



Clifton Scannell Emerson
Associates

ElAR Chapter 10 Noise & Vibration Suir Island Infrastructure Links



Comhairle Contae Thiobraid Árann
Tipperary County Council

Civil
Engineering

Structural
Engineering

Transport
Engineering

Environmental
Engineering

Project
Management

Health
and Safety

CONSULTING ENGINEERS





Clifton Scannell Emerson Associates Limited,
Consulting Engineers, 3rd Floor The Highline, Bakers Point, Pottery Road,
Dun Laoghaire, Co. Dublin, A96 KW29
T. +353 1 2885006 F. +353 1 2833466 E. info@csea.ie W. www.csea.ie

Document Control Sheet

Project Name: Suir Island Infrastructure Links
Project Number: 20_071
Report Title: EIAR Chapter 10 Noise and Vibration
Filename: RPT-20_071-037

Issue No.	Issue Status	Date	Prepared by	Checked by
0	Final	22.09.2023	LW (AWN)	LP

Table of Contents

Document Control Sheet	2
Table of Contents	3
List of Figures	4
List of Tables	4
10 Noise & Vibration	5
10.1 Introduction and Background	5
10.2 Assessment Methodology	5
10.2.1 Relevant Criteria – Construction Phase	6
10.2.2 Relevant Criteria – Operational Phase	10
10.3 Receiving Environment	11
10.3.1 Baseline Noise Environment	11
10.3.2 Environmental Noise Survey	12
10.3.3 Choice of Measurement Locations	12
10.3.4 Survey Periods	12
10.3.5 Instrumentation	12
10.3.6 Measurement Parameters	13
10.3.7 Survey Results and Observations	13
10.4 Characteristics of Proposed Development	14
10.5 Do Nothing Scenario	15
10.6 Effect Assessment	15
10.6.1 Construction Phase	15
10.6.2 Operational Phase	19
10.7 Mitigation and Monitoring Measures	22
10.7.1 Construction Phase	22
10.7.2 Operational Phase	24
10.8 Residual Effects	24
10.8.1 Construction Phase	24
10.8.2 Operational Phase	24
10.9 Cumulative Effects	24
10.10 Difficulties Encountered	25
10.11 References	26

List of Figures

Figure 10-1: Study Area for the Proposed Development	6
Figure 10-2: Proposed Development and Noise Monitoring Locations	12
Figure 10-3: Road Link Locations	20

List of Tables

Table 10-1: Example Threshold of Significant Effects at Dwellings	7
Table 10-2: Construction Noise Significance Ratings	8
Table 10-3: Likely Effect Associated with Change in Traffic Noise Level – Construction Phase	8
Table 10-4: Recommended Vibration Criteria During Construction Phase	9
Table 10-5: Guidance on Effects of Human Response to PPV Magnitudes	10
Table 10-6: Human Response Vibration Significance Ratings	10
Table 10-7: Significance in Change of Noise Level	11
Table 10-8: Instrumentation Details	13
Table 10-9: Survey Results – NM1	13
Table 10-10: Survey Results – NM2	13
Table 10-11: Survey Results – NM3	14
Table 10-12: Survey Results – NM4	14
Table 10-13: Reference Plant Noise Emissions – Bridge Construction	16
Table 10-14: Reference Plant Noise Emissions – General Construction	17
Table 10-15: Indicative Construction Noise Levels at Nearest Noise Sensitive Locations during bridge construction	17
Table 10-16: Indicative Construction Noise Levels at Nearest Noise Sensitive Locations during General Construction Works	18
Table 10-17: Predicted Change in Noise Level associated with Vehicular Traffic – 2024	21

10 Noise & Vibration

10.1 Introduction and Background

This section of the EIAR has been prepared by AWN Consulting Ltd. (AWN) to assess the potential noise and vibration effect of the proposed development in the context of current relevant standards and guidance.

This chapter includes a description of the receiving ambient noise climate in the vicinity of the proposed development and an assessment of the potential noise and vibration effect associated with the proposed development during both the short-term construction phase and the long-term operational phase on its surrounding environment. Direct, indirect and cumulative noise and vibration effects on the surrounding environment have been considered as part of the assessment.

Mitigation measures are included, where relevant, to ensure the proposed development is constructed and operated in an environmentally sustainable manner in order to ensure minimal effect on the receiving environment.

10.2 Assessment Methodology

The assessment has been undertaken with reference to the most appropriate guidance documents relating to environmental noise and vibration which are set out in the following sections. In addition to specific noise and vibration guidance documents, the following Environmental Protection Agency (EPA) guidelines were considered and consulted in the preparation of this Chapter:

- Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report (European Commission, 2017);
- Guidelines on the Information to be Contained in Environmental Impact Assessment Reports – (EPA, 2022); and
- Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (Department of Housing, Planning & Local Government, 2018).

The noise and vibration assessment has been undertaken using the following methodology:

- Baseline noise monitoring has been undertaken at 4 no. monitoring positions to determine the range of noise levels at locations and noise environments in proximity to the proposed development.
- A review of the most applicable standards and guidelines has been conducted in order to set a range of acceptable noise and vibration criteria for the construction and operational phases.
- Predictive calculations have been performed to estimate the likely noise emissions during the construction phase of the project at the nearest sensitive locations (NSLs) to the route.
- Predictive calculations have been performed to assess the potential effects associated with the operation of the development at the most sensitive locations surrounding the development site; and,
- A schedule of mitigation measures has been proposed, where relevant, to control the noise and vibration emissions associated with the construction and operation of the proposed development.

The study area for the proposed development is illustrated in Figure 10-1.

