

## CHAPTER THIRTEEN NOISE & VIBRATION

### 13.1 INTRODUCTION

This chapter identifies, describes and assesses the likely noise and vibration impacts of the Proposed Development located at the proposed 'Cleeves Riverside Quarter' located on the northern side of the River Shannon, Limerick City and situated in the townland of Farranshone More.

A description of the Proposed Development is described in detail in Chapter 1 (Introduction) and Chapter 2 (Project Description).

The assessment of direct, indirect and cumulative noise and vibration effects on the surrounding environment have been considered in this chapter. In addition, the inward effect of existing noise sources in the surrounding environment on the development itself has also been assessed. The assessment is focused on the specific impacts associated with the Proposed Development having regard to the wider masterplan, where relevant.

### 13.2 ASSESSMENT METHODOLOGY

#### 13.2.1 Outline Methodology

The assessment has been undertaken using the following methodology:

- 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 of the proposed development;
- A desktop review of published noise maps for road traffic in the vicinity of the proposed development has been undertaken to characterise the long-term traffic noise levels in the area and incident on the application and masterplan sites;
- An environmental noise survey has been undertaken within and in the vicinity of the proposed development in order to characterise the existing baseline noise environment.
- Predictive calculations have been performed to estimate the likely noise emissions during the construction phase of the proposed development at the nearest Noise Sensitive Locations (NSLs) to the site;
- Predictive calculations have been performed to assess the potential impacts associated with the operation of the development at NSLs surrounding the development site;
- An assessment has been completed of potential cumulative impacts that may arise as a result of the proposed development and other existing or proposed plans and projects;
- A schedule of mitigation measures has been proposed, where relevant, to control the noise and vibration emissions associated with both the construction and operational phases of the proposed development; and
- The inward effect of noise from the surrounding environment into the proposed residential buildings has also been assessed to determine the potential requirements for noise mitigation, to ensure a suitable internal noise environment for residential amenity.

### 13.2.2 Assessment Criteria, Guidelines and Standards – General

The Environmental Protection Agency (EPA) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA 2022), hereafter referred to as EPA EIAR Guidelines (2022) were considered and consulted in the preparation of this Chapter.

The significance of noise and vibration effects associated with the Proposed Development has been described in accordance with the EPA 2022 Guidelines. With regard to the quality of the effect, ratings may have positive, neutral or negative applications.

There are no statutory standards in Ireland relating to noise and vibration for construction works or for environmental noise relating to the operational phase. In the absence of specific statutory Irish guidelines, the assessment has referred to non-statutory national guidelines, where available, in addition to the most appropriate and commonly used international standards and guidelines relating to environmental noise and vibration which are best practice for environmental noise assessments in Ireland. These are set out in the following sections.

#### Construction Phase Relevant Guidelines and Standards

Reference is made to the following guidelines and standards to inform the most appropriate construction noise and vibration significance thresholds and assessment methodologies:

- British Standard Institute (BSI) British Standard (BS) 5228-1:2009 +A1 2014 Code of Practice for noise and vibration control of construction and open sites - Part 1: Noise (hereafter referred to as BS 5228–1) (BSI 2014);
- BS 5228-2:2009+A1:2014 Code of Practice for noise and vibration control of construction and open sites - Part 2: Vibration (hereafter referred to as BS 5228 – 2) (BSI 2014);
- BS 7385: 1993 Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration (hereafter referred to as BS 7385–2). (BSI 1993);
- BS 6472-1: 2008 Guide to evaluation of human exposure to vibration in buildings, Part 1 Vibration sources other than blasting (hereafter referred to as BS 6472–1) (BSI 2008);
- UK Highways Agency (UKHA) Design Manual for Roads and Bridges (DMRB) LA 111 Sustainability and Environmental Appraisal LA 111 Noise and Vibration Revision 2 (hereafter referred to as DMRB Noise and Vibration) (UKHE 2020); and
- International Organization for Standardization (ISO) 9613-2:2024 Acoustics – Attenuation of sound during propagation outdoors - Part 2: Engineering method for the prediction of sound pressure levels outdoors (hereafter referred to as ISO 9613 – 2).
- Limerick City & County Council: Limerick Development Plan 2022 – 2028. Volume 1 – Written Statement (2022)

#### Construction Noise Criteria – Residential Receptors

Construction noise sources include construction plant and machinery that will operate over the course of the construction phase. Appropriate criteria relating to construction noise levels for the proposed development is taken from British Standard BS 5228-1 (BSI 2014) is the most widely accepted standard for this purpose in Ireland. Section 11.2 of the Limerick Development Plan (2022) requires the use of BS 5228 Parts 1 and 2 (BSI 2014) for the assessment of noise and vibration from construction and demolition activities and for the implementation of site mitigation measures where necessary.

The 'ABC' methodology adopted from BS 5228-1 (BSI 2014) designates a NSL into a specific category (A, B or C) based on existing ambient noise levels in the absence of construction noise. For the appropriate assessment period (e.g. daytime) the ambient noise level is determined and rounded to the nearest 5 dB. This then sets a Construction Noise Threshold (CNT) that, if exceeded at this location, indicates a potential significant noise effect is associated with the construction activities, depending on context. Note that, in accordance with the BS 5228-1 guidance, this assessment criterion is only applicable to residential receptors.

Table 0.1 sets out the threshold values which, when exceeded, signify a potential significant effect at the facades of residential receptors.

**Table 0.1** Threshold of Potential Significant Effects for Construction Phase

| Assessment category and threshold value period (L <sub>Aeq</sub> )                                                                         | Threshold Value dB(A) For residential Receptors |                              |                              |
|--------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|------------------------------|------------------------------|
|                                                                                                                                            | Category A <sup>Note A</sup>                    | Category B <sup>Note B</sup> | Category C <sup>Note C</sup> |
| Night-time (23:00 to 07:00hrs)                                                                                                             | 45                                              | 50                           | 55                           |
| Evenings and weekends <sup>Note D</sup>                                                                                                    | 55                                              | 60                           | 65                           |
| Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)                                                                                      | 65                                              | 70                           | 75                           |
| Note A) Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values.        |                                                 |                              |                              |
| Note B) Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values. |                                                 |                              |                              |
| Note C) Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than category A values. |                                                 |                              |                              |
| Note D) 19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays.                                                         |                                                 |                              |                              |

### Construction Noise Criteria – Fixed Limits

BS 5228—1 (BSI 2014) gives several examples of acceptable limits for construction noise, the most simplistic being based upon the exceedance of fixed noise limits. Section E.2 notes

*“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”.*

These limits are typically applied to non residential sensitive receptors. These values are also useful for comparing calculated construction noise levels against, when reviewing acceptable levels of construction noise in suburban and urban sites. Exceedance of the above CNTs is deemed to result in a potentially significant effect, depending on the duration and margin above the threshold level.

### Proposed Construction Noise Thresholds

The proposed construction working hours are between 07:00 to 18:00 hrs Monday to Friday inclusive and between 08:00 and 14:00 hrs on Saturdays. However, it is possible that the contractor may wish to

carry out certain operations outside these hours i.e. Sunday or evening hours during long summer days etc. Such occurrences will be kept to a minimum and take place over a short timeframe and as such are unlikely to cause excessive disturbance. Deviation from these times will only take place when written approval is granted by Limerick City and County Council (LCCC) in exceptional circumstances.

Reference to the above criteria, proposed working hours and the baseline noise levels measured at various locations around the site (Refer to Section 13.3), a 'Category A' threshold has been adopted at all residential locations surrounding the site.

On this basis, the following CNTs are proposed, in line with the time periods in Table 0.1 for the construction stage of this development:

- Residential NSLs daytime periods and Saturday mornings: 65 dB  $L_{Aeq,T}$
- Residential NSLs evenings / Sundays: 55 dB  $L_{Aeq,T}$
- Commercial sensitive locations 70 dB  $L_{Aeq,T}$

#### Significance Ratings for Construction Noise Levels

In order to assist with interpretation of significance, Table 0.2 includes guidance as to the likely magnitude of noise impact associated with Construction Noise Levels (CNL), relative to the CNT. This guidance is derived from the DMRB Noise and Vibration (2020) document and adapted to include the relevant significance effects from the EPA EIAR Guidelines (2022) using professional expertise and judgment.

In accordance with the DMRB Noise and Vibration (2020) document, construction noise and construction traffic noise impacts shall constitute a significant effect where it is determined that a major or moderate magnitude of impact will occur for a duration exceeding:

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

**Table 0.2** Construction Noise Significance Ratings

| CNL per period                                                    | Classification of Impact      |                                      |                                                    |
|-------------------------------------------------------------------|-------------------------------|--------------------------------------|----------------------------------------------------|
|                                                                   | DMRB Classification of Impact | EPA Guidelines EIAR                  | Determination                                      |
| Below or equal to baseline noise level                            | Negligible                    | Not Significant                      | Depending on range of CNT and baseline noise level |
| Above baseline and below or equal to CNT                          | Minor                         | Slight to Moderate <sup>Note 1</sup> |                                                    |
| Above CNT and Below or equal to CNT +5 dB                         | Moderate                      | Moderate to Significant              |                                                    |
| Above CNT +5 dB and below or equal to CNT +15dB <sup>Note 2</sup> | Major                         | Significant to Very Significant      |                                                    |
| Above +15dB                                                       |                               |                                      |                                                    |

**Note 1:** CNLs at the upper end of this range will result in higher potential impacts, therefore this range is 'categorised as slight to moderate, acknowledging that values approaching the CNT are greater than slight. In accordance with DMRB, noise levels below the CNT are deemed 'Not Significant'.

**Note 2:** The DMRB does not distinguish beyond a 'Major' impact. For the purposes of distinguishing a Very Significant and Profound Impact, CNLs exceeding the CNT by +20dB are categorised as Profound.

### Construction Phase Traffic Noise Criteria

Vehicular movement to and from the construction site for the Proposed Development will make use of the existing road network. In order to assess the potential impact of additional traffic on the human perception of noise, the following two guidelines are referenced: DMRB Noise and Vibration (UKHE 2020) and the EPA EIAR Guidelines (EPA, 2022). For construction traffic, due to the short-term period over which this impact occurs, the magnitude of impacts is assessed against the 'short term' period in accordance with the DMRB document. Table 0.3 sets out the classification of changes in noise level to impact on human perception based on the guidance contained in these documents.

**Table 0.3** Classification of Magnitude of Traffic Noise Changes in the Short-Term

| Change in Sound Level (dB) | Subjective Reaction          | DMRB Magnitude of Impact (Short-term) | EPA Significance of Effect |
|----------------------------|------------------------------|---------------------------------------|----------------------------|
| Less than 1 dB             | Inaudible                    | Negligible                            | Imperceptible              |
| 1 – 2.9                    | Barely Perceptible           | Minor                                 | Not Significant to Slight  |
| 3 – 4.9                    | Perceptible                  | Moderate                              | Moderate                   |
| ≥ 5                        | Up to a doubling of loudness | Major                                 | Significant                |

### Construction Phase Vibration Criteria

There are two aspects to the issue of vibration that are addressed in the standards and guidelines: the risk of cosmetic or structural damage to buildings; and human perception of vibration. In the case of this development, vibration levels used for the purposes of evaluating building protection and human comfort are expressed in terms of Peak Particle Velocity (PPV) in mm/s. There is no published statutory Irish guidance relating to the maximum permissible vibration levels.

#### **Building Damage**

BS 7385 – 2 (BSI 1993) gives guidance regarding acceptable vibration in order to avoid damage to buildings. BS 5228 – 2 (BSI 2014) reproduces these same guidance values.

These standards differentiate between transient and continuous vibration. Surface construction activities are transient because they occur for a limited period of time at a given location. Both documents recommend that, for soundly constructed residential property and similar light framed structures that are generally in good repair, a threshold for minor or cosmetic damage (i.e. non-structural damage) should be taken as a PPV (in frequency range of predominant pulse) of 15mm/s (millimetres per second) at 4 Hertz (Hz) increasing to 20mm/s at 15 Hz and 50mm/s at 40 Hz and above. The standard also notes that below 12.5mm/s PPV the risk of damage tends to zero. Where the dynamic loading caused by continuous vibration is such as to give rise to dynamic magnification due to resonance, especially at the lower frequencies where lower guide values apply, then the guide values in Table B.2 of BS 5228 – 2 (BSI 2014b) might need to be reduced by up to 50%. On a cautious basis, therefore, continuous vibration limits are set as 50% of those for transient vibration across all frequency ranges. Historically important buildings that are difficult to repair might require special consideration on a case by case basis, but buildings of historical importance should not be assumed to be more sensitive unless they are structurally unsound.

If a building is in an unstable state, then it will tend to be more vulnerable to the possibility of damage arising from vibration or any other ground borne disturbance. The vibration limit range for protected and

historical buildings are equal to or up to 50% of those for light framed buildings, depending on their structural integrity. Where no structural defects are noted, the same limit to those for light framed buildings apply. For other structures and buildings that are determined to be potentially vulnerable to vibration due to significant structural defects, a further stringent criterion has been applied for transient vibration.

There are two protected structures within the Masterplan site: a former flax mill and a brick chimney. There are other structures which are of high heritage significance across the site. Stabilisation and repair works to the Flaxmill are being undertaken as part of the Phase I of the Masterplan and will be complete prior to any construction works commencing on site. The brick chimney has not been identified to date as a vulnerable structure requiring structural repairs.

Table 0.4 sets out the limits as they apply to vibration frequencies at 4 Hz where the most conservative limits are required. At higher frequencies, the relevant limit values for transient vibration within Table B.2 and Figure B.1 of BS5228-2 (BSI 2014) will apply, with similar reductions applied for continuous vibration and those for protected structures. For line 2 of Figure B.1. at frequencies below 4 Hz, a maximum displacement of 0.6mm (zero to peak) should not be exceeded. Taking the above into consideration the vibration criteria for building response is set out in Table 0.4.

**Table 0.4** Recommend Construction Vibration Thresholds for Buildings

| <b>Vibration Limits for Buildings (PPV) at the Closest Part of the Building to the Source of Vibration, at a Frequency of 4 Hz</b> |                            |                             |
|------------------------------------------------------------------------------------------------------------------------------------|----------------------------|-----------------------------|
| <b>Building Type</b>                                                                                                               | <b>Transient Vibration</b> | <b>Continuous Vibration</b> |
| Reinforced or framed structures. Industrial and heavy commercial buildings                                                         | 50 mm/s                    | 25 mm/s                     |
| Unreinforced or light framed structures. Residential or light commercial-type buildings                                            | 15 mm/s                    | 7.5 mm/s                    |
| Protected and Historic Buildings <sup>*Note 1</sup>                                                                                | 6 mm/s – 15 mm/s           | 3 mm/s – 7 mm/s             |
| Identified Potentially Vulnerable Structures and Buildings with Low Vibration Threshold                                            | 3 mm/s                     |                             |

**Note 1:** The relevant threshold value to be determined on a case by case basis. Where sufficient structural information is unavailable at the time of assessment, the lower values within the range will be used, depending on the specific vibration frequency

Table 0.4

### **Human Perception**

It is acknowledged that humans are particularly sensitive to vibration stimuli and that any perception of vibration may lead to concern. BS 5228-2 (BSI 2014) notes that vibration typically becomes perceptible at around 0.15 to 0.3 mm/s and may become disturbing or annoying at higher magnitudes. Higher levels of vibration are typically tolerated for single events or events of short-term duration, particularly during construction projects and when the origin of vibration is known.

Higher levels of vibration, however, are typically tolerated for single events or events of short duration. For example, during piling vibration levels may typically be tolerated at up to 2.5mm/s during daytime periods.

Table 0.5 presents the significance relating to potential effects to building occupants during construction based on guidance from BS 5228-2 (BSI 2014) the DMRB Noise and Vibration (UKHE 2020) document and the associated EPA EIAR (2022) significance ratings.

