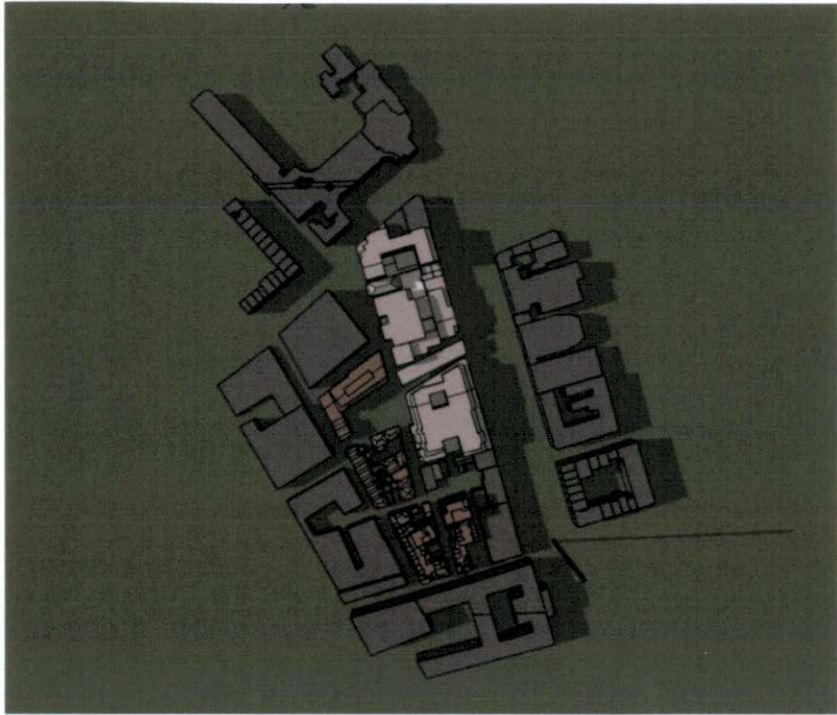
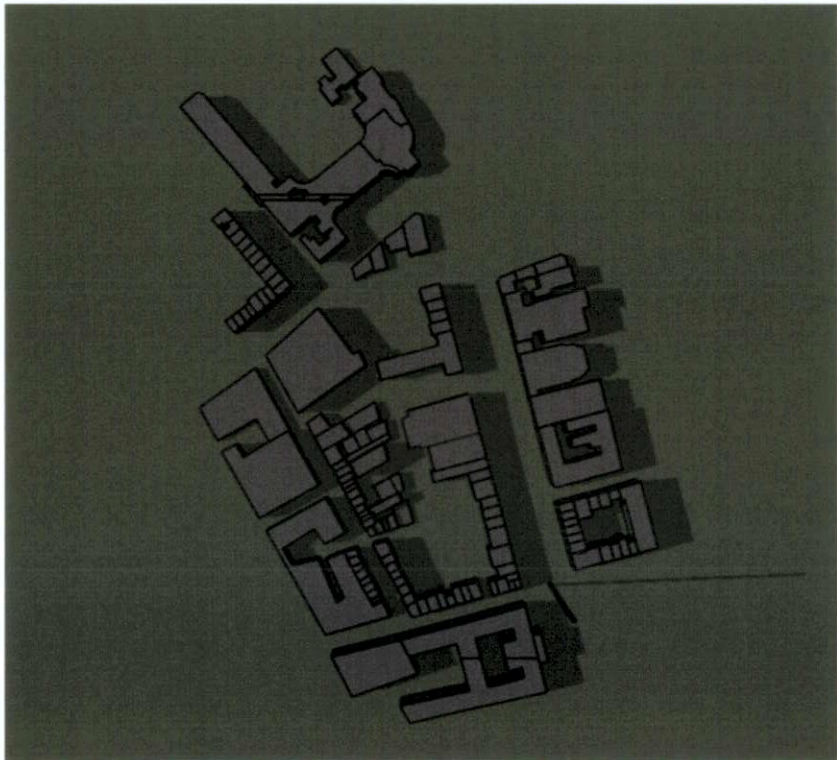


