locations will have negative residual effects. The overall impact of the development will be a reduction in road traffic noise levels. This will result in beneficial environmental and health effects on the general population in the study area. This has been summarised in Table 14-81.

Table 14-81: Summary of Potential Environment Effects, Mitigation and Monitoring

Description of impact	Measures adopted as part of the project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Mitigation measures	Residual effect	Proposed monitoring
Construction Noise	Minimising the use of piled foundations Adoption of noise criteria Controlled hours of Operation Noise Control Procedures	Negligible-High	Low - High	Not Significant – Very Significant	Noise Control Procedures	Not Significant - Significant	Continuous monitoring at specified locations
Construction Vibration	Adoption of vibration criteria	Negligible-High	Low - High	Not Significant – Significant	Operational controls	Not Significant - Moderate	Continuous and event monitoring at specified locations
Rock Blasting Noise & Vibration	Adoption of noise and vibration criteria	Negligible-High	Low - High	Not Significant – Very Significant	Operational controls	Not Significant - Moderate	Event noise and vibration monitoring
Road Traffic Noise	Low Noise surface throughout the scheme	Negligible-High	Low - High	Significant (Positive)	Bunds & Screening Noise Barriers Reduction of Speed limits Extension of LNRS outside Proposed Development area	Significant (Positive)	Post-Completion Survey

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