**Table 0.5** Guidance on effects of human response to PPV magnitudes

| PPV Range           | Description of Effect                                                                                                                                                                      | DMRB Magnitude of Impact | EPA Significance Rating |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|-------------------------|
| ≥10 mm/s PPV        | Vibration is likely to be intolerable for any more than a very brief exposure to this level in most building environments.                                                                 | Major                    | Very Significant        |
| ≥1 to <10 mm/s mm/s | Increasing likelihood of perceptible vibration in residential environments but can be tolerated at the lower end of the scale if prior warning and explanation has been given to residents | Moderate                 | Moderate to Significant |
| ≥0.3 to <1 mm/s     | Increasing likelihood of perceptible vibration in residential environments                                                                                                                 | Minor                    | Slight                  |
| <0.3 mm/s PPV       | Vibration is unlikely to be perceptible in even the most sensitive situations for most vibration frequencies associated with construction                                                  | Negligible               | Not Significant         |

Single or infrequent occurrences of these levels do not necessarily correspond to the stated effect in every case. The values are provided to give an initial indication of potential effects. Construction vibration shall constitute a likely 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; or 2) a total number of days exceeding 40 in any 6 consecutive months.

### 13.2.3 Operational Phase Relevant Guidelines and Standards – Outward Impact

The main potential source of outward noise from the proposed development relates to traffic flows to and from the development site onto the public roads, mechanical and electrical plant required to service the apartment buildings and any external noise sources associated with the meanwhile use areas and public realm spaces. In terms of inward noise, road traffic on the surrounding road network and any operational mechanical plant items serving the development buildings are the main potential sources of noise relating to residential amenity. The relevant guidance documents used to assess potential operational noise and vibration impacts on the surrounding environment are summarised below.

- BS 8233:2014 Guidance on sound insulation and noise reduction for buildings (hereafter referred to as BS 8233) (BSI 2014);
- BS 4142: 2014 +A1 2019 Methods for Rating and Assessing Industrial and Commercial Sound (hereafter referred to as BS 4142) (BSI 2019);
- ISO 1996-1:2016 Acoustics - Description, measurement and assessment of environmental noise. Part 1: Basic quantities and assessment procedures (hereafter referred to as ISO 1996 – 1) (ISO 2016);

- International Organization for Standardization (ISO) 9613-2: 2024: Acoustics – Attenuation of sound during propagation outdoors, Part 2: Engineering method for the prediction of sound pressure levels outdoors (hereafter referred to as ISO 9613 – 2) (ISO 2024);
- The UK Department of Transport Calculation of Road Traffic Noise (hereafter referred to as the CRTN) (UK Department of Transport 1988).
- UK Highways England (UKHE) Design Manual for Roads and Bridges (DMRB) LA 111 Sustainability and Environmental Appraisal LA 111 Noise and Vibration Revision 2 (UKHE 2020);
- ANC, IOA & CIEH (2017). ProPG: Planning & Noise – Professional Practice Guidance on Planning & Noise – New Residential Development (hereafter referred to as ProPG: Planning and Noise).
- Limerick City & County Council: Agglomeration of Limerick, Noise Action Plan 2024 – 2028 (hereafter referred to as the Limerick Agglomeration NAP (2024))
- Limerick City & County Council: Limerick Development Plan 2022 – 2028. Volume 1 – Written Statement (2022)

### 13.2.3.1 Operational Phase Traffic Noise

Vehicular movement to and from the proposed development will make use of the existing road network and new site access. Given that traffic from the development will make use of existing roads already carrying traffic volumes, the increase in traffic noise level that arises as a result of any additional vehicular movements associated with the development has been assessed.

In order to assess the potential impact of additional traffic on the human perception of noise, the following two guidelines are referenced DMRB Noise and Vibration (UKHA 2020) and the EPA Guidelines (EPA, 2022). For operational phase traffic, the change in traffic noise is assessed against the Long term significance ratings from DMRB in line with the traffic flows assessed for the future design year.

Table 0.6 relates the changes in noise to impact on human perception based on the guidance contained in these documents.

**Table 0.6** Classification of magnitude of changes in traffic noise in the long term

| Change in Sound Level (dB) | Subjective Reaction            | DMRB Magnitude of Impact (Long-term) | EPA Significance of Effect      |
|----------------------------|--------------------------------|--------------------------------------|---------------------------------|
| 0                          | Inaudible                      | No impact                            | Imperceptible                   |
| 0.1 – 2.9                  | Barely Perceptible             | Negligible                           | Not significant                 |
| 3 – 4.9                    | Perceptible                    | Minor                                | Slight, Moderate                |
| 5 – 9.9                    | Up to a doubling of loudness   | Moderate                             | Moderate to Significant         |
| 10+                        | Doubling of loudness and above | Major                                | Significant to Very significant |

### 13.2.3.2 Operational Phase Building Services Plant

Building services required for ventilation, heating or other active process have the potential to emit noise to the surrounding environment. For the proposed development these items of plant have the potential to operate on a 24/7 basis depending on the heating and cooling requirements of the building.

**Existing Noise Sensitive Locations**

To assess any noise impacts from these sources on the surrounding existing NSLs, reference is made here to the British Standard BS 4142 (BSI 2019). This document makes reference to the existing background noise and assesses the likelihood of adverse effects, depending on the increase above the prevailing noise levels. This document is directly referred to within the Limerick Development Plan (2022) for the control of commercial or industrial noise sources (e.g. fans, machinery etc.)

The method of assessing plant noise set out in BS 4142 (BSI 2019) is based on the following definitions:

- “Specific noise level,  $L_{Aeq, T}$ ” is the equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T;
- “Rating level,  $L_{Ar, T}$ ” is the specific noise level plus adjustments for the character features of the sound (if any);
- “Residual noise level,  $L_{Aeq, T}$ ” is the noise level produced by all sources excluding the sources of concern, in terms of the equivalent continuous A-weighted sound pressure level over the reference time interval, T;
- “Background noise level,  $L_{A90, T}$ ” is the A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T. This level is expressed using the  $L_{A90}$  parameter. These levels were measured as part of the baseline survey (refer to Section 13.3.2.1)

Adjustments to the rating level are appropriate where noise emissions are found to be tonal, impulsive in nature or irregular enough to attract attention. In these cases, penalties are applied of either an additional 2 dB, 4 dB or 6 dB depending on how perceptible the tone is at the noise receptors.

The background level should then be subtracted from the rating level. The greater this difference, the greater the magnitude of the impact will be. A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, while a difference of around +5 dB is likely to be an indication of an adverse impact (as referred to in BS 4142 (BSI 2019)), depending on the context (e.g. the absolute level, sensitivity of receptors amongst others).

**Development Noise Sensitive Locations**

For proposed residential units within the proposed development, and future commercial and retail elements within the overall masterplan site, acceptable noise levels both internally and externally, can be determined by referring to the British Standard BS 8233 (BSI 2014). The use of an absolute level is appropriate for these NSLs given there is no related increase in background noise for new occupants. This aligns with Policy 11.3.12 of the Limerick Development Plan (2022) which notes internal noise levels from BS 8233 should be applied for new residential development to ensure good acoustic design and acceptable internal noise levels are achieved. Table 0.7 summarises the internal ambient noise levels in the various spaces across the proposed development from this guidance.

The derived external levels are based on the approximate attenuation provided by a partially open window of 15 dB, as advised in BS 8233 (BSI 2014), and represent the appropriate noise level at the external façade of the relevant building. For mechanically ventilated buildings, higher external noise levels will achieve the same internal noise levels with closed windows.

**Table 0.7 Guidance on Indoor Ambient Noise Levels for Dwellings, offices and commercial spaces**

| Activity                               | Location                  | Daytime (07:00 to 23:00hrs)     | Night (23:00 to 07:00hrs)    | Derived External Levels (across an open window)                        |
|----------------------------------------|---------------------------|---------------------------------|------------------------------|------------------------------------------------------------------------|
| Residential Resting                    | Living room               | 35 dB L <sub>Aeq</sub> , 16hr   | -                            | 50 dB L <sub>Aeq</sub> , 16hr                                          |
| Residential Dining                     | Dining room               | 40 dB L <sub>Aeq</sub> , 16hr   | -                            | 55 dB L <sub>Aeq</sub> , 16hr                                          |
| Residential Sleeping (daytime resting) | Bedroom                   | 35 dB L <sub>Aeq</sub> , 16hr   | 30 dB L <sub>Aeq</sub> , 8hr | 50 dB L <sub>Aeq</sub> , 16hr<br>45 dB L <sub>Aeq</sub> , 8hr at night |
| Offices                                | Executive office          | 35 - 40 dB L <sub>Aeq</sub> , T | N/A                          | 50 – 55 dB L <sub>Aeq</sub> , T                                        |
|                                        | Open Plan                 | 45 - 50 dB L <sub>Aeq</sub> , T | N/A                          | 60 – 65 dB L <sub>Aeq</sub> , T                                        |
|                                        | Staff areas/meeting rooms | 35 - 45 L <sub>Aeq</sub> , T    | N/A                          | 50 – 65 dB L <sub>Aeq</sub> , T                                        |
| Commercial                             | Shops, cafes, etc         | 50 - 55 L <sub>Aeq</sub> , T    | N/A                          | 65 – 70 L <sub>Aeq</sub> , T                                           |

### 13.2.3.3 Meanwhile Use and Public Realm Areas

The Proposed Development includes for temporary event space for cultural/arts/music events pending redevelopment of the site. The Shipyard site is capable of accommodating pop up and community support uses and could include food markets and stalls should the demand exist. Similarly, the proposed area accommodating the Riverside Canopy has the potential to accommodate external exhibition space; events and social gatherings and to function as informal facility for ball games as the need arises. The Riverside Canopy will also accommodate heritage interpretative panels providing historical reference and understanding to the Cleeves site for external spaces for performances and gatherings to occur.

The main potential sources of outward noise from these areas relate to outdoor events occurring within the temporary meanwhile use spaces and public realm areas, particularly where amplified music or sound systems are in operation. Other sources of potential noise relate to external seating areas, cultural, play and public spaces proposed within the development site.

The operation of day to day activities with should be controlled to not exceed the external noise levels in Table 0.7 at the closest NSLs.

#### *Entertainment Noise*

There are no Irish guidelines for noise sources from these types of activities. The Limerick Development Plan (2022) notes that:

*“Where music events (e.g. concerts) are proposed, an appropriate balance should be achieved between the organiser(s) objectives, the participants’ enjoyment and the interests of the community at large, who may be affected by such functions. The applicant should actively engage with the planning authority at the earliest possible stage to ensure that the potential for noise disturbance is minimised” (Section 6.3.12.3).*

No specific noise limits are set within this EIAR on the basis of the above, but the provision of any temporary events requiring the use of amplified music with potential to generate noise impacts to adjacent sensitive spaces will be controlled via individual permits, depending on the activity.

### 13.2.4 Operational Phase Relevant Guidelines and Standards – Inward Impact

#### 13.2.4.1 Limerick Agglomeration Noise Action Plan (2024 – 2028)

The Limerick Agglomeration NAP (2024) states that in order to give effect to National Policy Objective 65 of the National Planning Framework 2040, that the following strategic approach will be adopted by the Council:

*“In the absence of Irish planning guidance local authorities in 2021 prepared Draft Interim National Guidance for the Consideration of Transportation Noise in the Design of New Residential under a subgroup of the NIECE National Local Authority Noise Working Group. This draft guidance includes an overarching aspiration that good acoustic design should be implemented from the outset of the design of new residential developments and recommends the use of the ProPG approach to bringing people to noise and cognisance of BS 8233:2014 and the AVO guidelines.”*

In addition, the following is provided

*“All new applications for residential developments shall be assessed in accordance with the LDP objective TR O54 (Noise Sensitive Development) and where there is the likelihood of an adverse noise impact near major roads that planning applications should be supplemented by an Acoustic Design Statement carried out by appropriately qualified acousticians and competent persons. The Acoustic Design Statement should demonstrate that all facets of the ‘Professional Practice Guidance on Planning and Noise: New Residential Developments’ (ProPG) have been followed.”*

In accordance with this NAP policy, an inward noise impact assessment is included within this EIAR chapter to comply with the requirements of this policy. The relevant criteria for internal noise levels are from BS 8233 (2014) is set out in Table 0.7. A summary of the Planning Policy document ProPG referred to the NAP (2022) is provided below.

#### 13.2.4.2 Professional Practice Guidance on Planning and Noise (ProPG 2017)

The ProPG: Planning and Noise document is generally considered best practice guidance adopted in Ireland the absence of equivalent Irish guidance for inward noise impact assessments, i.e. for assessing the impact of an existing source of new planned residential developments.

The ProPG outlines a systematic risk based 2-stage approach for evaluating noise exposure on prospective sites for residential development. The two primary stages of the approach can be summarised as follows:

Stage 1: Comprises a high-level initial noise risk assessment of the proposed site considering either measured and or predicted noise levels.

Stage 2: Involves a detailed appraisal of the Proposed Development dependent on the risk category of the site and considers the site design and layout, internal noise levels and external noise in amenity areas.

The initial noise risk assessment is intended to provide an early indication of any acoustic issues that may be encountered. It calls for the categorisation of the site as a negligible, low, medium or high risk, based on the pre-existing noise environment. presents the basis of the initial noise risk assessment; it provides appropriate risk categories for a range of continuous noise levels either measured and / or predicted on site.

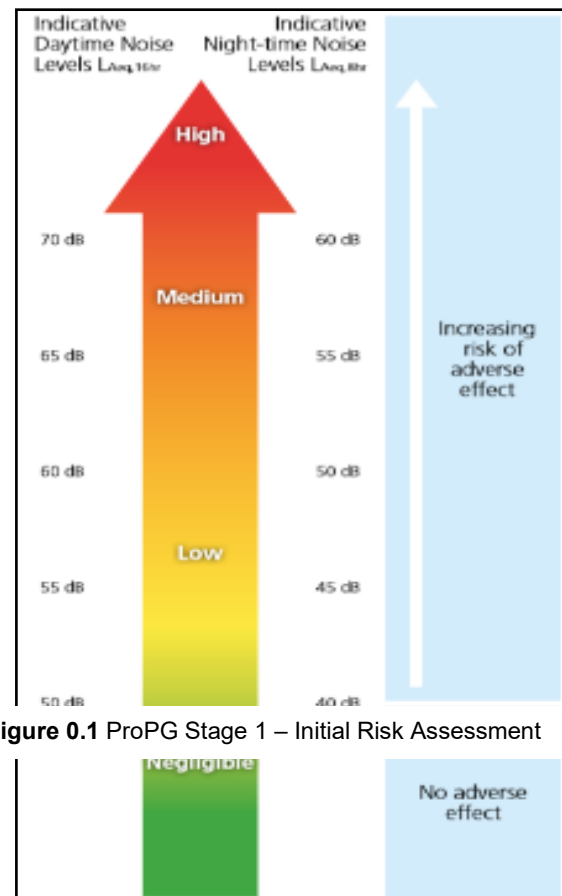


Figure 0.1 ProPG Stage 1 – Initial Risk Assessment

A site should not be considered a negligible risk if more than 10 no.  $L_{AFMax}$  events exceed 60 dB during the night period, and the site should be considered a high risk if the  $L_{AFMax}$  events exceed 80 dB more than 20 times a night.

Stage 2 of the ProPG: Planning and Noise document sets out recommended internal noise targets derived from BS 8233: 2014 (BSI 2014c). The recommended indoor ambient noise levels are those from BS 8233 (2014) set out in Table 0.7 for residential dwellings and are based on annual average data. In addition to these absolute internal noise levels, ProPG: Planning and Noise provides guidance on flexibility of these internal noise level targets based on guidance within BS 8233 (2014). For instance, in cases where the development is considered necessary or desirable or close to major infrastructure elements, and noise levels exceed the external noise guidelines, then a relaxation of the internal  $L_{Aeq}$  values by up to 5 dB can still provide reasonable internal conditions.

### External Noise

BS 8233 also provides desirable noise levels for external amenity areas such as gardens, patios, and balconies. It states:

*“For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB  $L_{Aeq,T}$ , with an upper guideline value of 55 dB  $L_{Aeq,T}$  which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.”*

### 13.3 EXISTING RECEIVING ENVIRONMENT

#### 13.3.1 Masterplan Site

The masterplan site is located north-west of the River-Shannon within an existing brownfield area. The north of the site is bound by residential dwellings, to south is bound by the R527 Condell Road, the east is bound by O Callaghan Strand and The River Shannon and the west by residential dwellings and the west by the Salesian Primary school.