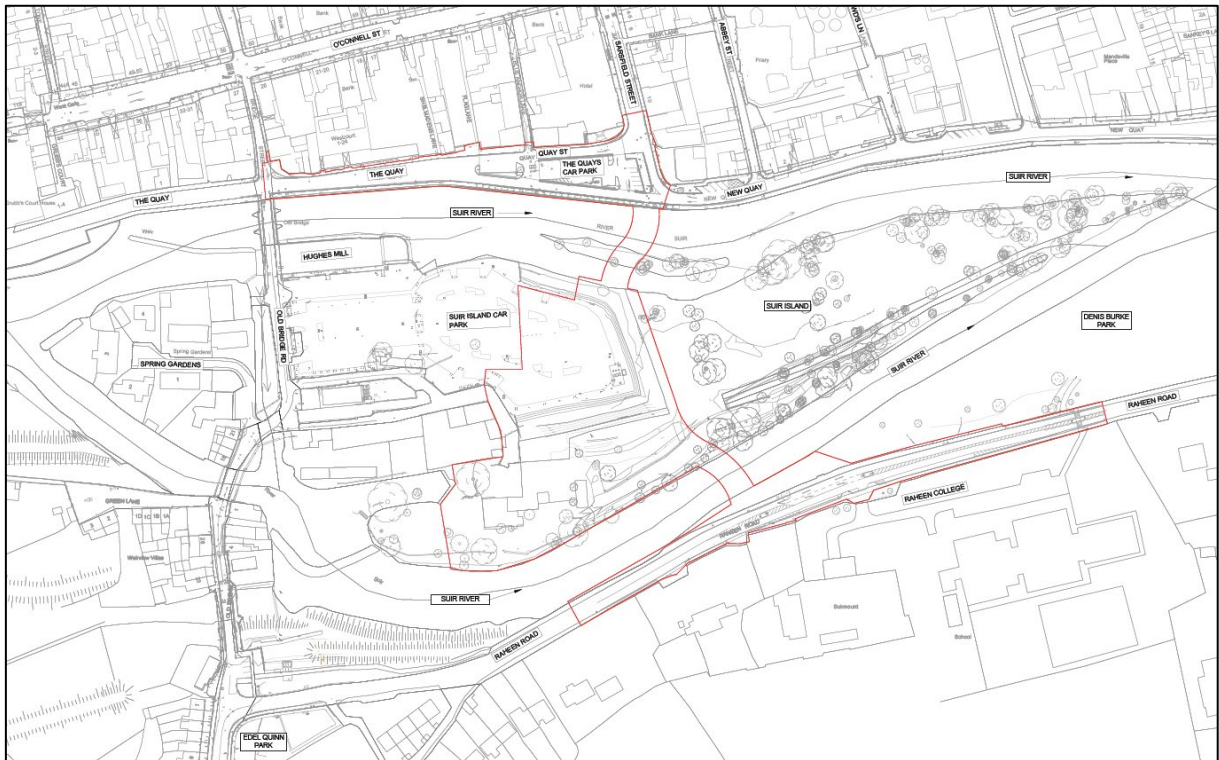


Figure 10-1: Study Area for the Proposed Development

10.2.1 Relevant Criteria – Construction Phase

Construction Noise

There is no published statutory Irish guidance relating to the maximum permissible noise level that may be generated during the construction phase of a project. Planning authorities typically control construction activities by imposing limits on the hours of operation and consider noise limits at their discretion.

In order to set appropriate construction noise limits for the development route, reference has been made to BS 5228 2009 +A1 2014 *Code of practice for noise and vibration control on construction and open sites*. Part 1 of this document *Noise* provides guidance on selecting appropriate noise criteria relating to construction works.

The approach adopted here calls for the designation of a noise sensitive location into a specific category (A, B or C) based on existing ambient noise levels in the absence of construction noise. This then sets a threshold noise value that, if exceeded at this location, indicates a significant noise effect that is associated with the construction activities.

BS 5228-1:2009+A1:2014 sets out guidance on permissible noise levels relative to the existing noise environment. Table 9-1 sets out the values which, when exceeded, signify a significant effect at the facades of residential receptors.

The closest neighbouring noise sensitive properties to the proposed development typically comprise of residential dwellings and commercial premises.

Table 10-1: Example Threshold of Significant Effects at Dwellings

Assessment category and threshold value period (L _{Aeq})	Threshold value, in decibels (dB)		
	Category A	Category B	Category C
Daytime (08:00 – 19:00) and Saturdays (08:00 – 14:00)	65	70	75
Evenings and weekends ^D	55	60	65
Night-time (23:00 to 07:00hrs)	45	50	55

- Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values.
- Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values.
- Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than category A values.
- 19:00 – 23:00 Weekdays, 13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays.

For the assessment of daytime periods the ambient noise level has been measured and rounded to the nearest 5 dB. If the construction noise exceeds the appropriate category value, then a significant effect is deemed to occur. It should be noted that this assessment method is only valid for residential properties and if applied to commercial premises without consideration of other factors may result in an excessively onerous thresholds being set.

Fixed Limits

Review of the proposed development surroundings identified a community centre located 35m to the west of the subject site.

When considering non-residential receptors, reference is made to BS 5228-1:2009+A1:2014, which gives several examples of acceptable limits for construction noise, the most simplistic being based upon the exceedance of fixed noise limits. For example, paragraph E.2 states: -

“Noise from construction and demolition sites should not exceed the level at which conversation in the nearest building would be difficult with the windows shut.”

Paragraph E.2 goes on to state: -

“Noise levels, between say 07.00 and 19.00 hours, outside the nearest window of the occupied room closest to the site boundary should not exceed: -

70 decibels (dBA) in rural, suburban areas away from main road traffic and industrial noise;

75 decibels (dBA) in urban areas near main roads in heavy industrial areas”.

Proposed Threshold Noise Levels

Taking into account the proposed documents outlined above and making reference to the baseline noise environment monitored around the development site (see **Section 9.3**), BS 5228-1:2009+A1:2014 has been used to inform the assessment approach for construction noise.

The closest neighbouring noise sensitive properties to the proposed development are dwellings approximately 30m to the south of the proposed development site on Raheen Road. Other residential receptors include apartments at The Mill, some 60m to the west.

Other noise sensitive locations include Raheen College, a school approximately 30m to the south of the proposed development site on Raheen Road.

The following Construction Noise Threshold (CNT) levels are proposed for the construction stage of this development: -

- For residential NSLs it is considered appropriate to adopt 65 - 75 dB(A) CNT depending on existing noise level. Given the baseline monitoring carried out, it would indicate that Category A, B and C values are appropriate using the ABC method.
- For non-residential NSLs it is considered appropriate to adopt the 70 dB(A) CNT, given the urban environment in which the development resides, in line with BS 5228-1:2009+A1:2014.

Interpretation of the CNT

In order to assist with interpretation of CNTs, Table 10-2 includes guidance as to the likely magnitude of effect associated with construction activities, relative to the CNT. This guidance is derived from Table 3.16 of the Design Manual for Roads and Bridges – *LA 111 Noise and Vibration* (UK HA, 2020) : and adapted to include the relevant significance effects from the *EPA Guidelines* (EPA 2022).

Table 10-2: Construction Noise Significance Ratings

Guidelines for Noise Impact Assessment Significance (DMRB)	CNT per Period	EPA EIAR Significance Effects	Determination
Negligible	Below or equal to baseline noise level	Not Significant	Depending on CNT, duration & baseline noise level
Minor	Above baseline noise level and below or equal to CNT	Slight to Moderate	
Moderate	Above CNT and below or equal to CNT +5 dB	Moderate to Significant	
Major	Above CNT +5 to +15 dB	Significant, to Very Significant	
	Above CNT +15 dB	Very Significant to Profound	

The adapted DMRB guidance outlined will be used to assess the predicted construction noise levels at NSLs and comment on the likely effects during the construction stages.

Construction Traffic

In order to assist with the interpretation of construction traffic noise, Table 10-3 includes guidance as to the likely magnitude of effect associated with changes in traffic noise levels along an existing road. This is taken from Table 3.17 of *LA 111 Noise and Vibration* (UKHA 2020).