There are six distinct areas identified within the overall Cleeves Masterplan site, these are detailed in Figure 2.1 of Chapter 2 Project Description and are described as follows:

- 'Flaxmill Site' comprises the Flaxmill, perimeter walls, Chimney, Engine House, Water Tank and Steeping Galleries.
- Shipyard Site' is located between the North Circular Road and Condell Road, adjoining Fernhill residential development to the north west and St, Michael's Rowing club to the south east, is currently used for storage and car parking and includes a warehouse.
- 'Riverfront' including St Michael's Rowing Club premises and club facilities, is defined by O'Callaghan Strand to the north and the River Shannon to the south extending from a point defined by the Condell Road and Shannon Bridge to the west.
- 'Stonetown Terrace Site' is accessed via the Stonetown Terrace Road and is defined by the Landsdowne Hall apartment block to the east, existing housing in Clanmaurice Gardens to the north, Clanmaurice Avenue to the west and the Quarry Site to the south. The site comprises an Upper Reservoir structure.
- 'Quarry Site' is dominated by a cliff face which adjoins the long rear gardens of housing in Clanmaurice Avenue to the north. Part of the southern boundary touches the North Circular Road and extends to include 2 no. Victorian Houses.
- 'Salesians Site' is separate to the Cleeves Complex, located to the west of the Quarry site. Salesian's primary school defining the western boundary and North Circular Road defining the southern boundary. The site comprises a complex of buildings including a former secondary school, which is currently used for the temporary accommodation and Fernbank House, a former private dwelling which is used by the school.

##### 13.3.1.1 Desktop Review of Noise Mapping

A desktop review of publicly available data has been undertaken to characterise the baseline noise environment across the Masterplan site. Reference has been made to the most recent Round 4 noise maps published by the Environmental Protection Agency (EPA) (<http://gis.epa.ie>) for road traffic noise within the Limerick Agglomeration. The published noise maps are provided for the overall day-evening-night period in terms of  $L_{den}$  parameter, defined below.

$L_{den}$  is the 24-hour noise rating level determined by the averaging of the  $L_{day}$  with the  $L_{evening}$  (plus a 5 dB penalty) and the  $L_{night}$  (plus a 10 dB penalty).  $L_{den}$  is calculated using the following formula, as defined within the Noise Regulations:

$$L_{den} = 10 \log \left( \frac{1}{24} \right) \left( 12 * \left( 10^{\frac{L_{day}}{10}} \right) + 4 * \left( 10^{\frac{L_{evening}+5}{10}} \right) + 8 * \left( 10^{\frac{L_{night}+10}{10}} \right) \right)$$

Where:

**L<sub>day</sub>** is the A-weighted long-term average sound level as defined in ISO 1996-2, determined over all the day periods of a year. The 12 hour daytime period is between 07:00hrs and 19:00hrs

**L<sub>evening</sub>** is the A-weighted long-term average sound level as defined in ISO 1996-2, determined over all the evening periods of a year. The four-hour evening period is between 19:00hrs and 23:00hrs

**L<sub>night</sub>** is the A-weighted long-term average sound level as defined in ISO 1996-2, determined over all the night periods of a year. The eight-hour night-time period is between 23:00hrs and 07:00hrs.

Figure 0.2 presents the mapped road traffic noise levels in the vicinity of the development site in terms of the L<sub>den</sub> parameter.



**Figure 0.2** Mapped L<sub>den</sub> Traffic Noise Level, (Source : <http://gis.epa.ie>)

The closest roads in the vicinity of the development site where traffic noise levels have been mapped are along Strandfield Gardens to the North, the North Circular Road and R527 Condell Road to the south, O' Callaghan Strand to the east and R464 Shelbourne Road Lower to the west.

Across the Masterplan site, highest traffic noise levels are mapped along southern site boundary along the R527 Condell Road which bounds the 'Shipyard Site' of the masterplan site. Traffic noise levels are mapped in the 65 to 75 dB L<sub>den</sub> contour range along the immediate southern boundary, reducing to within the 55 to 60 dB L<sub>den</sub> further north across the Shipyard site to the edge of the North Circular Road. Traffic noise levels along the southern boundaries of the 'Flaxmill Site' and the 'Quarry Site' which bound the North Circular Road are mapped in the range of 55 to 60 dB L<sub>den</sub>.

To the east of the Masterplan site, traffic noise levels are mapped in the range of 60 to 65 dB L<sub>den</sub> along the road edge, reducing to below 45 dB L<sub>den</sub> across the main portion of the 'Flaxmill Site' set back from the road.

To the north of the Masterplan site, road traffic noise levels are not mapped within the extents of the site itself due to the set back distances and screening from the adjacent roads. Along Strandville Avenue north-east of the Masterplan site, traffic noise levels are mapped in the range of 55 to 60 dB L<sub>den</sub> at the nearest residential dwellings.

To the west of the Masterplan site traffic noise levels along the R464 Shelbourne Road Lower are mapped in the range of 60 to 65 dB  $L_{den}$  at the closest facades of the Salesian Primary School to the road, reducing to below 45 dB  $L_{den}$  across the 'Quarry Site'.

The mapped values relate to the  $L_{den}$  parameter. This typically equates to a daytime  $L_{Aeq,16hr}$  noise level of 1 to 2 dB lower than then  $L_{den}$ .

Figure 0.3 presents the mapped road traffic noise levels in the vicinity of the development site in terms of the  $L_{night}$  parameter.



**Figure 0.3** Mapped  $L_{night}$  Traffic Noise Level, (Source : <http://gis.epa.ie>)

Across the Masterplan site, highest traffic noise levels are mapped along southern site boundary along the R527 Condell Road which bounds the 'Shipyards Site' of the masterplan site. Traffic noise levels are mapped in the 45 to 50 dB  $L_{night}$  contour range within the southern portion of the 'Shipyards Site', reducing to below 45 dB  $L_{night}$  further north across the Shipyards site and all other areas of the Masterplan site. Traffic noise levels across all areas of the 'Flaxmill Site', 'Quarry Site', 'Stonestown Terrace Site' and 'Salesians Site' are not mapped and hence are below the 45 dB  $L_{night}$  contour range.

### 13.3.2 Applicant Site

In terms of baseline noise, the same sources and noise level ranges discussed in Section 13.3.1 apply to the Applicant Site. To further characterise the noise levels across the applicant site and the closest NSLs a range of noise surveys were undertaken. The following section outlines the results of the noise survey details and results.

#### 13.3.2.1 Baseline Noise Survey

An environmental noise survey has been conducted at the site in order to quantify the existing noise environment. The survey was conducted in general accordance with ISO 1996: 2017: Acoustics – Description, measurement and assessment of environmental noise

### Baseline Noise Survey Locations

The environmental noise survey was undertaken at a number of representative locations in the vicinity of the development and is reviewed here to inform a preliminary discussion of the existing noise environment.

The survey locations are described below and illustrated in Figure 0.4.

**Location UN1** Located within the site boundary at the southwest perimeter within the front garden of an existing terraced house. The microphone was extended to first floor height above the boundary wall. This monitoring location is representative of noise levels at the proposed development site along North Circular Road.

**Location UN2** Located within the site boundary at the southeast perimeter, this monitoring location is representative of noise levels at the proposed development site along North Circular Road and O'Callaghan Strand. The microphone was extended to first floor height approximately 10m inside the boundary wall.

**Location UN3** Located along the eastern site boundary, this monitoring location is representative of noise levels at the eastern façade of the proposed development site.

**Location AT1** Located to the west of the site, within the grounds of the Secondary School. The survey position was chosen as a representative environment for the closest NSLs to the west of the site.

**Location AT2** Located within the site boundary at the northern perimeter, this survey position was chosen as a representative environment for the closest NSLs to the north of the site.

**Location AT3** Located within the car park to the south of the site, this survey position was chosen as a representative environment for the closest NSLs to the southwest of the site.



**Figure 0.4** Baseline Noise Monitoring Locations

**Survey Periods and Instrumentation**

AWN acoustic team staff accredited in environmental noise monitoring installed and collected the noise monitoring equipment.

Unattended noise monitoring equipment was installed at UN1, UN2 and UN3 during the following periods:

- UN1 - 12:38 hrs on 16 June 2025 to 11:22 hrs on 18 June 2025.
- UN2 - 12:22 hrs on 16 June 2025 to on 18 June 2025.
- UN3 - 12:50 hrs on 16 June 2025 to on 18 June 2025.

The survey was undertaken using RION NL 52 sound level meters (serial Numbers: 1076328; 1076330; 586940) and protective outdoor environmental monitoring kit.

Noise measurements were set to log over 15-minute intervals on a continuous basis over day and night-time periods. The results were saved to the instrument memory for later analysis. Survey personnel noted the primary noise sources contributing to noise build-up while installing and removing the equipment from site. The measurement instrument was check calibrated using a RION Type NC-75 Sound Level Calibrator.

An attended daytime survey was completed at AT1, AT2 and AT3 during the following periods:

- 13:06 hrs to 16:15 hrs on 18 June 2025.

Measurements were conducted at the locations noted above. Sample periods for the attended noise measurements were 15 minutes. The results were noted onto a Survey Record Sheet immediately following each sample and were also saved to the instrument memory for later analysis if required. Survey personnel noted the primary noise sources contributing to noise build-up. The measurement instrument was check calibrated using a RION Type NC-75 Sound Level Calibrator.

Weather conditions were dry and calm during all periods.

**Measurement Parameters**

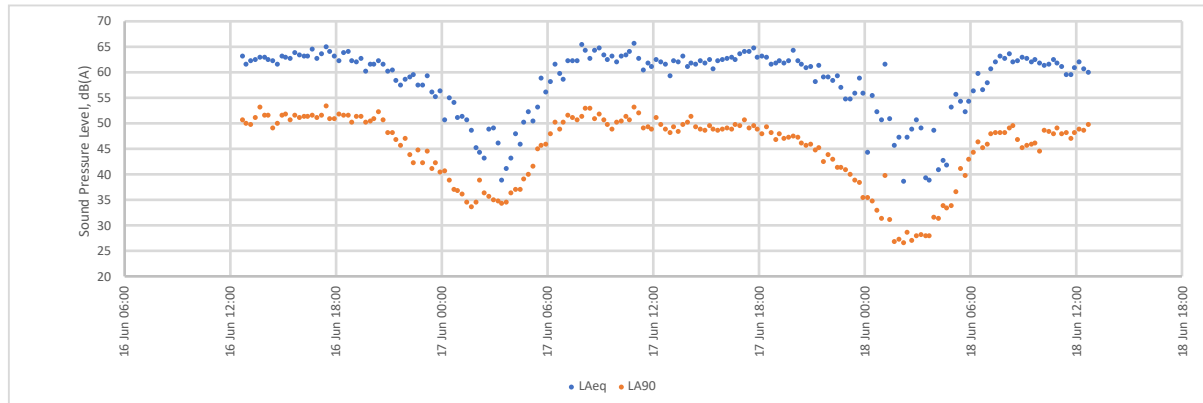
The noise survey results are presented in terms of the following parameters:

- $L_{Aeq}$  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.
- $L_{A90}$  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” 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  $2 \times 10^{-5}$  Pa.

**Measurement Results****Location UN1**

The survey results for UN1 are graphed in Figure 2.



**Figure 0.5** Graphed Surveys Results at UN1

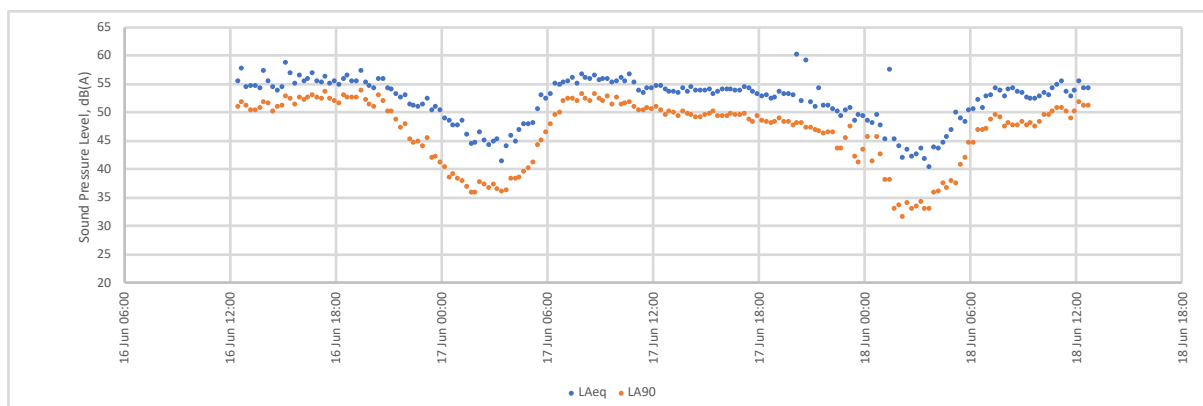
The survey results at Location UN1 are summarised in Table 0.8. The results are presented for the daytime period (07:00 to 23:00hrs) and night-time period (23:00 to 07:00hrs) periods for the survey dates. Road traffic along the North Circular Road was the dominant noise source during all measurement periods. The measured noise levels are higher than those mapped in the agglomeration noise maps for road traffic noise at this location. This may be due to the absence of traffic data in the mapped data sets for night-time periods along North Circular Road.

**Table 0.8** Noise Survey Results Measured at UN1

| Date          | Period | Measured Noise Level, dB |                  |
|---------------|--------|--------------------------|------------------|
|               |        | L <sub>Aeq</sub>         | L <sub>A90</sub> |
| 16 June 2025  | Day    | 62                       | 50               |
|               | Night  | 55                       | 40               |
| 17 June 2025  | Day    | 62                       | 49               |
|               | Night  | 54                       | 35               |
| 18 June 2025  | Day    | 62                       | 48               |
| Average Day   |        | 62                       | 49               |
| Average Night |        | 54                       | 37               |

#### Location UN2

The survey results for UN2 are graphed in Figure 0.6.



**Figure 0.6.** Graphed Survey Results for UN2

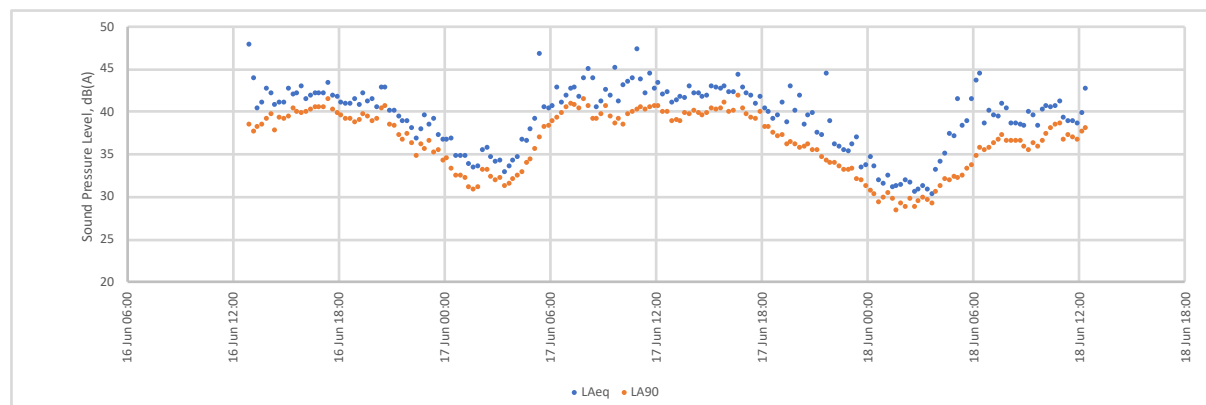
The survey results at Location UN2 are summarised in Table 0.9. The results are presented for the daytime period (07:00 to 23:00hrs) and night-time period (23:00 to 07:00hrs) for the survey dates. Road traffic along the North Circular Road and O'Callaghan Strand was the dominant noise source during all measurement periods. The measured noise levels are broadly in line with those mapped in the agglomeration noise maps for road traffic noise at this location.