Table 10-3: Likely Effect Associated with Change in Traffic Noise Level – Construction Phase

Magnitude of Impact	Increase in Traffic Noise Level (dB)
Negligible	Less than 1.0

Minor	Greater than or equal to 1.0 and less than 3.0
Moderate	Greater than or equal to 3.0 and less than 5.0
Major	Greater than or equal to 5.0

In accordance with the *DMRB Noise and Vibration*, construction noise and construction traffic noise effects shall constitute a significant effect where it is determined that a major or moderate magnitude of effect will occur for a duration exceeding:

- Ten or more days or night in any 15 consecutive day or nights;
- A total number of days exceeding 40 in any six consecutive months.

Construction Vibration

Building Damage

In terms of vibration, British Standard BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites –Vibration recommends that, for soundly constructed residential property and similar structures that are generally in good repair, a threshold for minor or cosmetic (i.e. non-structural) damage should be taken as a peak component particle velocity (in frequency range of predominant pulse) of 15mm/s at 4Hz increasing to 20mm/s at 15Hz and 50mm/s at 40Hz and above. The standard also notes that below 12.5 mm/s PPV the risk of damage tends to zero. It is therefore common, on a cautious basis to use this lower value. Taking the above into consideration the vibration criteria in Table 10-4 are recommended. For any protected structures located in proximity to the proposed works, there is a greater potential for these to be more vulnerable than modern structures. Therefore, on a precautionary basis, the guidance values for structurally sound buildings are reduced by 50% when applied to protected structures, in line with the guidance documents referred to above.

Table 10-4: Recommended Vibration Criteria During Construction Phase

Category of Building	Allowable vibration (in terms of peak particle velocity) at the closest part of sensitive property to the source of vibration, at a frequency of:		
	Less than 15Hz	15 to 40Hz	40Hz and above
Structurally sound and non-protected buildings	12 mm/s	20 mm/s	50 mm/s
Protected and /or potentially vulnerable buildings	6 mm/s	10 mm/s	25 mm/s

Human Perception

People are sensitive to vibration stimuli at levels of magnitude below those which have the potential to cause any cosmetic damage to buildings. There are no current standards which provide guidance on typical ranges of human response to vibration in terms of PPV for continuous or intermittent vibration sources.

BS5228-2:2009+A1:2014, provides a useful guide relating to the assessment of human response to vibration in terms of the PPV. Whilst the guide values are used to compare typical human response to construction works, they tend to relate closely to general levels of vibration perception from other general sources.

Table 10-5 below summarises the range of vibration values and the associated potential effects on humans.

Table 10-5: Guidance on Effects of Human Response to PPV Magnitudes

Vibration Level, PPV	Effect
0.14mm/s	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies. At lower frequencies people are less sensitive to vibration.
0.3mm/s	Vibration might be just perceptible in residential environments.
1mm/s	It is likely that a vibration level of this magnitude in residential environments will cause complaint.

Vibration typically becomes perceptible at around 0.15 to 0.3 mm/s and may become disturbing or annoying at higher magnitudes. However, higher levels of vibration are typically tolerated for single events or events of short-term duration, particularly during construction projects and when the origin and/or the duration of vibration is known. For example, ground breaking can typically be tolerated at vibration levels up to 2.5 mm/s if adequate public relations are in place and timeframes are known. These values refer to the day-time periods only.

During surface construction works (demolition and ground breaking etc.) the vibration limits set within Table 10-5 would be perceptible to building occupants and have the potential to cause subjective effects. The level of effect is, however, greatly reduced when the origin and time frame of the works are known and limit values relating to structural integrity are adequately communicated. In this regard, the use of clear communication and information circulars relating to planned works, their duration and vibration monitoring can significantly reduce vibration effects to the neighbouring properties.

Interpretation of the Human Response to Vibration

In order to assist with interpretation of vibration thresholds, Table 10-6 presents the significance table relating to potential effects to building occupants during construction based on guidance from BS5228-2:2009+A1:2014.

Table 10-6: Human Response Vibration Significance Ratings

Criteria	Impact Magnitude	Significance Rating
≥10 mm/s PPV	Very High	Very Significant
≥1 mm/s PPV	High	Moderate to Significant
≥0.3 mm/s PPV	Medium	Slight to Moderate
≥0.14 mm/s PPV	Low	Not significant to Slight
Less than 0.14 mm/s PPV	Very Low	Imperceptible to Not significant

10.2.2 Relevant Criteria – Operational Phase

Operational Noise

Once operational, the primary sources of noise will be associated with vehicles moving to and from car parking areas in order to visit the development and activity by members of the public. Any potential noise levels from this activity, however, will be low considering the proposed usage and noise sources will comprise people walking and cycling and the sound of voices. This is typically in line with surrounding ambient sources in a semi-urban, semi-rural environment. On this basis, noise limits are applied only to car parking areas.

Additional Traffic on Surrounding Roads

There are no specific guidelines or limits relating to traffic related sources along the local or surrounding roads. Given that traffic from the development will make use of existing roads already carrying traffic volumes, it is appropriate to assess the calculated increase in traffic noise levels that will arise because of vehicular movements associated with the development. In order to assist with the interpretation of the noise associated with additional vehicular traffic on public roads, Table 10-7 is taken from DMRB Design Manual for Roads and Bridges (DMRB), Highways England Company Limited, Transport Scotland, The Welsh Government and The Department for Regional Development Northern Ireland, (2020).

Table 10-7: Significance in Change of Noise Level

Change in Sound Level (dB)	Subjective Reaction	Magnitude of Impact	EPA Glossary of Effects¹
10+	Over a doubling of loudness	Major	Significant
5 – 9.9	Up to a doubling of loudness	Moderate	Moderate
3 – 4.9	Perceptible	Minor	Slight
0.1 – 2.9	Imperceptible	Negligible	Imperceptible
0	None	No Change	Neutral

The guidance outlined in **Section 10.7** will be used to assess the predicted increases in traffic levels on public roads associated with the proposed development and comment on the likely long-term effects during the operational phase.

10.3 Receiving Environment

The existing carpark located on Suir Island will be the focus of construction and operational activity associated with the development, as illustrated in Figure 10-2 below. Measurement locations were selected to capture representative noise levels at the nearest NSLs.

10.3.1 Baseline Noise Environment

Baseline noise monitoring has been undertaken to determine the range of noise levels at various locations close to the proposed development and to establish the existing noise climate representative of the nearest noise sensitive locations (NSLs).