**Table 0.9** Noise Survey Results Measured at UN2

| Date          | Period | Measured Noise Level, dB |                  |
|---------------|--------|--------------------------|------------------|
|               |        | L <sub>Aeq</sub>         | L <sub>A90</sub> |
| 16 June 2025  | Day    | 55                       | 51               |
|               | Night  | 50                       | 41               |
| 17 June 2025  | Day    | 55                       | 50               |
|               | Night  | 49                       | 39               |
| 18 June 2025  | Day    | 54                       | 49               |
| Average Day   |        | 55                       | 50               |
| Average Night |        | 50                       | 40               |

### Location UN3

The survey results for UN3 are graphed in Figure 0.7.



**Figure 0.7.** Graphed Survey Results for UN3

The survey results at Location UN3 are summarised in Table 0.10. The results are presented for the daytime period (07:00 to 23:00hrs) and night-time period (23:00 to 07:00hrs) for the survey dates. Background noise from traffic on surrounding roads was the main source of ambient and background noise levels at this location.

**Table 0.10** Noise Survey Results Measured at UN3

| Date          | Period | Measured Noise Level, dB |                  |
|---------------|--------|--------------------------|------------------|
|               |        | L <sub>Aeq</sub>         | L <sub>A90</sub> |
| 16 June 2025  | Day    | 42                       | 39               |
|               | Night  | 39                       | 34               |
| 17 June 2025  | Day    | 42                       | 39               |
|               | Night  | 37                       | 31               |
| 18 June 2025  | Day    | 40                       | 37               |
| Average Day   |        | 42                       | 39               |
| Average Night |        | 38                       | 33               |

Attended Locations AT1 – AT3

The survey results measured at Locations AT1 to AT3 are presented in Table 0.11.

**Table 0.11** Attended Noise Monitoring Results

| Location | Start Time (hrs) | Measured Noise Level, dB |                         |
|----------|------------------|--------------------------|-------------------------|
|          |                  | L <sub>Aeq,15mins</sub>  | L <sub>A90,15mins</sub> |
| AT1      | 13:29            | 50                       | 47                      |
|          | 14:33            | 51                       | 47                      |
|          | 15:15            | 52                       | 50                      |
| AT2      | 13:06            | 43                       | 40                      |
|          | 14:12            | 49                       | 40                      |
|          | 16:00            | 44                       | 41                      |
| AT3      | 13:50            | 54                       | 49                      |
|          | 14:52            | 54                       | 50                      |
|          | 15:34            | 53                       | 49                      |

The noise environment at the measurement Location AT1 was typically dominated by noise from road traffic along North Circular Road and the R464. Other noise sources noted included birdsong, intermittent air traffic, pedestrians passing the meter and vehicular movements within the school and sports hall car park. Ambient daytime noise levels were in the range of 50 to 52 dB L<sub>Aeq,15mins</sub> while daytime background noise levels were in the range of 47 to 50 dB L<sub>A90,15mins</sub>.

The noise environment at the measurement Location AT2 was dominated by noise from distant road traffic along North Circular Road, the R464 Shelbourne Road Lower and the R527 Condell Road. Birdsong, intermittent air traffic and a HGV operating nearby towards the end of the second measurement period were also noted. Ambient daytime noise levels were in the range of 43 to 49 dB L<sub>Aeq,15mins</sub> while daytime background noise levels were in the range of 40 to 41 dB L<sub>A90,15mins</sub>.

The noise environment at the measurement Location AT3 was typically dominated by noise from road traffic along the R527 Condell Road, birdsong and distant construction noise. Other noise sources noted included intermittent air traffic, vehicular movements from within the car park and some distant construction noise from a nearby house. Ambient daytime noise levels were in the range of 53 to 54 dB L<sub>Aeq,15mins</sub> while daytime background noise levels were in the range of 49 to 50 dB L<sub>A90,15mins</sub>. The measured noise levels at this location are broadly in line with those mapped as part of the agglomeration road noise maps in this area of the site.

### 13.3.2.2 Baseline Vibration

There are no appreciable sources of vibration in the surrounding environment. Baseline vibration monitoring was therefore not undertaken within or in the vicinity of the site as no appreciable levels of vibration would be measured.

### 13.3.3 Baseline Summary

The noise environment across the Masterplan and Applicant site is suburban in nature with road traffic and a mix of typical suburban from pedestrians, schools and residential areas. Highest noise levels are experienced along the southern portion of the Shipyard Site in immediate proximity to the R527 Condell Road. Across the masterplan and applicant site, noise levels are low to medium during both day and night-time periods due to distance from the surrounding road network and screening from existing boundary walls and site structures. The noise environment at the surrounding noise sensitive locations

are typical of a suburban environment with distant road traffic and surrounding local activities contributing to the ambient and background noise environment.

### 13.4 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

The Proposed Development includes the development of various residential sites across the Salesians Zone, Stonetown Terrace Zone, O'Callaghan Strand which is located within the Flaxmill Zone and the Quarry Zone; and the full Public Realm for the entire site excluding St. Michaels Rowing Club. A temporary meanwhile use for the Shipyard Zone is proposed as part of the application site. Demolition will be undertaken on site to facilitate the proposed development, including the total demolition of the Salesians School and associated buildings.

#### 13.4.1.1 Construction Phase

The construction phase for the applicant site will involve the same general construction activities as the overall Masterplan site, i.e. demolition works, excavation to base ground levels, basement slab construction, concrete works, construction of the superstructures, landscaping and fit out works in addition to construction traffic. The works will be undertaken on a phased basis during the construction phase of the application site. The same potential sources of noise and vibration associated with the Masterplan Site will occur during the construction of the Application Site.

#### 13.4.1.2 Operational Phase

Once operational the potential noise sources associated with the Applicant Site relate to external operational mechanical and electrical plant items required to serve the residential buildings. The location of external plant items with potential to emit noise to the surrounding environment are located on various roof levels of the proposed development buildings. There is potential for noise generated within the external plaza and temporary meanwhile use areas during the operational phase associated with external seating areas and potentially from amplified music. Traffic flows to and from the development via public roads also have the potential to increase the surrounding noise environment.

These potential impacts are discussed in the following sections.

### 13.5 LIKELIHOOD OF SIGNIFICANT EFFECTS

#### 13.5.1 Construction Noise Effects

The highest potential noise and vibration impacts associated with the Proposed Development will occur during the construction phase due to the different phases of work requiring a range of construction plant and equipment with high noise levels.

The construction phase for the Proposed Development is anticipated to be completed over an approximate 3 year period over 9 work stages. The work stages will progress sequentially but with overlapping stages. As the overall construction phase is less than 7 years, impacts during this phase are short-term. Specific stages of work will occur over a number of months and less than 1 year and hence are described as temporary impacts, where relevant.

The nearest NSLs to the site are existing residential dwellings along the north, northeast and southern boundaries in addition to the Salesian Primary School to the west of the site. The closet NSLs are outlined below and highlighted within Figure 0.8.

- NSL 1: Residential apartment building and houses to the north-east of the site along Stonetown Terrace.
- NSL 2: Residential houses to the North of the site along Clanmaurice Avenue.
- NSL 3: Salesian Primary School to west of the site.
- NSL 4: Residential houses within Fernhill residential estate to the southwest of the site



**Figure 0.8.** Closest NSLs to Proposed Development

The impact at nearby NSLs will depend upon a number of variables, the most notable of which are:

- the amount of noise generated by plant and equipment being used at any one time, expressed in terms of sound pressure or sound power;
- the periods of operation of the plant at the development site over the working day, known as the “on-time”;
- the distance between the noise source and the receptor; and
- the attenuation due to ground absorption or barrier screening effects from walls, buildings, site hoarding etc.

The construction phase involves a number of various stages which will encompass a range of different activities on a day to day and week to week basis. Given the dynamic nature of the works, it is not possible to calculate with a high degree of accuracy the specific levels of noise associated with each stage that is representative of each potential scenario.

Indicative ranges of noise levels associated with construction may be calculated in accordance with the methodology set out in BS 5228-1 (BSI 2019). This standard sets out sound power / sound pressure levels for plant items normally encountered on construction sites, which in turn enables the prediction of noise levels. These have been used to derive typical construction noise levels associated with different phases of work based on the main construction works and methods to be employed at the site.

### Construction Timelines

The nine key construction stages are set out below as set out in the Construction and Environmental Management Plan (CEMP) and Chapter 2 (Project Description). The proposed timeline and likely overlapping phases is illustrated below. Construction of Stages 4 to 8 will involve the longest periods of overlapping works.

| Stage | Work Activity                 | 2027 |    |    |    | 2028 |    |    |    | 2029 |    |    |    | 2030 |    |    |    |
|-------|-------------------------------|------|----|----|----|------|----|----|----|------|----|----|----|------|----|----|----|
|       |                               | Q1   | Q2 | Q3 | Q4 | Q1   | Q2 | Q3 | Q4 | Q1   | Q2 | Q3 | Q4 | Q1   | Q2 | Q3 | Q4 |
| 1     | Construction of Bat Houses    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |
| 2     | Demolition/enabling works     |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |
| 3     | Flood Defence works           |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |
| 4     | Construction of Salesians     |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |
| 5     | Construction of Stone Terrace |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |
| 6     | O'Callaghan Strand            |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |
| 7     | Construction of PBSA          |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |
| 8     | Delivery of Flaxmill Plaza    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |
| 9     | MobilityHub on the Shipyard   |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |

The potential noise impacts during each stage are discussed in the following sections.

### Stage 1 – Construction of Bat Houses

Two bat houses are proposed within the north-west boundary of the site in the vicinity of the existing school buildings to be demolished. The construction of these structures will involve standard construction methodologies using plant items which may include lifting equipment, dozers etc with noise levels typically between 65 and 70 dB  $L_{Aeq}$  at 10m. A total construction noise level of 75 dB  $L_{Aeq}$  at 10m has been used for the purposes of a conservative indicative calculation. This would include, for example three items of plant at 70 dB  $L_{Aeq}$  operating simultaneously within a work area.

Using the above combined construction noise level for this stage of works, indicative construction noise levels have been calculated the closest NSLs as per Figure 0.8. The calculations are based on the closest NSLs from this work area. The calculations include screening from site hoarding or site boundary walls, where these are in place in proximity to the assessed NSLs.

**Table 0.12** Indicative Construction Noise Levels during Stage 1 Works

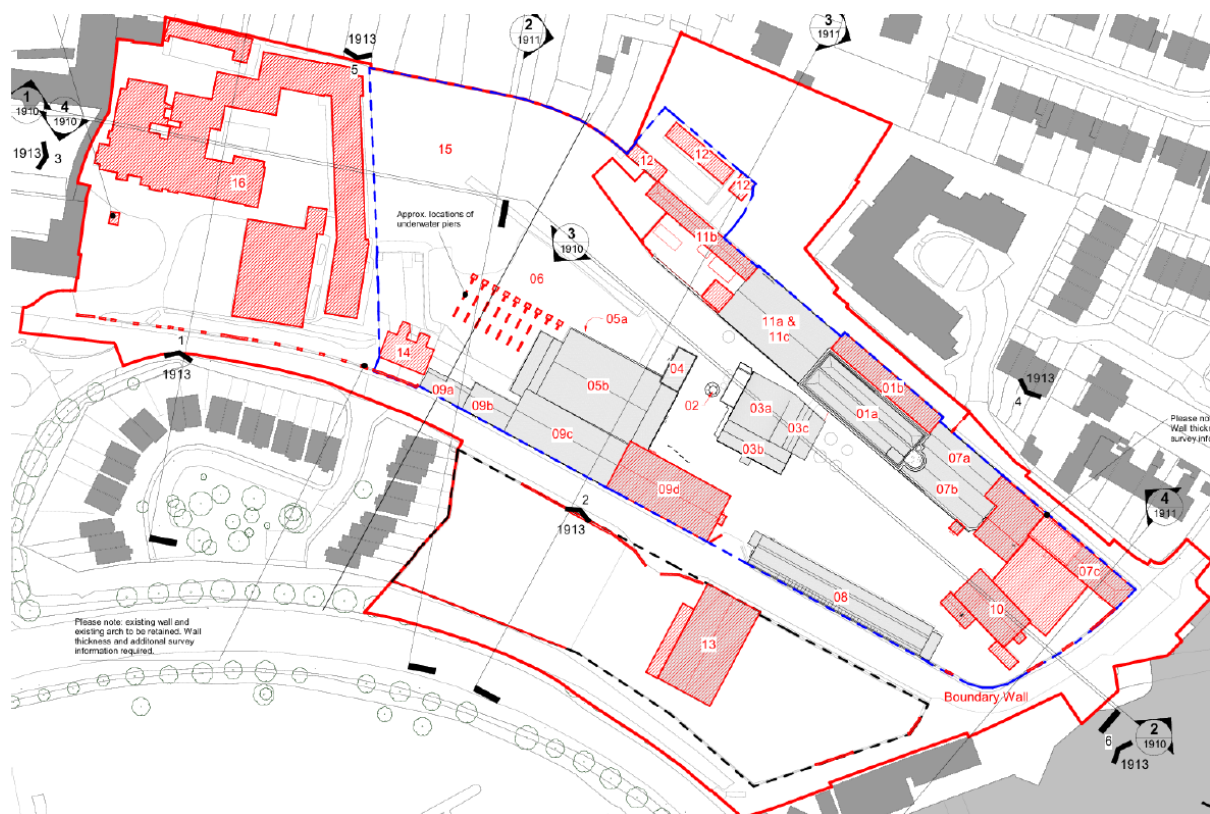
| Assessment Location | Predicted Construction Noise Level (dB $L_{Aeq,T}$ ) | EPA Significance Rating |                                          |
|---------------------|------------------------------------------------------|-------------------------|------------------------------------------|
|                     | Stage 1                                              | Significance Rating     | Potential Effect                         |
| NSL 1               | 38                                                   | Not Significant         | Negative, Not Significant, and Temporary |

|       |    |                    |                                             |
|-------|----|--------------------|---------------------------------------------|
| NSL 2 | 48 | Slight to Moderate | Negative, Slight to Moderate, and Temporary |
| NSL 3 | 53 | Slight to Moderate | Negative, Slight to Moderate, and Temporary |
| NSL 4 | 43 | Not Significant    | Negative, Not Significant, and Temporary    |

There are no significant construction noise levels associated with this phase at any of the surrounding NSLs.

### Stage 2 – Site Demolition and Enabling Works

This stage involves demolishing identified buildings and structures to facilitate development and installing enabling drainage infrastructure across the Flaxmill area. A number of structures will be demolished within the Application Site, including those in the Riverside quarter, The Shipyard, Stonetown Terrace and portion of the Quarry site. The location of proposed demolition works across the Application Site are illustrated in Figure 0.9, taken from Figure 2.7 of Chapter 2 (Project Description). A description of each demolition area is provided in Section 2.5.2.the CEMP.



**Figure 0.9.** Demolitions and Infrastructure Works During Stage 2

Demolition of existing structures will involve careful deconstruction using controlled techniques. This will involve top-down deconstruction methods that will avoid intrusive activities, as far as practicable. There will be a requirement for breaking of structures and made ground as part of specific demolition procedures. The use of a mobile crusher will be required during this phase.

For construction works associated in any one work area, the typical plant required is likely to include wheeled loaders, bulldozers, pulverisers, hand tools and a mobile crusher. Noise levels are typically in

the range of 80 to 90 dB  $L_{Aeq}$  at 10m within BS 5228-1 from these activities, depending on the on-time over any one day.

A total construction noise level of 92 dB  $L_{Aeq}$  at 10m has been used for the purposes of indicative calculations for these activities representing a variety of plant items and activities over this stage. This would include, for example two items of plant at 80 dB  $L_{Aeq}$ , one item of plant at 85 dB  $L_{Aeq}$  and one item of plant at 90 dB  $L_{Aeq}$  operating simultaneously within one work area resulting in a total noise level of 92 dB  $L_{Aeq}$ .