¹ EPA Guidelines on the Information to be contained in Environmental Impact Assessment Reports, (May 2022)

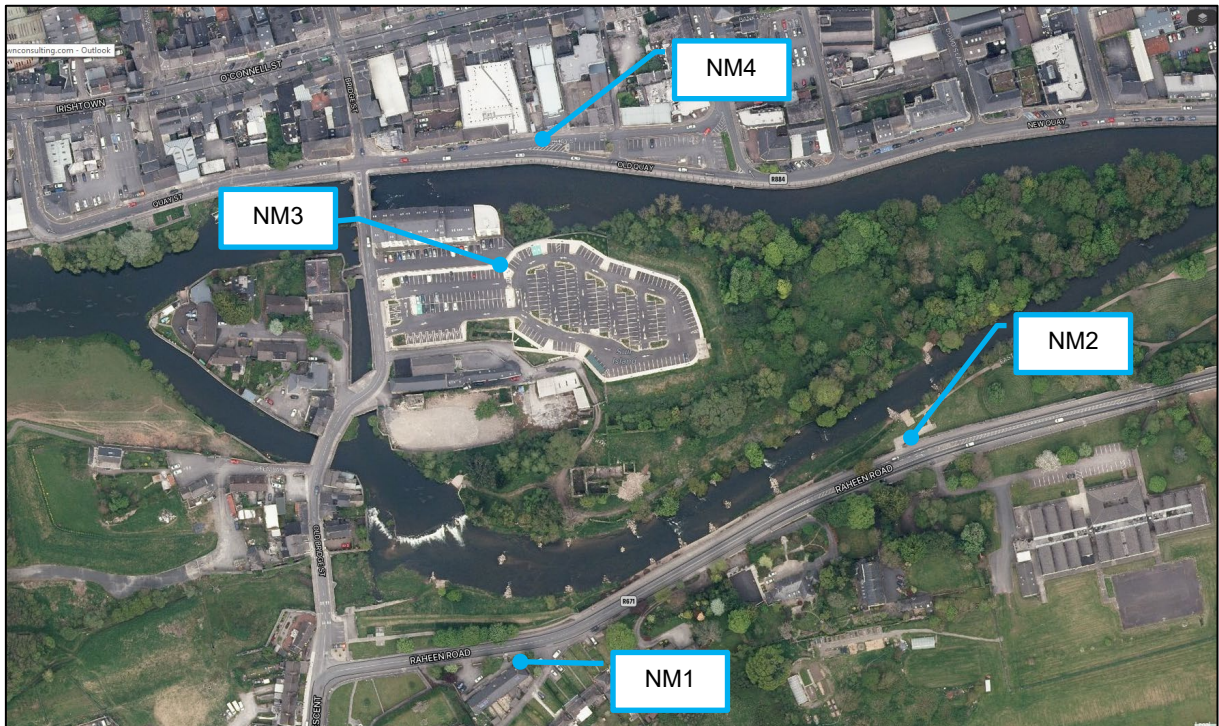


Figure 10-2: Proposed Development and Noise Monitoring Locations

10.3.2 Environmental Noise Survey

An environmental noise survey has been conducted along the proposed development route in order to quantify the existing noise environment. The survey was conducted in accordance with ISO 1996: 2017: Acoustics – Description, measurement and assessment of environmental noise. Specific details are set out below.

10.3.3 Choice of Measurement Locations

Baseline noise monitoring was undertaken at four locations described below and illustrated in Figure 10-2.

- Location NM1 Adjacent to NSL at Raheen Road.
- Location NM2 Off Raheen Road in proximity to Raheen College
- Location NM3 Suir Island car park adjacent to Mill House.
- Location NM4 Quay Street adjacent to nearby NSLs.

10.3.4 Survey Periods

The noise survey was carried out between 10:30hrs and 15:00hrs on 30 November 2021.

10.3.5 Instrumentation

The following instrumentation was used during the baseline surveys:

Table 10-8: Instrumentation Details

Manufacturer	Model	Serial Number
RION	NL-52	575782

10.3.6 Measurement Parameters

The noise survey results are presented in terms of the following parameters.

- L_{Aeq}** is the equivalent continuous sound level. It is a type of average and is used to describe a fluctuating noise in terms of a single noise level over the sample period.
- L_{AFmax}** is the instantaneous maximum sound level measured during the sample period using the 'F' time weighting.
- L_{A90}** is the sound level that is exceeded for 90% of the sample period. It is typically used as a descriptor for background noise.

The "A" suffix denotes the fact that the sound levels have been "A-weighted" in order to account for the non-linear nature of human hearing. All sound levels in this report are expressed in terms of decibels (dB) relative to 2×10^{-5} Pa.

10.3.7 Survey Results and Observations

Location NM1

The measured noise levels at location NM1 are presented in the Table 10-9 below.

Table 10-9: Survey Results – NM1

Date	Time	Measured Noise Levels, dB			
		L _{Aeq}	L _{Amax}	L _{A10}	L _{A90}
30/11/21	10:36	66	79	70	57
	12:10	66	80	70	57
	13:46	66	79	70	58

Noise from traffic on the Raheen Road was the dominant noise source at this location. Other noise sources contributing to measured noise levels were water noise from the river, pedestrian activity, and birdsong. The ambient noise level was 66 dB L_{Aeq} and background noise levels were in the range 57 to 58 dB L_{A90}.

Location NM2

The measured noise levels at location NM2 are presented in the Table 10-10.

Table 10-10: Survey Results – NM2

Date	Time	Measured Noise Levels, dB			
		L _{Aeq}	L _{Amax}	L _{A10}	L _{A90}
30/11/21	11:00	68	83	72	55
	12:30	70	83	75	53
	14:05	72	86	76	59

Noise from traffic on the Raheen Road was the dominant noise source at this location. Other noise sources contributing to measured noise levels were cars on adjacent lanes, activity at nearby houses and pedestrian activity. A power-washer was observed to be in used for several minutes during the third

measurement, elevating the L_{A90} level. Ambient noise levels were in the range 68 – 72 dB L_{Aeq} and background noise levels were in the range 53 to 59 dB L_{A90} .

Location NM3

The measured noise levels at location NM3 are presented in the Table 10-11.

Table 10-11: Survey Results – NM3

Date	Time	Measured Noise Levels, dB			
		L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
30/11/21	11:20	47	59	49	45
	12:50	49	61	50	47
	14:25	49	63	50	47

Measured noise levels at this location comprised traffic noise from the Raheen Road, water noise from the River Suir, traffic arriving at and leaving the car park and birdsong. Ambient noise levels were in the range 47 – 49 dB L_{Aeq} and background noise levels were in the range 45 to 47 dB L_{A90} .

Location NM4

The measured noise levels at location NM4 are presented in the Table 10-12.

Table 10-12: Survey Results – NM4

Date	Time	Measured Noise Levels, dB			
		L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
30/11/21	11:46	65	81	68	54
	13:10	63	77	67	54
	14:45	65	79	68	51

Road traffic on the Quays was the dominant noise source at this location. Other noise sources included pedestrian activity, plant noise from nearby commercial buildings and intermittent construction noise. In lulls in traffic, water noise from the river was audible. Ambient noise levels were in the range 63 – 65 dB L_{Aeq} and background noise levels were in the range 51 to 54 dB L_{A90} .

Construction Noise Criteria

With reference to Table 10-1 and the baseline survey results above, the following construction noise criteria have been determined for residential noise sensitive receivers in proximity to the survey positions:

- NM1: Category B - 70 dB $L_{Aeq,1hr}$
- NM2: Category C - 75 dB $L_{Aeq,1hr}$
- NM3: Category A - 65 dB $L_{Aeq,1hr}$
- NM4: Category B - 70 dB $L_{Aeq,1hr}$

10.4 Characteristics of Proposed Development

A full description of the proposed development is provided in Chapter 2 Project Description and Planning Policy Context of this EIAR document.