### Stage 3 – Flood Protection Works

It is proposed to regrade the North Circular Road to a flood protection level of 5.7m AOD as a key flood mitigation measure in addition to implementing other flood protection measures will occur concurrently with Stage 2 and is expected to take 15 months. These works will be completed before any residential units are occupied.

This will likely involve the use of typical road work construction equipment including lorries, road planers, pavers and rollers etc. Noise levels are typically in the range of 75 to 80 dB  $L_{Aeq,T}$  at 10m within BS 5228-1. For a linear working area of 100m with different mobile plant in operation at different locations, an average noise level of 79 dB at 10m has been used for these works.

Using the above combined construction noise level for Stage 2 and Stage 3 occurring at the same time, indicative construction noise levels have been calculated the closest NSLs as per Figure 0.8. The calculations are based on the closest NSLs from both working areas. The calculations include screening from site hoarding or site boundary walls, where these are in place in proximity to the assessed NSLs.

**Table 0.13** Indicative Construction Noise Levels during Stage 2 and 3 Works Concurrently

| Assessment Location | Predicted Construction Noise Level (dB $L_{Aeq,T}$ ) | EPA Significance Rating         |                                                           |
|---------------------|------------------------------------------------------|---------------------------------|-----------------------------------------------------------|
|                     | Stage 2 & 3                                          | Significance Rating             | Potential Effect                                          |
| NSL 1               | 79                                                   | Significant to Very Significant | Negative, Significant to Very Significant, and Short-term |
| NSL 2               | 73                                                   | Significant to Very Significant | Negative, Significant to Very Significant, and Short-term |
| NSL 3               | 81                                                   | Significant to Very Significant | Negative, Significant to Very Significant, and Short-term |
| NSL 4               | 77                                                   | Significant to Very Significant | Negative, Significant to Very Significant, and Short-term |

During Stage 2 and 3 works, there is potential for a negative, significant to very significant and short-term effect to occur at the closest NSLs without mitigation measures. Highest noise levels will occur when breaking and crushing equipment are in use which will only occur for portions of time during the overall demolition phase. There will be extended periods during this phase of works when these items of plant (i.e. breakers and crushing plant) will not be in operation, hence the calculated noise levels in

Table 0.13 represents a conservative assessment representing the potential highest noise levels likely to occur during these phases.

#### **Stage 4 – Stage 7: Salesians Zone, Stonetown Terrace, Quarry Zone**

These stages will involve construction of development buildings, along with local public realm and communal open spaces. The construction activities associated with each of these stages is sub divided into three main sub categories, discussed below.

##### Excavation and Piling Works

Once the demolition works and site clearance works are complete, there will be excavation works across each of the development sites to varying levels to obtain the required formation levels. Excavation of shallow bedrock will be undertaken during the works which will necessitate the use of rock breaking and other standard mechanical excavations methods. The majority of rock extraction will occur within the Salesians Site and a portion of O Callaghan Strand Site. Crushing of excavated rock and concrete will likely be required on site also.

Bored piling is proposed for the Stonetown Terrace Apartments. For the other buildings, shallow pad foundations are the likely foundation solution and hence don't have any significant noise generating activity.

For construction works associated with such activities as rotary piling, ground-breaking and excavation, noise levels are typically in the range of 80 to 90 dB  $L_{Aeq}$  at 10m. A total construction noise level of 90 dB  $L_{Aeq}$  at 10m has been used for the purposes of indicative calculations for these activities representing a variety of plant items and activities over this stage. This would include, for example three items of plant at 75 dB  $L_{Aeq}$ , two items of plant at 85 dB  $L_{Aeq}$  and two items of plant at 80 dB  $L_{Aeq}$  operating simultaneously within one work area resulting in a total noise level of 90 dB  $L_{Aeq}$ . Multiple other combination of higher or lower noise emission plant items with various "on-times" would result in this noise emission which is considered a robust value to use for this phase.

Using the above combined construction noise level associated with this activity, indicative construction noise levels have been calculated the closest NSLs as per Figure 0.8. The calculations are based on the closest distances of the NSLs from both working areas. The calculations include screening from site hoarding or site boundary walls, where these are in place in proximity to the assessed NSLs.

**Table 0.14** Indicative Construction Noise Levels during Excavation and Piling Works

| Assessment Location | Predicted Construction Noise Level (dB $L_{Aeq,T}$ ) | EPA Significance Rating         |                                                           |
|---------------------|------------------------------------------------------|---------------------------------|-----------------------------------------------------------|
|                     | Stage 4 – 7 (Excavation and Piling)                  | Significance Rating             | Potential Effect                                          |
| NSL 1               | 77                                                   | Significant to Very Significant | Negative, Significant to Very Significant, and Short-term |
| NSL 2               | 71                                                   | Significant to Very Significant | Negative, Significant to Very Significant, and Short-term |
| NSL 3               | 75                                                   | Significant to Very Significant | Negative, Significant to Very Significant, and Short-term |

|       |    |                                 |                                                           |
|-------|----|---------------------------------|-----------------------------------------------------------|
| NSL 4 | 75 | Significant to Very Significant | Negative, Significant to Very Significant, and Short-term |
|-------|----|---------------------------------|-----------------------------------------------------------|

During Stages 4 to 7 works when rock breaking, ground breaking, rock crushing and piling activities are taking place, there is potential for a negative, significant to very significant and short-term effect to occur at the closest NSLs without mitigation measures. In reality, construction activities (specifically rock breaking activities) will occur at greater distances than those assumed in the Table 0.14 at any one time. There will be extended periods during this phase of works when these items of plant will not be in operation or will be in use only for a portion of any one period. The assessment above therefore represents a conservative assessment representing the potential highest noise levels likely to occur.

#### Foundations, Concreting and Steel Works

For construction works associated with activities such as basement and foundation construction and structural works including excavators, loaders, dozers, cranes, generators, and concreting works etc. noise levels are typically in the range of 70 to 80 dB  $L_{Aeq}$  at 10m.

For ongoing construction activity associated with the above activities, a total construction noise level of 82 dB  $L_{Aeq}$  at 10m has been used for the purposes of indicative calculations for these activities representing a variety of plant items and activities over this stage. This would include, for example one items of plant at 70 dB  $L_{Aeq}$ , two items of plant at 75 dB  $L_{Aeq}$  and one item of plant at 80 dB  $L_{Aeq}$  at 10m operating simultaneously within one work area resulting in a total noise level of 82 dB  $L_{Aeq}$ .

Using the above combined construction noise level associated with this activity, indicative construction noise levels have been calculated the closest NSLs as per Figure 0.8. The calculations are based on the closest NSLs from both working areas. The calculations include screening from site hoarding or site boundary walls, where these are in place in proximity to the assessed NSLs.

**Table 0.15** Indicative Construction Noise Levels during Foundations, Concrete and Steelworks

| Assessment Location | Predicted Construction Noise Level (dB $L_{Aeq,T}$ ) | EPA Significance Rating |                                                   |
|---------------------|------------------------------------------------------|-------------------------|---------------------------------------------------|
|                     | Stage 4 – 7 (Foundations and Steelworks)             | Significance Rating     | Potential Effect                                  |
| NSL 1               | 69                                                   | Moderate to Significant | Negative, Moderate to Significant, and Short-term |
| NSL 2               | 63                                                   | Slight to Moderate      | Negative, Slight to Moderate, and Short-term      |
| NSL 3               | 67                                                   | Moderate to Significant | Negative, Moderate to Significant, and Short-term |
| NSL 4               | 67                                                   | Moderate to Significant | Negative, Moderate to Significant, and Short-term |

During Stages 4 to 7 works when building foundations, concrete works and steelworks are taking place, there is potential for a negative, slight to very significant and short-term effects to occur at the closest NSLs without mitigation measures. There will be extended periods during this phase of works when lower noise levels will occur compared to those in Table 0.15 will be experienced during the dynamic

nature of construction activities, hence the assessment above represents a conservative assessment representing the potential highest noise levels likely to occur.

#### Superstructure and Fit-out Works

For construction work areas with lower noise levels such as those associated with superstructure works including site compounds (for storage, offices and material handling, generators etc.), building elements with smaller items of mobile plant (excavators, cranes, dozers) and landscaping with lower noise emissions, a total construction noise level of 78 dB  $L_{Aeq}$  at 10m has been used for the purposes of indicative calculations. This would include, for example one item of plant at 75 dB  $L_{Aeq}$  and three items of plant at 70 dB  $L_{Aeq}$  operating simultaneously within a work area.

Using the above combined construction noise level associated with this activity, indicative construction noise levels have been calculated the closest NSLs as per Figure 0.8. The calculations are based on the closest NSLs from both working areas. The calculations include screening from site hoarding or site boundary walls, where these are in place in proximity to the assessed NSLs.

**Table 0.16** Indicative Construction Noise Levels during Superstructure and Fitout Works

| Assessment Location | Predicted Construction Noise Level (dB $L_{Aeq,T}$ ) | EPA Significance Rating |                                              |
|---------------------|------------------------------------------------------|-------------------------|----------------------------------------------|
|                     | Stage 4 – 7 (Superstructure and Fitout)              | Significance Rating     | Potential Effect                             |
| NSL 1               | 65                                                   | Slight to Moderate      | Negative, Slight to Moderate, and Short-term |
| NSL 2               | 59                                                   | Slight to Moderate      | Negative, Slight to Moderate, and Short-term |
| NSL 3               | 63                                                   | Slight to Moderate      | Negative, Slight to Moderate, and Short-term |
| NSL 4               | 63                                                   | Slight to Moderate      | Negative, Slight to Moderate, and Short-term |

During Stages 4 to 7 works when the main building works are taking place, there is potential for a negative, slight to moderate and short-term effects to occur at the closest NSLs without mitigation measures. There will be extended periods during this phase of works when lower noise levels will occur compared to those in Table 0.16 will be experienced during the dynamic nature of construction activities, hence the assessment above represents a conservative assessment representing the potential highest noise levels likely to occur.

#### **Stage 8: Flaxmill Plaza and Riverside Public Realm**

Delivery of Flaxmill Plaza and riverside canopy works is anticipated to take 15 months. This stage will begin after the completion of Stonetown Terrace but before the Salesians Zone is finished. Completion is expected to align with the Purpose Built Student Accommodation (PBSA). This will include the use of ground works, landscaping using a variety of standard construction plant and equipment, similar in nature to those discussed above for general construction works. A total noise level of 78 dB  $L_{Aeq}$  at 10m has been used for the purposes of indicative calculations for this stage.

Using the above combined construction noise level associated with this activity, indicative construction noise levels have been calculated the closest NSLs as per Figure 0.8. The calculations are based on the closest NSLs from both working areas. The majority of the on-site buildings will be constructed during this phase of work and will provide a high level of screening to NSLs around the site boundaries.

**Table 0.17** Indicative Construction Noise Levels during Flaxmill Plaza and Public Realm

| Assessment Location | Predicted Construction Noise Level (dB L <sub>Aeq,T</sub> ) | EPA Significance Rating |                                              |
|---------------------|-------------------------------------------------------------|-------------------------|----------------------------------------------|
|                     | Stage 8 (Plaza and Public Realm)                            | Significance Rating     | Potential Effect                             |
| NSL 1               | 50                                                          | Slight to Moderate      | Negative, Slight to Moderate, and Short-term |
| NSL 2               | 46                                                          | Slight to Moderate      | Negative, Slight to Moderate, and Short-term |
| NSL 3               | 40                                                          | Not Significant         | Negative, Not Significant, and Short-term    |
| NSL 4               | 49                                                          | Not Significant         | Negative, Not Significant, and Short-term    |

During Stage 8 works there is potential for a negative, not significant to moderate and short-term effects to occur at the closest NSLs without mitigation measures. There will be extended periods during this phase of works when lower noise levels will occur compared to those in Table 0.17 will be experienced during the dynamic nature of construction activities, hence the assessment above represents a conservative assessment representing the potential highest noise levels likely to occur.

#### **Stage 9: Shipyard Mobility Hub**

The final stage involves constructing the Mobility Hub on the Shipyard site, along with associated site works. This will include a canopy and photovoltaic panels including double stacker bicycle parking and EV Charging spaces. The remaining area of the zone will accommodate temporary car parking and a temporary external event space to be used on a periodic basis as the need arises, pending future redevelopment proposals as detailed in the Masterplan (Stage IV). Works associated with this stage will commence once all other stages are complete and is expected to take 6 months.

The proposed works will involve surfacing of the ground area for car parking, construction of canopy and installation of ancillary elements. A total noise level of 78 dB L<sub>Aeq</sub> at 10m has been used for the purposes of indicative calculations for this stage, representing the range of typical construction activities with low to medium noise levels.

Using the above combined construction noise level associated with this activity, indicative construction noise levels have been calculated the closest NSLs as per Figure 0.8. The calculations are based on the closest NSLs from both working areas. The majority of the on-site buildings will be constructed during this phase of work and will provide a high level of screening to NSLs around the site boundaries.

**Table 0.18** Indicative Construction Noise Levels during Mobility Hub Works

| Assessment Location | Predicted Construction Noise Level (dB L <sub>Aeq,T</sub> ) | EPA Significance Rating |                                                  |
|---------------------|-------------------------------------------------------------|-------------------------|--------------------------------------------------|
|                     | Stage 9 (Mobility Hub)                                      | Significance Rating     | Potential Effect                                 |
| NSL 1               | 46                                                          | Slight to Moderate      | Negative, Slight to Moderate, and Temporary      |
| NSL 2               | 42                                                          | Not Significant         | Negative, Not Significant, and Temporary         |
| NSL 3               | 43                                                          | Not Significant         | Negative, Not Significant, and Temporary         |
| NSL 4               | 67                                                          | Moderate to Significant | Negative, Moderate to Significant, and Temporary |

During Stage 9 works there is potential for a negative not significant to moderate to significant and temporary effects to occur at the closest NSLs without mitigation measures. There will be extended periods during this phase of works when lower noise levels will occur compared to those in Table 0.18 will be experienced during the dynamic nature of construction activities, hence the assessment above represents a conservative assessment representing the potential highest noise levels likely to occur.

### 13.5.2 Construction Vibration Effects

#### 13.5.2.1 Ground Breaking / Rock Breaking Activities

The proposed building formation levels will require made ground, rock and overburden to be excavated. During excavation below ground level in soil, there are no significant vibration sources expected due to the ground conditions.

As the depth to bedrock varies across the site 0.7 to 14.5 m below ground level, the use of rock ripping / breaking will likely be required which will be largely within the Salesians Site and a portion of O Callaghan Strand. These activities have the potential to generate vibration impacts to the surrounding structures, buildings and building occupants. Empirical data for this activity is not provided in the BS 5228-2 (BSI 2014) standard, however the likely levels of vibration from this activity will be significantly below the vibration criteria for any form of cosmetic building damage on experience from other sites. AWN Consulting have previously conducted vibration measurements under controlled conditions, during trial construction works on a sample site where concrete slab breaking was carried out. The trial construction works consisted of the use of the following plant and equipment when measured at various distances:

- 3 tonne hydraulic breaker on small CAT tracked excavator
- 6 tonne hydraulic breaker on large Liebherr tracked excavator

Vibration measurements were conducted during various staged activities and at various distances. Peak vibration levels during staged activities using the 3 Tonne Breaker ranged from 0.48 to 0.25 PPV (mm/s) at distances of 10 to 50m respectively from the breaking activities. Using a 6 Tonne Breaker, measured vibration levels ranged between 1.49 to 0.24 PPV (mm/s) at distances of 10 to 50m respectively. Whilst these measurements relate to a solid concrete slab, the range of values recorded provides some context in relation typical ranges of vibration generated by construction breaking activity.

***Historic and or Protected Structures***

There are two protected structures within the overall Masterplan site; a former Flaxmill and a brick chimney. There are other structures which are of high heritage significance which are described in Chapter 9 of this EIAR (Architectural and Cultural Heritage). Phase 1 of the Masterplan development involves the stabilisation and repair works to the Flaxmill. In the event rock breaking is occurring within 10m of any of the protected or heritage structures, vibration levels will be below those set in Table 0.4 for protected buildings (6mm/s) or the identified structurally vulnerable buildings (3mm/s) during the use of 3 or 6 tonne breakers in operation. The impact to protected structures is negative, not significant and short-term.