When considering a development of this nature, the potential noise and vibration effect on the surroundings must be considered for each of the two distinct stages:

- (a) construction phase, and.
- (b) operational phase.

The key features of the proposed development/design which are relevant to noise and vibration are described below for each of these phases:

Construction Phase

The following is proposed during the construction phase:

- Construction of 2 No. four-metre-wide curved pedestrian bridges and associated pier supports and abutments.
- North Plaza: Construction of a public plaza open space including a bridge landing, steps and pedestrian/cyclist ramp at the Quays/Quay Street/Sarsfield Junction.
- Construction of a bus stop, road improvements and shared surface pathways.
- Construction of a foul pumping station at Suir Island Carpark with a rising main to connect into the existing public foul network along the Quays.
- Construction of a 4-metre-wide shared pathway/promenade along the existing flood defence berm.
- Construction of mini plaza, steps and pedestrian/cyclist ramp at Suir Island Carpark connecting onto the proposed promenade.
- South Arrival Point: Construction of an access ramp and steps and bridge landing on Raheen Road.
- Road improvements at the South Arrival Point on Raheen Road.
- Construction of two uncontrolled crossing points on Raheen Road.
- All associated ancillary works.

Operational Phase

The day-to-day operation of the project will comprise members of the public walking and cycling along the access routes and taking part in water sports in the river using the Suir Island facilities as a base.

Other aspects of the operational phase include private vehicles moving to and from the car park areas, operation of the pumping station and public use of the plaza and community areas.

10.5 Do Nothing Scenario

In the absence of the proposed development being constructed, the noise environment at the nearest noise sensitive locations and near the development site will remain largely unchanged resulting in a neutral effect.

10.6 Effect Assessment

The potential effects of the proposed development are considered for the short-term construction phase and long-term operational phase. These are set out in the following sections.

10.6.1 Construction Phase

Noise

It is anticipated that the construction phase will comprise of the following activities:

- Construction of encased bored piles at six locations for the footbridges, to avoid the use of bentonite.

- In-situ concrete poured foundations for the piers will be constructed during dry weather periods to allow access to the piers for the duration of low tidal zones.
- Provision of haul roads on the island for accessibility of machinery for pile construction and installation of bridges.
- Piers to be constructed with concrete up to the flood level height with steel above to limit the environmental effect of the work.
- Provision of prefabricated steel structures to be transported by road convoys to site in sections.
- Prefabricated steel sections to be assembled at 3 No. locations, namely the North Plaza, Suir Island Carpark site compound and a temporary assembly platform within Denis Burke Park.
- Footbridge to be installed by crane in approx. 30m length sections into position onto the supporting piers.
- For the northern footbridge, a crane will lift half of the footbridge from the North Plaza along the north riverbank while another crane will lift the other half of the footbridge from the Suir Island Carpark.
- For the southern footbridge, a crane will lift half of the footbridge from the temporary assembly platform within Denis Burke Park along the south riverbank while another crane will lift the other half of the footbridge from the Suir Island Carpark.
- All site assemblies/installations are envisaged at Suir Island Carpark.
- Ground works, paving and construction at North Plaza and Quays.
- Ground works, paving and construction of mini-plaza, ramp and steps from proposed promenade onto Suir Island Carpark.
- Road improvements and footpath widening at South Arrival Point.

During the construction phase of the proposed development, a variety of items of plant will be in use, such as road pavers, piling rigs, dumper trucks, compressors, and generators. Due to the nature of daytime activities undertaken on a construction site, there is potential for generation of significant levels of noise. The potential for vibration at neighbouring sensitive locations during construction is typically limited to excavation works/topsoil stripping, where required, and lorry movements on uneven road surfaces.

Outline construction programme and sequence information has been provided by Clifton Scannell Emerson Associates Consulting Engineers and are used to calculate the magnitude of noise emissions to the local environment in this assessment. There may be some variations depending on the actual construction methodology implemented by the successful contractor however these are not likely to change significantly and will have to be agreed with the local authority prior to construction.

Using the provided information, it is possible to predict typical noise levels using guidance set out in BS 5228-1:2009+A1:2014. Table 10-13 outlines typical plant items and associated noise levels that are anticipated for this aspect of the construction programme.

The construction activities can be broadly separated into two groups. The first is the construction of the bridge footings and installation of prefabricated structural elements. This will comprise of piling bridge foundations, construction of concrete piers and assembly and installation of steel structural elements.

Table 10-13: Reference Plant Noise Emissions – Bridge Construction

Activity	Item of Plant (<i>BS5228 Ref</i>)	L _{Aeq} at 10m
Bridge Foundation Work	Tracked excavator (C2.21)	71
	Dump Truck (C2.30)	79
	Diesel Generator (C4.76)	61
	Piling (C.3.14)	83

	Telescopic Handler (C4.54)	79
Pier Construction	Asphalt Paver & Tipping Lorry (C5.30)	75
	Electric Water Pump (C5.40)	68
	Vibratory Roller (C5.20)	75
Superstructure	Tracked excavator (C2.21)	71
	Dump Truck (C2.30)	79
	Tracked Mobile Crane (C3.28)	67

The second activity will be general construction of footpaths, improvements to footpaths along the Quays and Raheen Road, construction of the public plaza, facilities and ancillary infrastructure as shown in Table 10-14.

Table 10-14: Reference Plant Noise Emissions – General Construction

Activity	Item of Plant (<i>BS5228 Ref</i>)	L _{Aeq} at 10m
Site Preparation	Tracked excavator (C2.21)	71
	Dump Truck (C2.30)	79
	Diesel Generator (C4.76)	61
Paving and Landscaping Work	Asphalt Paver & Tipping Lorry (C5.30)	75
	Electric Water Pump (C5.40)	68
	Vibratory Roller (C5.20)	75
	Telescopic Handler (C4.54)	79

Tables 10-15 and 10-16 present the predicted daytime noise levels from an indicative construction period on site at various distances from the works. The calculations also assume that the equipment will operate for 66% of the 12-hour working day (i.e. 8 hours). It is assumed that construction activities described above will take place during normal working hours only.

It is understood that all construction works will take place during the daytime.

Noise predictions have been prepared for various distances from the proposed works. Bridge construction is anticipated at the two locations some 20m and further from nearby NSLs. General construction and upgrade works will take place some 10m and further from NSLs.

As set out in **Section 10.2.1** and **Section 10.3.7**, based on existing noise levels, the more onerous 'Category A' noise criterion (65 dB L_{Aeq,T}) is typically applied to NSLs on Suir Island. Apartments at Hughes Mill are some 25m and 120m from general construction work and bridge construction work, respectively.

Other noise sensitive locations are typically found along Old Quay, Raheen Road and Old Bridge Street. Derived noise criteria are typically Category B at these locations located at the roadside (70 dB L_{Aeq,T}).