***Residential and other Light Framed Structures***

Considering the vibration levels at very close distances to breaking activity, vibration levels at the surrounding buildings will be below those associated with cosmetic or structural damage to any of the buildings in proximity to the development works or any of the other nearby buildings.

***Building Occupants – Human Response***

The closest occupied NSLs relate to the Salesian Primary School to the west of the Salesian Site where rock will be extracted. Vibration levels have the potential to be of the order of 1mm/s or below at this building depending on the proximity of rock breaking activity to the school building. Vibration magnitudes of 1mm/s have the potential to generate moderate to significant effects to building occupants, depending on the duration of works and the absence of prior notice. At all other occupied sensitive buildings surrounding the site, impacts are expected to be negative, slight to moderate and short-term.

**13.5.2.2 Piling**

Bored piling is proposed for the Stonetown Terrace Apartments. The expected vibration levels during piling using bored piles, have been determined through reference to published empirical data. The British Standard BS 5228 – 2 (BS1 2019), publishes the measured magnitude of vibration of rotary bored piling using a 600 mm pile diameter for bored piling into soft ground over rock in line with the site conditions experienced at the proposed development site:

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

***Historic and or Protected Structures***

The closest protected structure to any planned piling works is not greater than 20m from the Flaxmill complex. Referring to the vibration magnitudes above during bored piling, vibration levels will be well below those set in Table 0.4 for protected buildings (6mm/s) or the identified structurally vulnerable buildings (3mm/s). The impact to protected structures is negative, not significant and short-term.

***Residential and other Light Framed Structures***

The closest off-site sensitive buildings to piling works are the Landsdowne Hall apartment building, located at least 20m from any piling works. Referring to the vibration magnitudes above during bored piling, vibration levels relating to building response will be well below those set in Table 0.4 for residential

and light-framed buildings (15mm/s) The impact to adjacent residential buildings is negative, not significant and short-term

#### ***Building Occupants – Human Response***

The closest occupied NSLs relate to Landsdowne Hall apartment building, located at least 20m from any piling works. Considering the low vibration levels at very close distances to the piling rigs (5m), vibration levels at this building will be below 0.5mm/s and below those associated with significant effects to building occupants. The potential vibration effects relating to human response is negative, not significant to slight and temporary.

### **13.5.3 Construction Traffic**

The construction phase of the proposed development will result in additional traffic on the roads in the vicinity of the development. Additional vehicles will comprise heavy goods vehicles, fuel trucks and light goods vehicles. The proposed haul route for demolition waste and construction materials and plant will be from the N18, via the Salesians Roundabout, the R527 Condell Road and the Clonmacken Roundabout. Chapter 17 (Material Assets – Traffic & Transport) presents an assessment of the construction traffic required to access and exit the site over the duration of the Construction Phase of the Proposed Development.

The assessment notes that due to the complexity of the site and separate zones to be built, the construction activities will be phased, with the intensity of trips being limited at any given time. It has been robustly assumed that during construction of any one zone, there will be no more than 20 additional construction vehicular trips per hour (10 in / 10 out).

Taking a precautionary approach, it has been assumed that 100% of construction vehicles travel through the Salesians roundabout. The construction traffic uplift results in a 2% increase in flows through the Salesians roundabout during the AM and PM peak periods. The resultant change in traffic noise at this junction is set out in Table 0.19 and the related potential effect as per Table 0.3.

**Table 0.19** Construction Traffic Noise Impacts

| Road Link                   | Do Nothing               |      | Do something – Construction Traffic |      | Change in Noise Level, dB | Potential Effect          |
|-----------------------------|--------------------------|------|-------------------------------------|------|---------------------------|---------------------------|
|                             | Traffic Flow – Peak Hour | %HGV | Traffic Flow – Peak Hour            | %HGV |                           |                           |
| Salesian roundabout AM Peak | 1,052                    | 2%   | 1,072                               | 4%   | +1.1                      | Not Significant to Slight |
| Salesian roundabout PM Peak | 1,048                    | 2%   | 1,072                               | 4%   | +1.1                      | Not Significant to Slight |

The calculated change in traffic noise associated with the addition of construction related traffic is less than 2 dB (A) along the closest access roundabout to the site and the potential effects are determined as negative, not significant to slight and short-term.

#### 13.5.4 Operational Phase – Outward Noise Impacts

The main potential sources of outward noise from the development during the operational phase relate to building services plant, additional traffic on the surrounding road network and general activity from the proposed new plaza and temporary meanwhile use areas.

##### ***Building Services Plant Noise***

There will be a variety of mechanical and electrical (M&E) items required to serve the apartment buildings once they become operational. The majority of these are housed at basement, ground and first floor level within the buildings as relevant, and will not emit any notable noise outside the buildings. The location of external plant items with potential to emit noise to the surrounding environment are Air Source Heat Pumps (ASHPs) located at roof level of the following buildings:

- Block A of Salesians Apartments;
- West wing of the quarry zone PBSA;
- Stonetown Terrace Apartment Block, and;
- O'Callaghan Strand Apartment Building Roof space.

The proposed design allows for each block to have two ASHP units (1 duty and 1 standby). There are 4 no. ASHP located on Block A (western block) of the Salesians Apartments, 2 duty and 2 standby serving blocks A and B. There are 6 no. of ASHP located on the Quarry / PBSA western block. 2 No. of units will provide the heating to the western block, 2 no. of units for the central block and 2 no of units for the eastern block. There are 2 no. ASHPs located on the roof of Stonetown Terrace Apartments, 1 no duty, 1 no standby and 2 no. ASHP within the open roof pitched zone of the O'Callaghan Strand Building (1 no duty, 1 no standby).

Each ASHP unit shall be sized for approximately 70% of the overall max heating load of the relevant block it is supplying. The pair of units will not operate together at full capacity except for in extreme cold conditions (i.e. in conditions of less than -5 degrees) when the two units may have to operate to meet the heating load of the building. In normal conditions, only one of the units will operate up to its maximum capacity. Typically, the single unit would be operating at a lower capacity of 60%.

Each of the plant areas housing the ASHPs will be surrounded by a solid acoustic perimeter screen with absorptive facing to inner face, the screen heights are designed to be higher than the units (up to 3.2m high) to provide a sufficient level of vertical screening to surrounding NSLs.

The closest NSLs are those within the development itself. In line with Section 13.2.3 and Table 0.7, the external design criteria for NSLs within the development are 50 to 55 dB  $L_{A,T}$ , and 45 dB  $L_{A,T}$  for day and night-time periods respectively.

At existing NSLs outside the development, the operational criterion is set in line with Section 13.2.3 and BS 4142 (BSI 2019). Reference to the measured background noise level at the UN3 representing the closest NSLs along the northern and north-eastern site boundaries of the site has been used to set appropriate operational noise levels. Average background noise levels during the day were 39 dB  $L_{A90,16hr}$  and during the night, were 33  $L_{A90,8hr}$ . Allowing for an increase of no greater than 5 dB above existing background noise levels, a night-time plant noise level of 37  $L_{A,T}$  dB is proposed for the closest NSLs outside the development.

### Plant Noise Assessment

To calculate the contribution of plant noise emissions to the surrounding environment, noise prediction calculations have been carried out in general accordance with ISO 9613-2 (2024) using noise calculation software DGMR *iNoise*. The calculations consider the development layout buildings, ground topography, the noise attenuation provided by the plant screens and buildings between the plant and the surrounding NSLs, distance attenuation and the operational noise levels from the ASHP units.

As the final selection of the ASHP units is not yet procured, noise levels have been modelled using provided sound power information from potential suppliers, using a total sound power value of 91.6 dB (A). It is understood that the sound power levels are stated for full load operation. As noted above, 50% of the installed units are for standby use and will not operate under normal conditions at the same time as the duty units. Two scenarios have therefore been considered:

- Scenario 1: All duty ASHPs units in operation only at 80% on-time each
- Scenario 2: All duty and standby ASHPs units in operation at 60% on-time each

### Scenario 1

Under Scenario 1, representative of normal expected operation, the operational noise design criteria are achieved across all NSLs within and outside the development boundary.

### Scenario 2

Under Scenario 2, representative of scenarios where extra heating may be required during significantly colder winter nights, the operational noise design criteria is largely achieved across all NSLs within and outside the development boundary. There is potential for operational noise levels up to 40 dB  $L_{Aeq,8hr}$  at NSLs north of the site along Clanmaurice Avenue and the Landsdowne Hall Apartment buildings to the east of Stonetown Terrace. An external noise level of 40 dB  $L_{Aeq,8hr}$  will achieve a good internal noise level within all external NSLs with a window open. Given this scenario will occur during cold periods, windows will be closed and hence no significant effects relating to noise intrusion is expected.

Within the development, there is potential for night-time noise levels at the top floor of the Quarry and Salesians buildings to of up to 48 to 49 dB  $L_{Aeq,8hr}$ . Across an open window a reasonable internal noise level can be achieved and across a closed window a good internal noise level can be achieved in accordance with BS 8233 (BSI 2019). As noted above, given this scenario will occur during cold periods, windows will be closed and hence no significant effects relating to noise intrusion is expected. Further discussion on inward noise impacts to on-site development buildings are discussed within 13.5.4.1.

The above assessment is based on preliminary indicative operational noise levels associated with the proposed ASHPs which was used to determine the potential effects and noise mitigation requirements. Further discussion on mitigation measures is set out in Section 13.7.2.

Once the site is designed to achieve the noise limits discussed above. The impact associated with plant items serving the proposed development are not significant to slight, and long-term.

### ***Additional Traffic on Surrounding roads***

The Masterplan site has six vehicular access/egress points. Four are located off North Circular Road, one is off O' Callaghan Strand and one off Stonetown Terrace. All are existing access point with the

exception of a new access to the undercroft carparking at Salesians off North Circular Road and the other at the end of Stonetown Terrace providing access to the Stonetown Terrace Zone.

For the purposes of assessing the potential noise impact, it is appropriate to consider the relative increase in noise level associated with traffic movements on existing roads and junctions with and without the proposed development, given that traffic from the development will make use of the existing road network.

Traffic data along the adjacent roads/ junctions where traffic will travel from the site for the Do Minimum and Do Something scenarios in terms of the Annual Average Daily Traffic (AADT) and the percentage of HGVs (provided in parenthesis) have been reviewed to calculate the change in traffic noise.

The calculated change in noise levels during the Design Year (2045) and include traffic associated with the overall Masterplan Site are summarised in Table 0.20.

**Table 0.20** Operational Traffic Noise Impacts

| Junction                                           | Road                                 | Do Nothing<br>AADT<br>(% HGV) | Do Something<br>AADT<br>(% HGV) | Change in<br>Noise Level,<br>dB | Potential<br>Effect |
|----------------------------------------------------|--------------------------------------|-------------------------------|---------------------------------|---------------------------------|---------------------|
| Ennis Road/Shelbourne Road Junction                | Shelbourne Road Upper (Northern Arm) | 10,198 (4%)                   | 10,255 (3%)                     | 0.0                             | Imperceptible       |
|                                                    | Ennis Road Eastern Arm               | 10,360 (4%)                   | 10,366 (4%)                     | 0.0                             | Imperceptible       |
|                                                    | Shelbourne Road Lower (Southern Arm) | 9,311 (3%)                    | 9,395 (3%)                      | 0.0                             | Imperceptible       |
|                                                    | Ennis Road Western Arm               | 12,321 (3%)                   | 12,342 (3%)                     | 0.0                             | Imperceptible       |
| Salesian Roundabout + North Circular Road Junction | North Circular Road Western Arm      | 3,076 (3%)                    | 3,099 (3%)                      | 0.0                             | Imperceptible       |
|                                                    | R464 Northern Arm                    | 10,453 (3%)                   | 10,537 (3%)                     | 0.0                             | Imperceptible       |
|                                                    | North Circular Eastern Arm           | 4,420 (5%)                    | 4,826 (4%)                      | 0.2                             | Not significant     |
|                                                    | R464 Southern Arm                    | 15,334 (2%)                   | 15,634 (2%)                     | 0.1                             | Not significant     |
| Condell Road/R464 Junction                         | R464 Northern Arm                    | 15,629 (2%)                   | 15,929 (2%)                     | 0.1                             | Not significant     |
|                                                    | Condell Road Eastern Arm             | 29,698 (3%)                   | 29,987 (3%)                     | 0.0                             | Imperceptible       |
|                                                    | Condell Road Western Arm             | 15,462 (4%)                   | 15,473 (4%)                     | 0.0                             | Imperceptible       |
| Ennis Road/Sarsfield Bridge Junction               | Clancy's Strand (Northern Arm)       | 5,353 (8%)                    | 5,393 (7%)                      | 0.0                             | Imperceptible       |
|                                                    | Sarsfield Bridge (Eastern Arm)       | 13,851 (6%)                   | 13,882 (6%)                     | 0.0                             | Imperceptible       |
|                                                    | O'Callaghan Strand (Southern Arm)    | 3,840 (2%)                    | 3,965 (2%)                      | 0.1                             | Not significant     |
|                                                    | Ennis Road (Western Arm)             | 12,538 (4%)                   | 12,592 (4%)                     | 0.0                             | Imperceptible       |

The calculated change in traffic noise associated with the addition of operational phase traffic is less than 1 dB (A) along the site access roads. Reference to Table 0.20 confirms the potential related impact is neutral, imperceptible, and long-term.

***Public Realms, Commercial Floor Space, Meanwhile Use Areas***

Commercial floor space at ground floor level of the apartment block fronting onto O'Callaghan Strand, within the O'Callaghan Strand Zone is proposed. This will likely include uses such as professional services or services to visiting members of the public or the use as a museum /art gallery /library. The purpose of this space is to activate the Flaxmill Plaza and to support the area defined by the Riverside Canopy. There are no significant sources of noise associated with this area.

Whilst external areas of seating have the potential to introduce a new noise source associated with people conversing etc. this area will be significantly screened from surrounding NSLs by the existing stone boundary wall surrounding the Cleaves Site, on its northern and eastern boundary.

The temporary meanwhile uses will mostly occur within the existing buildings to be retained on site, which is currently in place at the development site. There are no significant noise sources associated with these areas.

It is envisaged that the Shipyard Site will function as a temporary event space / sporting facility pending redevelopment of the site prior to the final Phase IV being progressed. The Shipyard site is capable of accommodating pop up and community support uses and could include food markets and stalls should the demand exist. Similarly, the proposed area accommodating the Riverside Canopy has the potential to accommodate external exhibition space; events and social gatherings and to function as informal facility for ball games as the need arises.

The main potential sources of outward noise from these areas relates to outdoor areas where amplified music or sound systems are proposed. Other sources of potential noise relate to external seating areas, cultural, play and public spaces proposed within the development site.

Activities from people congregating in these areas, and amplified music have the potential to generate audible noise to NSLs within the development site and those external to the development. The most critical time period being during late evenings periods or at night, if proposed. The majority of these activities will be designed to not exceed the design criteria in Table 0.7 relating to external noise levels. The specific control measures for individual areas or events will be determined at detail design and operational stage when specific events are planned in liaison with LCCC.

In the event that entertainment noise breakout from internal or external seating areas is scheduled post 23:00 hrs, music noise will be controlled in line with guidelines set by Limerick City Council for entertainment noise and will be detailed on a case by case basis.

In this instance it is proposed that an Estate Management policy is developed and takes cognisance of the potential for a noise nuisance to occur and implements suitable management policies communicated to all tenants

Once these broad principles of noise nuisance control are established as part of the overall estate management policy, the potential noise effects are negative, not significant to slight and temporary to short-term.

#### 13.5.4.1 Operational Phase – Noise Impacts

For the proposed development, the potential sources of inward noise are road traffic from the surrounding road network and operational plant noise serving the proposed development.

##### ***Stage 1 Assessment***

For the proposed development, the potential sources of inward noise are road traffic from the surrounding road network and any potential plant noise emissions from the development itself. The baseline noise surveys carried out, summarised in 13.3.2.1 and review of published road traffic mapped noise levels in Section 13.3.1.1, indicate that road traffic is the main source of noise in the surrounding area but does not contribute to any significant noise levels across the development site itself.

The closest NSLs within the Application Site to road traffic are the Salesians Townhouses fronting the North Circular Road (NCR) and eastern façade of the Apartment Building fronting O' Callaghan Strand. Across the remainder of the site, road traffic is not a major contributor due to the set-back distances and screening from the various existing structures across the site.

##### Salesians Townhouses

Noise levels at UN1 are representative of the external noise levels to the front elevations of the Salesians townhouses which front the onto NCR. Reference to Table 0.8 shows an average measured daytime noise level of 62 dB  $L_{Aeq,16hr}$  and the average night-time noise level of 54 dB  $L_{Aeq,16hr}$ .

Reference to Figure 0.1 indicates this area of the site is classified as low to medium risk in terms of residential use. Across the remainder of the townhouses which are setback from the NCR and screened by the proposed buildings, the noise environment will be negligible to low.

##### O'Callaghan Strand

The eastern façade of O'Callaghan Strand apartment building fronts onto O'Callaghan Strand. Reference to 13.3.1.1 which reviews the mapped traffic noise level along this road, indicates mapped noise levels in the range of 60 to 64 dB  $L_{den}$ . Using the higher value from the contour range, this would typically equate to a daytime noise level 62 dB  $L_{Aeq,16hr}$ . Night-time traffic noise levels are not mapped along this road. Given the similar mapped noise levels along this road to those measured at UN1 along NCR, the same night-time noise level will be used for this area also resulting in a low to medium risk classification.

##### Stage 1 Classification

ProPG states the following with respect to low and medium risks areas:

|             |                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Low Risk    | At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development                                                                                                                                        |
| Medium Risk | As noise levels increase, the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised, and which clearly demonstrate that a significant adverse noise impact will be avoided in the finished development. |

## ***Stage 2 Assessment***

### **Element 1 – Good Acoustic Design Principals**

Section 2.23 of the ProPG outlines the following checklist for Good Acoustic Design:

- Check the feasibility of relocating or reducing noise levels from relevant sources;
- Consider options for planning the site or building layout;
- Consider the orientation of proposed building(s);
- Select construction types and methods for meeting building performance requirements;
- Examine the effects of noise control measures on ventilation, fire regulation, health and safety, cost, CDM (construction, design and management) etc;
- Assess the viability of alternative solutions; and,
- Assess external amenity area noise.

In the context of the proposed development, each of the considerations listed above have been addressed in the following subsections.

#### ***Relocation or Reduction of Noise from Source***

With regards to road noise, this source is located outside the redline boundary of the site and therefore it is beyond the scope of this development to introduce any noise mitigation at source.

#### ***Planning, Layout and Orientation***

As part of the project design, the majority the residential buildings are set back from the road boundary and result in a negligible to low noise environment. The two areas identified above with elevated noise levels front the NCR and O'Callaghan Strand Road, however only a portion of the rooms within each face the road with the remaining facades set back from road traffic. The external amenity areas facing the road boundaries are also inset into the building façade, providing a sheltered set back area. The orientation of the site is such that the existing structures that are being retained and the proposed site buildings themselves provide screening from road traffic and also screen the common external amenity areas associated with the development.

#### ***Selection Construction Types for Meeting Building Regulations***

The design of all buildings is required to meet with all relevant parts of the Building Regulations including Part E, Sound. The specific detail of which will be completed at detailed design stage. This will include separation constructions between the residential apartments and those spaces with potentially higher noise levels including residential amenity areas, retail spaces, restaurant and cafes, creche etc. All the above spaces will be separated from the residential areas through specification of enhanced sound insulation performance to separating slabs and walls (where relevant). This element of the work forms part of the detail design.

In terms of the building envelope sound insulation, the glazed elements and any required ventilation paths to achieve compliance with Part F of the Building Regulations will be the weakest elements in the façade from a noise ingress point of view. The buildings will be ventilated by heat recovery units which don't require in window or wall passive ventilation.

The provision of sound insulation performance for glazing, will be used where required to achieve suitable internal noise levels within the development. Achievement of acceptable internal ambient noise levels does not form part of building regulation requirements in Part E. However, this will be incorporated into the building design in line with best practice and compliance with the guidance set out in ProPG, BS 5288 (2019) and the Limerick Agglomeration NAP (2024).

For units where it will not be possible to achieve the desirable internal acoustic environments with windows open, the proposal here will be to provide dwelling units with glazed elements that have good acoustic insulation properties so that when the windows are closed the noise levels internally are good. Inhabitants will be able to open the windows during all periods. However, doing so will increase the internal noise level.

#### *Impact of noise control measures on fire, health and safety etc.*

The good acoustic design measures that have been implemented on site, e.g. locating properties away from the road are considered to be cost neutral and do not have any significant impact on other issues.

#### *Access Viability of Alternative Solutions*

The main noise source incident on the site is road traffic. This source is largely mitigated by the distance to the building, screening by the on-site building and orientation of building layouts to avoid overlooking of sensitive rooms and amenity spaces to the main noise sources. All the measures listed above aid in the control of noise intrusion to the buildings across the development site.

#### *Access External Amenity Area Noise*

ProPG provides the following advice with regards to external noise levels for amenity areas in the development:

*“The acoustic environment of external amenity areas that are an intrinsic part of the overall design should always be assessed and noise levels should ideally not be above the range 50 – 55 dB  $L_{Aeq,16hr}$ .”*

The amenity spaces across the majority of the development achieve noise levels at or below the noise level ranges above. The front garden areas of the Salesians Townhouses at ground floor level will exceed these levels, however an external amenity area at first floor level inset from the façade will experience lower noise levels and a range of communal amenity external areas with low noise levels are available across the application and masterplan site.

#### *Summary*

Considering the constraints of the site, insofar as possible and without limiting the extent of the development area, the principles of Good Acoustic Design have been applied to the development.

#### Element 2 – Internal Noise Levels

Element 2 of the ProPG document sets out recommended internal noise targets derived from BS 8233 (2014) which are set out in Table 0.7.

In addition to these absolute internal noise levels, ProPG provides guidance on flexibility of these internal noise level targets. For instance, in cases where the development is considered necessary or

desirable, and noise levels exceed the external noise guidelines, then a relaxation of the internal  $L_{Aeq}$  values by up to 5 dB can still provide reasonable internal conditions.

#### *Discussion on Open/Closed Windows*

The typical level of sound reduction offered by a partially open window falls in the region of 10 to 15 dB. Considering the design goals outlined in Table 0.7. and a sound reduction across an open window of 15 dB, the free-field noise levels that would be required to ensure that internal noise levels do not exceed good (i.e. at or below the internal noise levels) or reasonable internal noise levels (i.e. 5 dB above the internal noise levels) have been summarised in Table 0.21.

**Table 0.21** External Noise Levels Required to Achieve Internal Noise Levels

| Level Desired                                                       | Day<br>(07:00 to 23:00hrs)  | Night<br>(23:00hrs to 07:00) |
|---------------------------------------------------------------------|-----------------------------|------------------------------|
| Good (i.e. at or below the internal noise levels from BS 8233)      | 50 – 55 dB $L_{Aeq,16hour}$ | 45 dB $L_{Aeq,8hour}$        |
| Reasonable (i.e. 5 dB above the internal noise levels from BS 8233) | 55 – 60 dB $L_{Aeq,16hour}$ | 50 dB $L_{Aeq,8hour}$        |

For the Salesians Townhouses facing NCR, ground floor and first floor levels are above those where a good or reasonable internal noise level would be achieved with an open window by a small margin. At second floor level, reasonable levels can be achieved with windows open due to the availability of a dual aspect window for the living space opening onto the inset amenity area and the set back location of the bedroom level on this floor.

The façade noise levels for the apartment façade overlooking O'Callaghan Strand, are above those where a good or reasonable internal noise level would be achieved with an open window by a small margin. For all other facades across the development, including noise levels associated with the operation of the ASHPs at the upper floors of the Quarry PBSA and Salesians Apartments, a good or reasonable noise level can be achieved with open windows.

#### *Glazing*

Given the level of noise across the majority of the development, there are no specific glazing requirements beyond standard double glazing to meet good to reasonable internal noise levels at all development buildings with the exception of the Salesian Townhouse south facades facing NCR and apartments facing O'Callaghan Strand. Given the potential for elevated level of plant noise during intermittent periods at the upper floors of the proposed development apartment buildings, this glazing type is also proposed to the top floor level around all facades of the proposed apartments and PBSA across the development site.

Taking account of the measured day and night-time noise levels associated with road traffic from UN1, the glazing specifications in Table 0.22 are applied to the identified facades discussed above.

**Table 0.22** Minimum Sound Insulation Performance Requirements (SRI) to Glazing

| Element                           | Octave Band Sound Reduction Index – dB R |     |     |    |    |    | dB $R_w$ |
|-----------------------------------|------------------------------------------|-----|-----|----|----|----|----------|
|                                   | 125                                      | 250 | 500 | 1k | 2k | 4k |          |
| Glazing SRI to identified facades | 20                                       | 24  | 30  | 35 | 36 | 38 | 33       |

The specifications provided in Table 0.22 are those determined to achieve the internal noise levels within bedrooms and living rooms in accordance with the design criteria from BS 8233 (2014). This acoustic SRI is not significant in terms of uplift above a standard glazing configuration that would be installed and can be achieved with double glazed system. Alternative specifications will be acceptable provided the internal ambient noise criteria outlined in Table 0.7 can be achieved. During the detailed design stage, the acoustic performance of any glazing systems installed to noise sensitive internal areas will be reviewed alongside the building design to determine compliance with the relevant internal design criteria.

The glazing specifications relate to bedrooms and living spaces. For staircore and windows to non-sensitive spaces, standard double glazing provides a suitable level of sound insulation.

It is important to note that the acoustic performance specifications detailed herein are minimum requirements which apply to the overall glazing system. In the context of the acoustic performance specification the 'glazing system' is understood to include any and all of the component parts that form part of the glazing element of the façade, i.e. glass, frames, seals, openable elements etc.

#### *Wall Construction*

In general, all wall constructions (i.e. blockwork, or concrete) offer a high degree of sound insulation, much greater than that offered by glazing systems. Therefore, noise intrusion via the wall construction will be minimal. The calculated internal noise levels across the building façade have assumed a minimum sound reduction index of 50 dB  $R_w$  for this construction.

#### *Ventilation*

The ventilation strategy for the development will be in accordance with Part F of the Building Regulations and will be finalised at the detail design stage. The ventilation strategy for the proposed development includes for closed mechanical heat recovery ventilation (MHRV) system and hence passive wall or trickle vents are not proposed.

#### *Internal Noise Levels*

Taking into account the external façade levels and the specified building envelope, the internal noise levels have been calculated. In all instances the good or reasonable internal noise criteria are achieved for daytime and night-time periods.

### **13.5.5 Do Nothing Scenario**

In the Do-Nothing scenario, the baseline noise levels measured and mapped across the site will remain largely unchanged. There is potential for surrounding noise levels to change (increase or decrease) in accordance with trends within the wider area (including influences from potential new developments in the surrounding area, changes in road traffic, etc). Road traffic associated with the Do Nothing scenario along the surrounding road network for future year are assessed in 13.5.4.1 and is not significant.

## **13.6 CUMULATIVE DEVELOPMENT & IMPACTS**

### 13.6.1 Construction Phase

#### 13.6.1.1 Masterplan Site

The Masterplan site includes a full redevelopment of the Cleaves site and includes a mix of residential developments, student accommodation, commercial and educational development, mixed use development, civic plaza and public realm areas and redevelopment of buildings of heritage significance including the Flaxmill, Cold Store, Engine House and Infiltration Gallery.

Phase I of the Masterplan Site will not overlap with the Proposed Development (Masterplan Phase II), there are therefore no cumulative construction noise impacts associated with these Phases.

Phase II will be largely progressed prior to the works occurring within Phases III and IV of the Masterplan. There is potential for some overlap of construction activities, however, it is expected the Phase II works will be well progressed and high noise levels associated with the earlier phases will be completed prior to works commencing on Phase III of the site.

It is likely that some of the residential buildings within Phase II will be occupied during the construction of Phase III and likely to all be occupied during the construction of Phase IV. These will therefore experience construction phase noise and vibration impacts. The NSLs assessed as part of the Proposed Development construction phase are at similar distances to the future NSLs within the Phase II site when works associated with Phase III and Phase IV are taking place. It is noted that all demolition works will be completed during Phase II and will not be required during subsequent stages. In addition, excavation and rock breaking will also be limited during the Phase III and Phase IV works. The range of construction noise impacts associated with building works described in Section 13.5.1 will likely be experienced at the NSLs within Phase II depending on their distance from the construction works and any screening from on-site structures. The surrounding existing NSLs will benefit from the presence of the Phase II buildings to provide screening to construction activities and hence any cumulative noise impacts to existing NSLs are expected to be equal to or lower than those discussed in Section 13.5.1.

#### 13.6.1.2 Other Surrounding Developments

There is the potential for cumulative construction noise impacts to nearby sensitive receptors if the construction phase of the proposed development coincides with that of other large-scale developments in the vicinity of the site. Due to the nature of construction works associated with the Proposed Development, noise levels from this site will dominate the noise environment when occurring in proximity to the noise sensitive locations along its immediate boundary. The noise contribution from other construction sites would need to be equal to those associated with the proposed development in order to result in notable any cumulative effect (i.e. two noise levels of the same noise levels would increase the overall noise level by 3 dB.)

A review of the planned and permitted projects (see Appendix 1.1) within the vicinity of the site was undertaken in order to identify developments with the potential for cumulative construction phase impacts. The majority of projects within the reviewed list are set back from the Proposed Development by more than 300m and will have no cumulative noise impact due to the negligible noise contribution from the Proposed Development at this distance. Due to the attenuation with distance and screening from intervening buildings in an urban and semi urban environment, there are no potential significant cumulative noise impacts beyond 100m from the Proposed Development. On review of the list, those

within 100m of the Proposed Development relate to works to private residential dwellings (extensions or modifications to individual properties) and will not result in any significant cumulative noise or vibration impacts given the nature and scale of the works.

The implementation of mitigation and monitoring measures detailed in Section 13.7 as well as the compliance of any surrounding permitted developments (with their respective planning conditions), will ensure that each development will control noise and vibration impacts using best practice guidance documents and appropriate noise and vibration limits.

### **13.6.2 Operational Phase**

#### **13.6.2.1 Masterplan Site**

Once operational the potential noise sources associated with the Masterplan Site relate to external operational mechanical and electrical plant items required to serve the building uses within Phases III and IV. These will potentially include heat pumps, air handling systems, condensers, etc. Depending on the operational hours and occupancy of the various spaces within the buildings (e.g. retail and commercial end user requirements), some of these will operate on a 24/7 basis depending on the specific use. Whilst these are potential sources of noise, the specific details of the location, requirement and number of plant items are not progressed to any design stage. The cumulative operational noise levels from any plant items associated with these additional units, will however, be required to meet the operational design criteria in Section 13.2.3.

The Masterplan site will bring additional trips to the area via car and active travel. Chapter 18.0 has considered the potential traffic associated with the master plan which has been assessed within this chapter in Section 13.5.4. The impact is determined to be neutral, imperceptible and long term.

#### **13.6.2.2 Other Surrounding Developments**

There are no cumulative noise impacts associated with the proposed development and other developments in the areas. The noise limits set for off-site noise sensitive locations are designed to avoid any significant increase in the prevailing background noise environment. Any nearby adjacent permitted or planned developments reviewed, will not generate any operational noise levels that will result in a cumulative noise level.

The assessment of traffic on the surrounding road network takes into account future increases in traffic flows from the surrounding area and the proposed Masterplan site. The assessment has determined the impact neutral, imperceptible and long term

## **13.7 REMEDIAL & MITIGATION MEASURES**

### **13.7.1 Construction Phase Mitigation**

Best practice noise and vibration control measures will be employed by the contractor during the construction phase in order to avoid significant impacts at the nearest sensitive buildings. The best practice measures set out in BS 5228-1 and BS 5228-2 (BSI 2019) will be complied with. The above documents include guidance on several aspects of construction site mitigation measures, which include:

- Selection of quiet plant;
- Noise control at source;
- Screening;
- Liaison with the public, and;
- Monitoring.