Table 10-15: Indicative Construction Noise Levels at Nearest Noise Sensitive Locations during bridge construction

Construction Phase	Item of Plant (<i>BS 5228-1 Ref</i>)	L _{Aeq} at distance (m)		
		20m	50m	80m
Bridge Foundation Work	Tracked excavator (C2.21)	63	55	51
	Dump Truck (C2.30)	71	63	59
	Diesel Generator (C4.76)	53	45	41
	Piling (C.3.14)	75	67	63

	Telescopic Handler (C4.54)	71	63	59
Pier Construction	Asphalt Paver & Tipping Lorry (C5.30)	67	59	55
	Electric Water Pump (C5.40)	63	55	51
	Vibratory Roller (C5.20)	67	59	55
Superstructure	Tracked excavator (C2.21)	62	54	50
	Dump Truck (C2.30)	70	62	58
	Tracked Mobile Crane (C3.28)	59	51	47

The predicted noise levels are marginally above the Category B construction noise criterion (70 dB $L_{Aeq,T}$) at the nearest NSLs at Old Quay, some 20m from the bridge construction areas. Therefore, in the absence of noise mitigation, a *negative, moderate to significant*, and *temporary* effect is likely at NSLs designated Category A.

Elsewhere, the nearest residential noise sensitive receivers are set back from the bridge construction works. The nearest NSLs are estimated to be > 100m and 55m away (Category A and Category B respectively). Noise levels at NSLs that are 50m from areas of bridge construction are predicted to be below the noise criteria. The predicted effect is therefore *negative, moderate to significant*, and *temporary*.

Table 10-16: Indicative Construction Noise Levels at Nearest Noise Sensitive Locations during General Construction Works

Construction Phase	Item of Plant (BS 5228-1 Ref)	L_{Aeq} at distance (m)		
		10m	20m	50m
Site Preparation	Tracked excavator (C2.21)	69	63	55
	Dump Truck (C2.30)	77	71	63
	Diesel Generator (C4.76)	59	53	45
Paving and Landscaping Work	Asphalt Paver & Tipping Lorry (C5.30)	73	67	59
	Electric Water Pump (C5.40)	66	60	52
	Vibratory Roller (C5.20)	73	67	59
	Telescopic Handler (C4.54)	77	71	63

The predicted noise levels are above the Category A construction noise criterion (65 dB $L_{Aeq,T}$) at the nearest NSLs on Suir Island, some 25m from the general construction areas. Therefore, in the absence of noise mitigation, a *negative, moderate to significant*, and *temporary* effect is likely at NSLs designated Category A.

Elsewhere, the Category B criterion (70 dB $L_{Aeq,T}$) is applicable to residential noise sensitive receivers located along Raheen Road and the Quays. Noise levels at NSLs that are 10m-20m from areas of general construction are predicted to be above the noise criterion. The predicted effect is therefore *negative, moderate to very significant*, and *temporary*.

At 50m from construction works, the predicted construction noise levels are below the most onerous Category A values and therefore the associated effect is predicted to be *negative, moderate* and *temporary*.

Construction works typically occur at several locations whereby distances, and therefore noise levels, will vary. The above predictions represent a worst case whereby noise sources are at the closest point to a noise sensitive location.

It is noted there is a proposal for the development of the Suir Island Gardens within the redline boundary of the proposed development. In the scenario whereby the Gardens project is completed in advance or during the proposed development, construction noise is likely to be audible within the Gardens. Considering the timeframe for construction, the effects would be temporary in nature.

Mitigation to minimise the effect of construction works are presented in **Section 10.7**.

Vibration

In terms of construction vibration, excavations will be made using standard excavation machinery which typically do not generate appreciable levels of vibration close to the source. Taking this into account and considering the distance the sensitive receivers are from the works, i.e. 10m at a minimum, and the attenuation of vibration levels over distance, the resultant vibration levels are expected to be well below a level that would cause disturbance to building occupants or even be perceptible.

Piling is proposed at areas where bridges will be constructed. For the purposes of this assessment, vibration levels during rotary bored piling using a 600mm pile diameter for bored piling into soft ground over rock taken from BS 5228 – Part 2: *Vibration* has been referenced (BS 5228:2 Table D.6, Ref. No. 106). The associated vibration levels are summarised below:

- 0.54mm/s at a distance of 5m, for auguring;
- 0.22mm/s at a distance of 5m, for twisting in casing;
- 0.42mm/s at a distance of 5m, for spinning off, and;
- 0.43mm/s at a distance of 5m, for boring with rock auger.

Considering the low vibration levels at very close distances to the piling rigs, vibration levels at the nearby buildings are not expected to pose any significance in terms of cosmetic or structural damage to any of the residential or sensitive buildings in proximity to the development works. In addition, the range of vibration levels is typically below a level which would cause any disturbance to occupants of nearby buildings.

Vibration levels associated with piling works are also orders of magnitudes below the more onerous threshold recommended for protected structures however care should be taken when heavy works are taking place in close proximity.

The associated effect is considered to be *neutral, imperceptible, and temporary*.

10.6.2 Operational Phase

Once operational, potential effects associated with the proposed development will be low in noise, i.e. people cycling and walking, limited vehicular activity at car parking areas, occasional maintenance works comprising management of surface, scheduled maintenance as necessary to the bridge structure and vegetation.

North Plaza

The North Plaza is located along the Quays, in the northern area of the proposed development. The location is currently used as a car park, bounded by The Quay to the south and Quay Street to the north. The nearest NSLs are located to the east and north along Sarsfield Street and Quay Street.

Noise measurements were made at this location labelled NM4 in **Section 10.3**. In summary, observations made during the survey confirm that the existing noise environment was dictated by traffic noise on adjacent roads, pedestrian activity, and mechanical plant noise from nearby businesses. Ambient noise levels were in the range 63 – 65 dB L_{Aeq} , indicative of an urban, roadside location.

The proposed North Plaza will provide an open space for public use. It is expected that it will function as an informal multi-purpose space which will predominantly include for a seating area, gathering area for cyclist groups and pedestrian link for access to Suir Island.

Whilst noise levels associated with these types of activities are difficult to predict, given the proposed use is predominately a seating and resting area for those along the Blueway, people conversing is the main noise source expected which will vary depending on the numbers congregated at any one time. Given the existing noise environment is dominated by road traffic noise and experiences a high baseline noise level at present, the proposed uses of this area will not contribute to any significant noise levels over and above those currently experienced from the car parking and urban environment.

The proposed use will be similar in nature to an urban seating area and therefore a significant change in noise levels is not expected in association with the above activities. Review of the development shows a layout change to the roads in this localised area and it is predicted that there will in fact be a reduction in traffic noise levels surrounding the plaza as a result of modification of the road network. More information is provided in the next section relating to traffic flows.

Additional Traffic on Surrounding Roads

During the operational phase of the proposed development, there will be an increase in vehicular traffic associated with the site on some surrounding roads. A traffic impact assessment relating to the proposed development has been prepared by Clifton Scannell Emerson Associates consulting engineers, as part of this EIAR. Using this information, the related potential noise effects along the relevant road links have been assessed.

Table 10-17 below presents the predicted change in noise level at different road links around the site for the year of opening and the design year using the Annual Average Daily Traffic (AADT) flows along the road links under consideration. The different road links are shown in Figure 10-2.

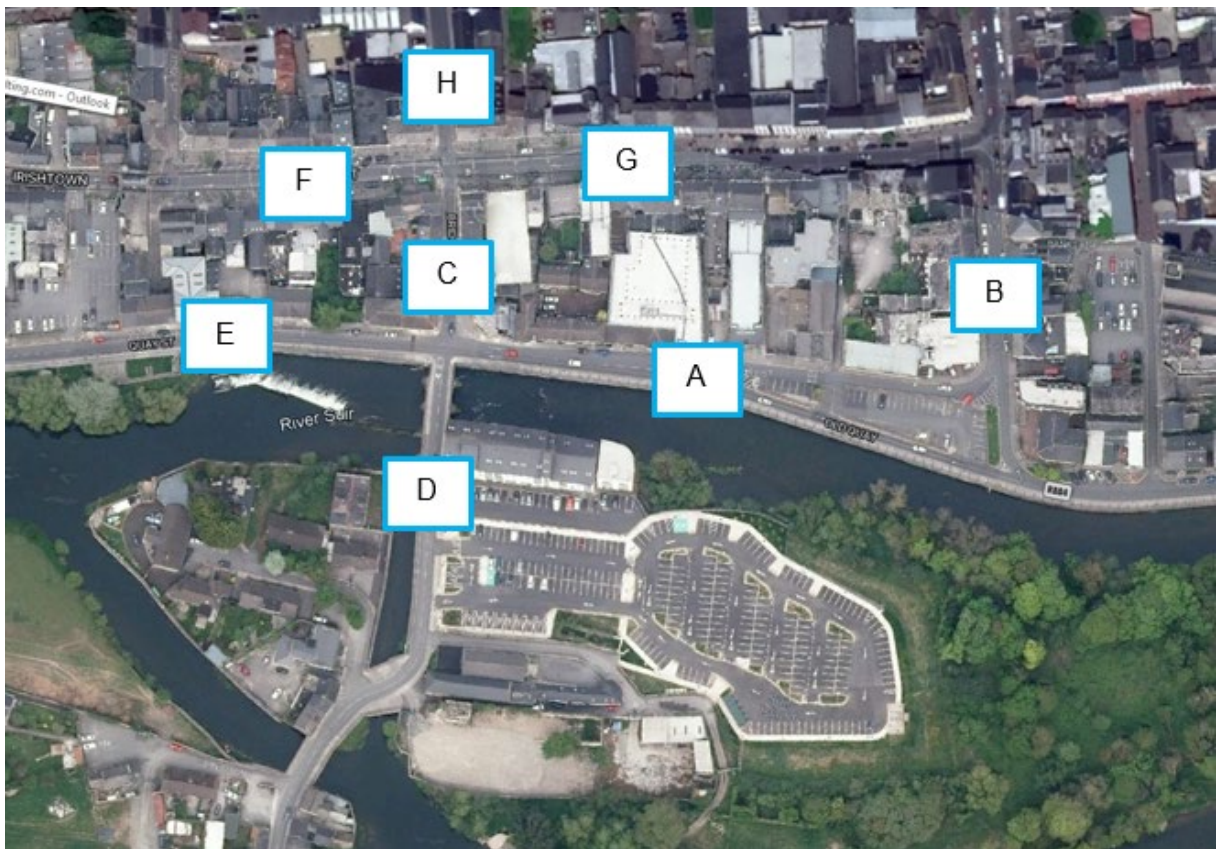


Figure 10-3: Road Link Locations

Table 10-17: Predicted Change in Noise Level associated with Vehicular Traffic – 2024

Road Link	Road Name	Opening Year (2025)		
		Do Nothing - AADT Without Development	Do Something - AADT With Development	Change in Noise Level (dB)
A	The Quay/Quay Street	4,899	3,929	-1.0
B	Sarsfield Street	3,228	2,205	-1.7
C	Bridge Street	2,523	2,523	0.0
D	Old Bridge	1,426	1,426	0.0
E	The Quay/ Joyces Lane	4,791	5,761	+0.8
F	O'Connell Street West	6,413	7,366	+0.6
G	O'Connell Street East	6,381	6,106	-0.2
H	Mary Street	4,634	3,885	-0.8
Road Link	Road Name	Design Year (2040)		
		Do Nothing - AADT Without Development	Do Something - AADT With Development	Change in Noise Level (dB)
A	The Quay/Quay Street	5,405	4,335	-1.0
B	Sarsfield Street	3,567	2,437	-1.7
C	Bridge Street	2,784	2,784	0.0
D	Old Bridge	1,574	1,574	0.0
E	The Quay/ Joyces Lane	5,288	6,358	+0.8
F	O'Connell Street West	7,075	8,123	+0.6
G	O'Connell Street East	7,039	6,737	-0.2
H	Mary Street	5,110	4,285	-0.8

With reference to Table 10-7, for the Opening Year 2025 and Design Year 2040, the predicted change in noise level associated with additional traffic on the surrounding existing road network has a negligible effect. For some road links, less traffic will be experienced and a decrease in noise level is predicted. The effect therefore varies from *negative, imperceptible and long-term* to *positive, imperceptible and long-term*.

Routine Maintenance

Maintenance work will take place on an occasional basis in order to maintain the proposed development, such as removal of vegetation and maintenance to bridges. This will be carried out using maintenance vehicles. Noise levels associated with this activity are not expected to be significant and will typically be transient in nature.

10.7 Mitigation and Monitoring Measures

Noise associated with construction phase and operation phase activities have been predicted. Significant impacts are predicted for unmitigated construction activity and therefore the following measures will be implemented in order to reduce effects associated with construction. Operational noise was determined not to be significant and therefore no mitigation measures are proposed.

10.7.1 Construction Phase

With regard to construction activities, best practice control measures for noise and vibration from construction sites are found within BS 5228 (2009 +A1 2014) *Code of Practice for Noise and Vibration Control on Construction and Open Sites* Parts 1 and 2. Whilst construction noise and vibration effects are expected to vary during the construction phase depending on the distance between the activities and noise sensitive receptors. The contractor will ensure that best practice noise and vibration control methods will be used, as necessary in order to ensure effects at off-site noise sensitive locations are minimised. The best practice measures set out in BS 5228 (2009) Parts 1 and 2 includes guidance on several aspects of construction site mitigation measures, including, but not limited to:

- selection of quiet plant.
- noise control at source.
- screening.
- liaison with the public, and
- monitoring.