Noise control measures that will be implemented include the selection of quiet plant, use of enclosures and screens around noise sources and site boundaries, limiting the hours of work and noise and vibration monitoring.

#### Selection of Quiet Plant

The potential for any item of plant to result in exceedance of construction noise thresholds will be assessed prior to the item being brought onto the site. The least noisy item of plant will be selected wherever practicable (e.g. plant items with sound attenuation incorporated). Should a particular item of plant already on the site be found to exceed the construction noise thresholds, the first action will be to identify whether the item can be replaced with a quieter alternative.

The appointed contractor will evaluate the choice of excavation, breaking, piling or other working method taking into account various ground conditions and site constraints. Where alternative lower noise generating equipment are available that will provide equivalent structural / excavation / breaking results, these will be selected to control noise within the relevant thresholds, where it is practicable to do so.

The decision regarding the type of excavation technique or other construction activity to be used on a site will normally be governed by a range of engineering and environmental constraints. In these instances, it may not be possible for technical reasons to replace an item of plant with a quieter alternative. In some instances, the adoption of a quieter method may prolong the overall process, with the net result being that the overall disturbance to the community will not necessarily be reduced.

#### Noise Control at Source

The following measures will be implemented, if required, by the appointed contractor to control noise at source. These measures relate to specific site considerations:

- For mobile plant items such as dump trucks, cranes, excavators and loaders, the installation of an acoustic exhaust, utilising an acoustic canopy to replace the normal engine cover and / or maintaining enclosure panels closed during operation can reduce noise levels by up to 10 dB;
- For percussive tools such as pneumatic breakers and tools a number of noise control measures include fitting a muffler or sound reducing equipment to the breaker 'tool' and ensuring any leaks in the air lines are sealed;
- Use of rotary drills and 'bursters' activated by hydraulic or electrical power to facilitate quieter methods for excavation of hard material.
- Removal of larger sections of demolished buildings by lifting out and breaking at areas away from noise sensitive boundaries;
- For piling plant, noise reduction can be achieved by enclosing the driving system in an acoustic shroud. For steady continuous noise, such as that generated by diesel engines, it is possible to reduce the noise emitted by fitting a more effective exhaust silencer system or utilising an acoustic canopy to replace the normal engine cover;

- Mobile and stationary plant will be switched off or throttled back to a minimum when not in use (engines, motors and generators). Lorries, trucks and concrete vehicles will not be permitted to queue outside site compounds with engines left idling;
- Where compressors, generators and pumps are located in proximity to NSLs and have the potential to exceed the construction noise thresholds, these will be surrounded by acoustic lagging or enclosed within acoustic enclosures providing air ventilation;
- Resonance effects in panel work or cover plates can be reduced through stiffening or the application of damping compounds, while other noise nuisance can be controlled by fixing resilient materials in between the surfaces in contact;
- For all materials handling, ensure that materials are not dropped from excessive heights, lining drops chutes and dump trucks with resilient materials;
- 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;
- Where practicable, equipment powered by mains electricity or battery shall be used in preference to equipment powered by internal combustion engines or locally generated electricity; and
- Plan the site layout to ensure that reversing is kept to a minimum.

### Screening

Screening is an effective method of reducing construction noise levels at a receiver location and can be used successfully as an additional measure to other forms of noise control. The effectiveness of a noise screen will depend on the height and length of the screen, its mass, and its position relative to both the source and receiver. BS 5228–1 states that on level sites the screen should be placed as close as possible to either the source or the receiver. The construction of the barrier will be such that there are no gaps or openings at joints in the screen material.

The site will incorporate a solid site hoarding line of minimum 2.4m in height around its perimeter which will be maintained in situ for the duration of the construction phase. Where necessary, this hoarding height will be increased in height to assist in reducing noise levels at adjacent noise sensitive buildings. Erection of localised demountable enclosures or screens will be used around breakers or drill bits when in operation in proximity to NSLs with the potential to exceed the construction noise thresholds. Annex B of BS 5228–1 (Figures B1, B2 and B3) provide typical details for temporary and mobile acoustic screens, sheds and enclosures that can be constructed on-site from standard materials. A well placed and designed mobile temporary screen around a breaker or excavation can effectively reduce noise emissions by 10 dB(A).

In addition, careful planning of the construction site layout will also be considered. The placement of site buildings such as offices and stores between the site and sensitive locations can provide a good level of noise screening.

### Hours of Work

Standard construction working hours are between 07:00 to 18:00 hrs Monday to Friday inclusive and between 08:00 and 14:00 hrs on Saturdays. However, it is possible that the contractor may wish to carry out certain operations outside these hours i.e. Sunday or evening hours during long summer days etc. Such occurrences will be kept to a minimum and take place over a short timeframe and as such

are unlikely to cause excessive disturbance. Deviation from these times will only take places when written approval is granted by LCCC in exceptional circumstances.

#### Liaison with the Public

For the proposed development, the duration of demolition, piling and excavation and any required ground breaking will be short in relation to the length of construction work as a whole, and the amount of time spent working near to sensitive areas can represent only a part of the overall period.

The contractor will establish clear forms of communication between the contractor and adjacent NSLs to the works, so that residents or building occupants are aware of the likely duration of activities likely to generate noise or vibration that are potentially significant.

A community Liaison Plan will be developed by the developer in liaison with the local residents and the adjacent Salesians Primary school and a single point of contact nominated to engage with LCC.

#### Vibration Control

On review of the likely vibration levels associated with construction activities, construction activities associated with the proposed development will not give rise to vibration that is either significantly intrusive or that would give rise to structural or cosmetic damage to buildings. Notwithstanding, is recommended that a review of any foundations relating to protected structures is undertaken prior to any significant excavations commence to ensure all direct connections between these structures and the proposed construction areas are severed to avoid any bridging and vibration transmission.

Vibration from construction activities will be limited to the values set out in Table 0.4. to avoid any form of potential cosmetic damage to buildings and structures.

In the case of vibration levels giving rise to human response, impacts are significantly reduced once the source of vibration is known and good communications are in place. As such, in order to minimise any potential impacts to adjacent building occupants, the following measures shall be implemented during the Construction Phase.

- A clear communication programme will be established by contractor to inform adjacent building occupants in advance of any potential intrusive works which may give rise to vibration levels likely to result in significant effects as per Table 0.5. The nature and duration of the works will be clearly set out in all communication circulars as necessary; and
- Appropriate vibration isolation will be applied to plant (such as resilient mounts to pumps and generators), where required and where feasible

### 13.7.2 Operational Phase Mitigation

#### Building Services Plant

At the detailed design stage, best practice measures relating to building services plant will be taken to ensure there is no significant noise impact on NSLs within the development. Due to the relative proximity of the NSLs within the development, this will also prevent a negative impact on NSLs in the surrounding area external to the site. Best practice measures in this context include the following:

- The selection and design of operational plant items with potential to emit noise to atmosphere will be designed to comply with the noise control guidance from BS 4142 (BSI 2014) and BS 8223 (bsi 2019) as discussed in Section 13.2.3;

- Where ventilation is required for plant rooms, consideration will be given to acoustic louvers or attenuated acoustic vents, where required, to reduce noise breakout;
- The use of perimeter plant screens will be used for roof-top plant areas for AHSPs. The screen heights are as per the architectural drawings and all plant screens to these areas will be solid acoustic panels with absorptive facing to the inner face of the screen;
- The selection of the ASHPs will be those with the lowest operational noise output that is available to serve the heating needs of the buildings. Based on the assessment in this chapter, the sound power of any one unit shall not exceed 91 dB(A).
- The plant items will be selected to have no tonal or impulsive characteristics when in operation at NSLs;
- All mechanical plant items, e.g. fans, pumps etc., shall be regularly maintained to ensure that excessive noise generated by worn or rattling components is minimised;
- Any new or replacement mechanical plant items, including plant located inside new or existing buildings, shall be designed so that all noise emissions from site do not exceed the noise limits outlined in this document; and

#### Operational Traffic

Changes to traffic flows will not result in a perceptible increase in noise level in the surrounding environment. Therefore, no mitigation measures are necessary in this case.

#### Public Realm, Commercial Floor Space, Meanwhile Use Areas

During general low noise events or use of these spaces, no specific noise control measures are deemed necessary. In the event that amplified music is used for specific events during evening or night-time period, the control limits set out in Section 13.2.4.2 are recommended in order to control noise levels at the nearest noise sensitive dwellings. The use of best practice control measures for music noise will be used including the choice and location of speakers, volume control and screening, where necessary, around the site perimeter.

The following control measures will form part of the operational phase management of any external plaza or temporary meanwhile use spaces:

- a “Respect your Neighbours” campaign should be initiated within all outdoor seating areas including signage indicating that it is a residential area and noise levels should be kept to a minimum;
- brief and train all staff on the requirement to keep noise levels to a minimum and to actively discourage raised voices, rowdy behaviour, singing etc.;
- the acoustic performance requirements of any music limit values will be communicated to areas where this may occur in these spaces to notify them of their operational restrictions within the development;
- Prior to the use of any new external entertainment system being operated, a comprehensive review of audio systems and calibration survey will be required to ensure the music noise levels set out above (relating to day to day use of spaces) will not be exceeded. This will establish background noise levels at the closest NSLs and set the operational noise level at the entertainment system, and;
- An overarching management policy is developed and takes cognisance the potential for a noise nuisance to occur and implements suitable management policies communicated to all uses.

## 13.8 RESIDUAL IMPACTS

### 13.8.1 Construction Phase

#### Construction Noise

**The use of best practice noise control measures, hours of operation, scheduling of works within appropriate time periods, and noise monitoring during this phase will be implemented. With the inclusion of the various noise and vibration control measures on site discussed in Section 13.7.1, it is expected that calculated noise levels in Table 0.12 to**

Table 0.18 can be reduced by 5 to 10 dB.

With the inclusion of the various available noise and vibration control measures, noise levels can be controlled to within the CNTs at the closest NSLs for the majority of the Construction Phases, thus resulting in a negative, moderate to significant and short term impact.

For early stage demolition and excavation phases, there is potential for construction noise levels to remain above the CNT by the order of 5 to 10 dB during specific phases of work. Whilst the adopted CNT has the potential to be exceeded for specific activities, the residual noise levels can be controlled to below the absolute construction noise limit of 75 dB  $L_{Aeq,T}$  typically applied for urban sites during all phases of work. Given the potential for elevated periods of construction noise will be experienced over temporary periods, this can be tolerated with good public liaison and monitoring programmes. The resulting impact is determined to be negative, significant and short term impact associated with these works.

#### Construction Phase Traffic Noise

The calculated change in traffic noise associated with the addition of construction related traffic is less than 2 dB (A) along the closest access roundabout to the site and the predicted effects are determined as negative, not significant to slight and short-term.

#### Construction Phase Vibration

The predicted vibration impact to protected structures is negative, not significant and short-term. The predicted vibration impact to residential and light-framed buildings is negative, not significant and short-term.

In terms of human response, with clear communication protocols in place, vibration impacts during excavation and piling phases are predicted to be negative, not significant to moderate and temporary.

### 13.8.2 Operational Phase

#### Building Services Plant Noise

Once operational, once all best practice control measures relating to building services plant are incorporated into the design and the limit values set out in 13.2.3 are complied with, the predicted noise impact is negative, not significant to slight and long term.

### Operational Traffic

The calculated change in traffic noise associated with the addition of operational phase traffic is less than 1 dB (A) along the site access roads. The assessment has determined the predicted impacts to be neutral, imperceptible, and long-term.

### Public Realm, Commercial Floor Space and Meanwhile Uses

Once these broad principles of noise nuisance control are established as part of the overall estate management policy and the relevant operational noise limits are complied with, the predicted noise effects are negative, not significant to slight and temporary to short-term.

### 13.8.3 Cumulative Residual Effects

With the inclusion of the various available noise and vibration control measures, cumulative construction noise levels can be controlled to within 5 to 10 of the CNTs at the closest NSLs for the majority of the Construction Phases, thus resulting in a negative, moderate to significant and temporary to short term impact.

## 13.9 WORST CASE SCENARIO

Reasonable worst-case estimates have been used as part of this assessment as set out in the various sections of this report.

## 13.10 MONITORING

### 13.10.1 Construction Phase

The contractor will carry out noise and vibration monitoring at representative sensitive locations to evaluate and inform the requirement and / or implementation of noise and vibration management measures.

Noise and vibration monitoring systems will be installed at the site prior to any works taking place and will be maintained in continuous operation throughout the construction period. The system will be configured to trigger alerts in the event that the set limit values relating to the control of significant noise effects are approaching, as per Table 0.2 and for the avoidance of any cosmetic damage to buildings as per Table 0.4.

As a minimum, a vibration monitor will be installed adjacent to the Flaxmill complex and brick chimney, adjacent to these protected structures.

Noise monitoring equipment will be installed along the site boundaries in closest proximity to the surrounding NLS. Noise monitoring will be conducted in accordance with the International Standard ISO 1996: Acoustics – Description, measurement and assessment of environmental noise Part 1 (2016) and Part 2 (2017). The result of the monitoring programme will be used to determine compliance with the construction noise thresholds and to inform the requirement and / or implementation of noise and or vibration management measures.

Noise control audits will be conducted at regular intervals throughout the construction programme in conjunction with noise monitoring. The purpose of the audits will be to ensure that all appropriate steps are being taken to control construction noise emissions and to identify opportunities for improvement, where required.

Vibration monitoring will be installed at the base of the two on-site protected structures during excavation works. It is also recommended to install vibration monitoring equipment along the western site boundary in proximity to the Salesians Primary School.

### 13.10.2 Operational Phase

During the commissioning phase of the project, noise monitoring will be undertaken to determine compliance with the operational noise levels from the on-site buildings services plant.

## 13.11 REFERENCES AND SOURCES

This chapter has been prepared with reference to the various drawings provided by the design team, the various chapters of the EIAR discussed throughout this chapter and the CEMP.

The chapter has been prepared with reference to the following documents also discussed throughout the chapter.

- ANC, IOA & CIEH (2017). ProPG: Planning & Noise – Professional Practice Guidance on Planning & Noise – New Residential Development.
- British Standard BS 8233: 2014: Guidance on sound insulation and noise reduction for buildings.
- British Standard BS 4142: 2014+A1:2019: Methods for Rating and Assessing Industrial and Commercial Sound.
- British Standard BS 5228: 2009 +A1:2014: Code of Practice for Control of Noise and Vibration on Construction and Open Sites Part 1: Noise & Part 2: Vibration.
- British Standard BS 7385: 1993: Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration.
- BS 6472-1: 2008 Guide to evaluation of human exposure to vibration in buildings, Part 1 Vibration sources other than blasting (hereafter referred to as BS 6472–1) (BSI 2008);
- Department of Transport Welsh Office, HMSO (1988). Calculation of Road Traffic Noise.
- EPA (2022). Guidelines on the Information to be contained in Environmental Impact Assessment Reports.
- EPA noise maps (<http://gis.epa.ie>)
- Limerick City & County Council: Limerick Development Plan 2022 – 2028. Volume 1 – Written Statement (2022)
- Limerick City & County Council: Agglomeration of Limerick, Noise Action Plan 2024 – 2028 (hereafter referred to as the Limerick Agglomeration NAP (2024))
- UK Highways Agency (UKHA) Design Manual for Roads and Bridges (DMRB) LA 111 Sustainability and Environmental Appraisal LA 111 Noise and Vibration Revision 2 (UKHE 2020)

- International Organization for Standardization (ISO) ISO 1996: 2017: Acoustics – Description, measurement and assessment of environmental noise.
- ISO 9613-2:2024 Acoustics – Attenuation of sound during propagation outdoors - Part 2: Engineering method for the prediction of sound pressure levels outdoors (hereafter referred to as ISO 9613 – 2).
- WHO (2018). Environmental Noise Guidelines for the European Region.