Detailed comment is offered on these items in the following paragraphs. Noise control measures that will be considered include the selection of quiet plant, enclosures, and screens around noise sources, limiting the hours of work and noise and vibration monitoring, where required.

i. Selection of Quiet Plant

This practice is recommended in relation to static plant such as compressors and generators. It is recommended that these units be supplied with manufacturers' proprietary acoustic enclosures. The potential for any item of plant to generate noise will be assessed prior to the item being brought onto the site. The least noisy item should be selected wherever possible. Should a particular item of plant already on the site be found to generate high noise levels, the first action shall be to identify whether or not said item can be replaced with a quieter alternative.

ii. Noise Control at Source

If replacing a noisy item of plant is not a viable or practical option, consideration will be given to noise control "at source". This refers to the modification of an item of plant or the application of improved sound reduction methods in consultation with the supplier. For example, resonance effects in panel work or cover plates can be reduced through stiffening or application of damping compounds; rattling and grinding noises can often be controlled by fixing resilient materials in between the surfaces in contact. Referring to the potential noise generating sources for the works under consideration, the following best practice mitigation measures shall be considered:

- The use of machinery for lifting bulky items, dropping, and loading of materials within work areas should be restricted to normal working hours.

-
- For mobile plant items such as dump trucks, excavators and loaders, the installation of an acoustic exhaust and/or maintaining enclosure panels closed during operation can reduce noise levels by up to 10dB. Mobile plant shall be switched off when not in use and not left idling.
 - For compressors, generators, and pumps, these can be surrounded by acoustic lagging or enclosed within acoustic enclosures providing air ventilation.
 - Demountable enclosures will be used to screen operatives using hand tools and will be moved around site, as necessary.
 - All items of plant will be subject to regular maintenance. Such maintenance can prevent unnecessary increases in plant noise and can serve to prolong the effectiveness of noise control measures.
 - Care will be taken when cleaning augers of piling rigs. Shaking and banging of the auger to loosen earth will be avoided.
 - Use of pneumatic hand tools will be avoided at night-time and fixings should be manually tightened where possible.
 - Site compounds will be located in excess of 30m from noise sensitive locations within on-the-ground constraints.

iii. Screening

Screening is an effective method of reducing the noise level at a receiver location and can be used successfully as an additional measure to all other forms of noise control. Where required, the use of temporary hoarding or mobile screens will be used to aid in reducing noise levels from potential high levels of construction activity. The use of screening is recommended when works are occurring in proximity to noise sensitive dwellings, or high amenity areas during high noise activities. This can be undertaken using standard site hoarding or using mobile / demountable screens around noisy items of plant or works.

iv. Liaison with the Public

As part of the Construction Environmental Management Plan (CEMP) proposed as part of the project, a designated environmental liaison officer will be appointed to site during construction works. Any noise complaints should be logged and followed up in a prompt fashion by the liaison officer. In addition, where a particularly noisy construction activity is planned or other works with the potential to generate high levels of noise are expected to operate outside of normal working hours etc., the liaison officer will inform the nearest noise sensitive locations of the time and expected duration of the noisy works.

v. Monitoring

Construction noise monitoring will be undertaken at periodic sample periods at the nearest noise sensitive locations to the development works to check compliance with the construction noise criterion.

Noise monitoring should be conducted in accordance with the International Standard ISO 1996: 2017: *Acoustics – Description, measurement and assessment of environmental noise*.

vi. Project Programme

The phasing programme will be arranged so as to control the amount of disturbance in noise and vibration sensitive areas at times that are considered of greatest sensitivity. During excavation, piling or other high noise generating works that are in progress on a site at the same time as other works of construction that themselves may generate significant noise and vibration, the working programme will be phased so as to prevent unacceptable disturbance.

10.7.2 Operational Phase

There are no activities that would generate significant levels of noise associated with the operational phase of the proposed development, therefore no mitigation measures are required.

10.8 Residual Effects

10.8.1 Construction Phase

Noise

During the construction phase of the proposed development there is the potential for significant effects on nearby noise sensitive properties due to noise emissions from construction activities. The application of binding noise limits, hours of operation, along with implementation of appropriate noise and vibration control measures, will ensure that noise effect will have a *negative, moderate to very significant, and temporary to short-term* effect on the surrounding environment.

Vibration

Taking into account the low levels of vibration generated at close distances to piling rigs and excavations the vibration effects are *negative, not significant, and short-term*.

10.8.2 Operational Phase

Once operational, potential effects associated with the proposed development are expected to be low in noise, such as people walking and talking, limited to vehicular activity near car parking areas, occasional maintenance works along the route and members of the public using the public plaza. The following residual effects are predicted:

Additional Traffic

Based on the traffic flows associated with the operation of the proposed development the effects are predicted to vary from *negative, imperceptible and long-term* to *positive, imperceptible and long-term*.

Routine Maintenance Works

The associated effect is considered to be *negative, not significant, and long-term*.

10.9 Cumulative Effects

During the construction phase of the proposed development, construction noise on site will be localised and will therefore likely be the primary noise source at the nearest noise sensitive receivers.

A list of offsite developments has been compiled and presented in Chapter 1, Section 1.16. This list comprises proposed developments ranging from modifications of private properties to the Clonmel Urban Design Project.

Should another development become active and construction was undertaken in proximity to the proposed development, there is the possibility that cumulative noise impacts could occur at nearby sensitive receptors that are equidistant to both sites. The most likely of these is the works proposed at the Suir Island Gardens, adjacent to the proposed development. There is also the possibility that elements of the Clonmel Urban works may take place close to northern end of the proposed development, closer to the town centre.

In this scenario, it is recommended that liaison between construction sites is on-going throughout the duration of the construction phase. Contractors should schedule work in a co-operative effort to limit the duration and magnitude of potential cumulative impacts on nearby sensitive receptors.

Any large-scale future projects that are not yet proposed or permitted would also need to be the subject of EIA in turn, to ensure that no significant impacts resulting from noise and vibration will occur as a result of those developments.

10.10 Difficulties Encountered

No difficulties were encountered during the preparation of this chapter.

10.11 References

- EPA Guidelines on the Information to be contained in Environmental Impact Statements, (EPA, 2002).
- EPA Advice Notes on Current Practice (in the preparation of Environmental Impact Statements), (EPA, 2003).
- EPA Guidelines on the Information to be contained in Environmental Impact Assessment Reports, (May 2022).
- EPA Advice Notes for Preparing Environmental Impact Statements, (Draft, September 2015).
- BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise.
- BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 2 – Vibration.
- BS 7385-2:1993 Evaluation and measurement for vibration in buildings. Guide to damage levels from ground-borne vibration.
- BS 8233: 2014: Guidance on sound insulation and noise reduction for buildings.
- Design Manual for Roads and Bridges, Volume 11 – Environmental Assessment, 2019.
- ISO 1996: 2017: Acoustics – Description, measurement and assessment of environmental noise.

Clifton Scannell Emerson Associates Limited, Civil & Structural Consulting Engineers

3rd Floor The Highline, Bakers Point, Pottery Road, Dun Laoghaire, Co. Dublin, A96 KW29

T. +353 1 288 5006 F. +353 1 283 3466 E. info@csea.ie W. www.csea.ie