5pm – 21<sup>st</sup> June

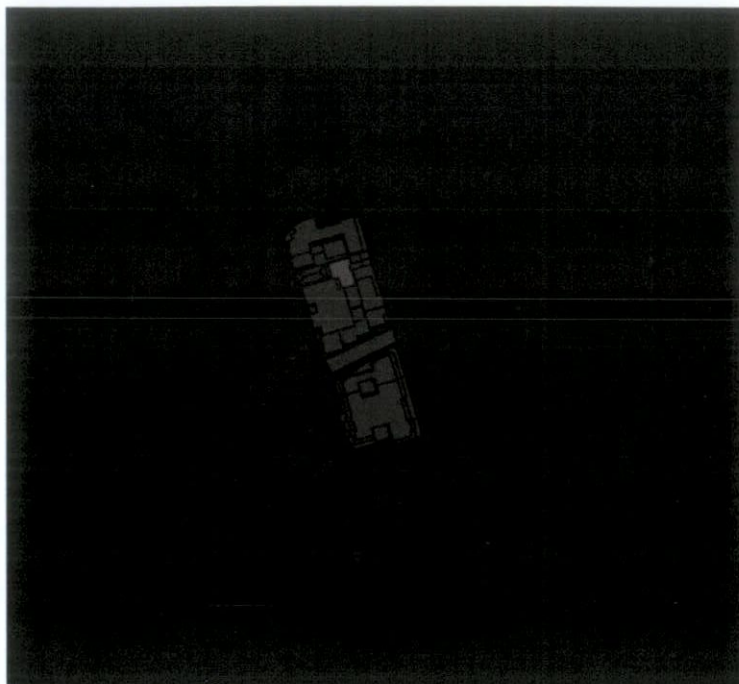


Proposed Site

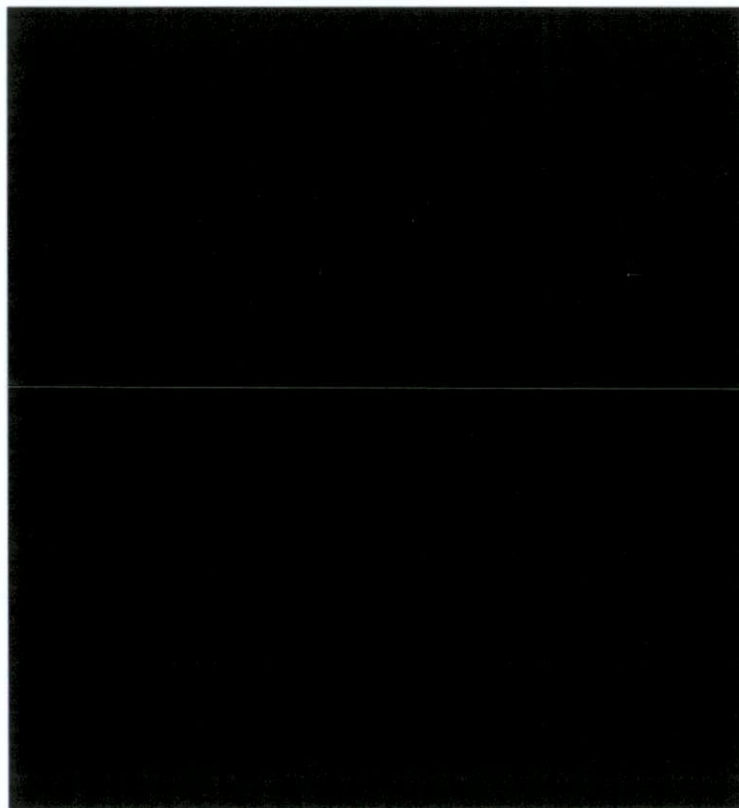


Existing Site

9am – 21<sup>st</sup> December

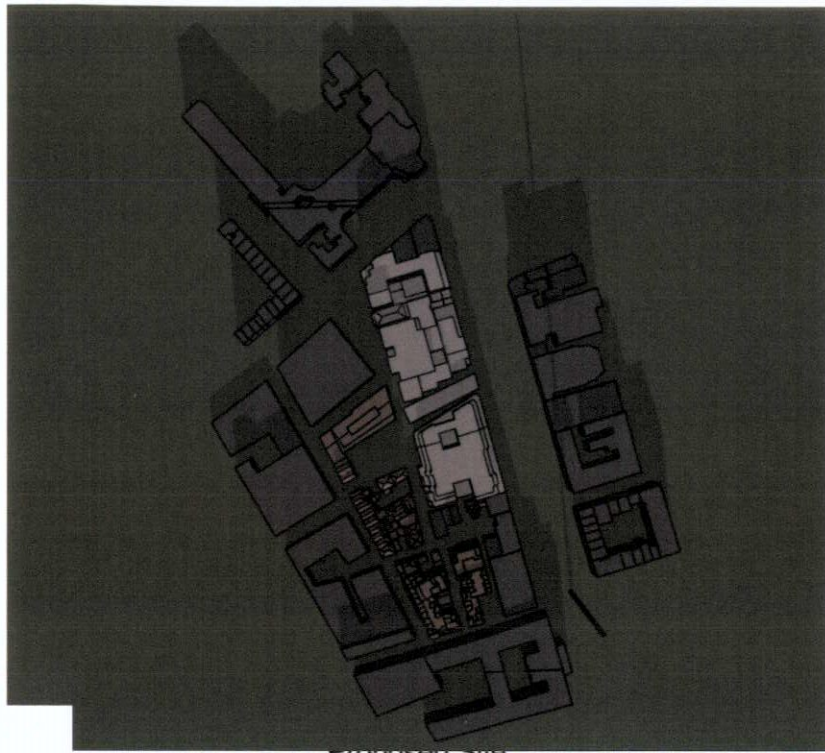


Proposed Site

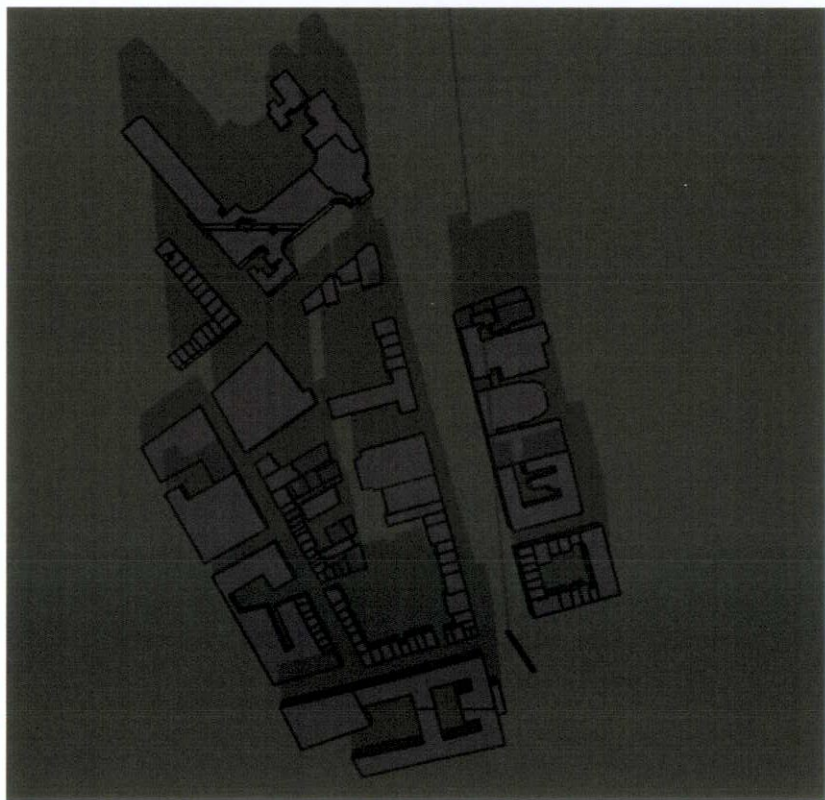


Existing Site

12pm – 21<sup>st</sup> December



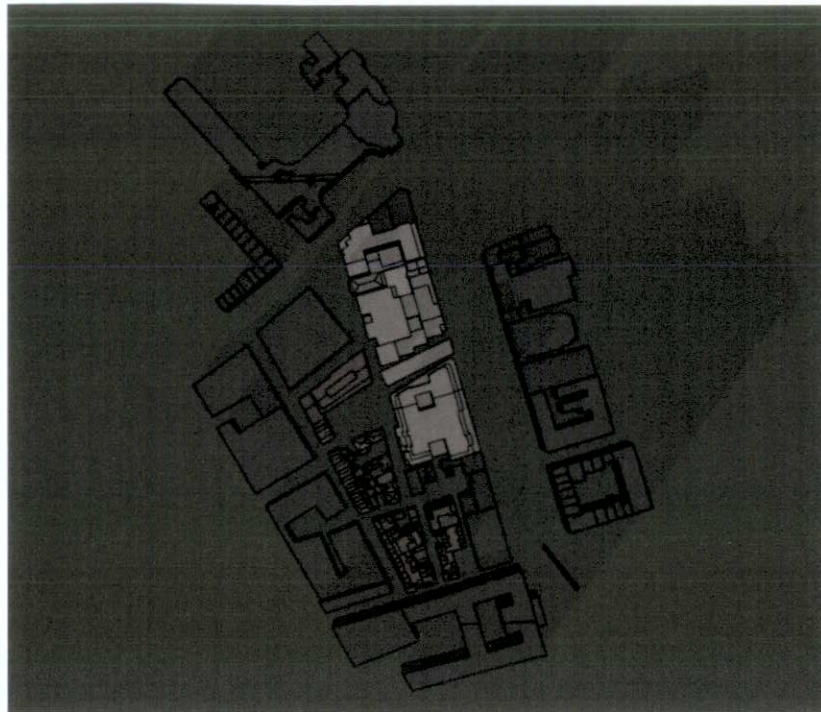
Proposed Site



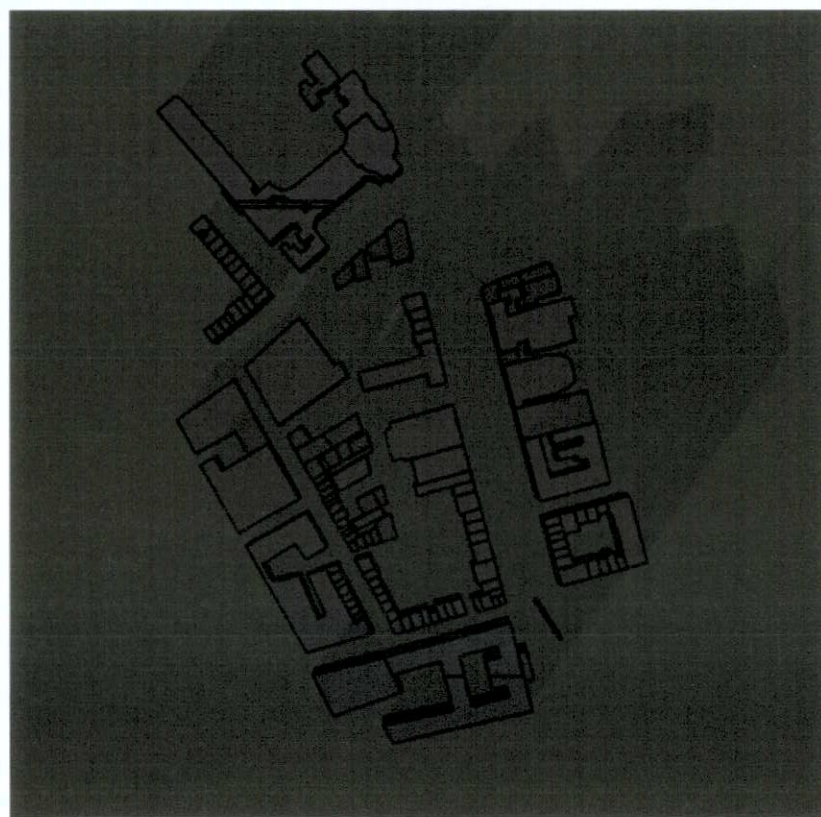
Existing Site

3pm – 21<sup>st</sup> December

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Proposed Site



Existing Site

#### 10.5.2.4 Do-Nothing Impact

In a 'do-nothing' scenario, the daylight and sunlight environment within existing buildings will remain unchanged.

#### 10.6 MITIGATION MEASURES (AMELIORATIVE, REMEDIAL OR REDUCTIVE MEASURES)

No mitigation measures are proposed as the impact of Sunlight and Daylight is relatively insignificant and considered consistent with development within a city centre environment.

#### 10.7 RESIDUAL IMPACT

The scale of the development at Sites 3, 4 & 5 will have a **minor impact** on the shadow environment but the consequences of this will not be noticeable due to the site orientation and existing urban density of the area.

#### 10.8 MONITORING

Monitoring is not relevant to this assessment.

#### 10.9 REINSTATEMENT

Reinstatement is not relevant to this assessment.

#### 10.10 DIFFICULTIES ENCOUNTERED

There were no difficulties encountered when undertaking this assessment.





## 11 AIR (NOISE AND VIBRATION)

### 11.1 INTRODUCTION

Potential noise and vibration effects are assessed in this chapter. This section will provide information on the assessment of noise and vibration effects on the surrounding environment during both the construction and operational stages of the Proposed Development. Dublin Central is underpinned by a Masterplan which will be assessed also. The principal objectives of the noise and vibration assessment will be to specify appropriate threshold values and mitigation measures to ensure that the effect on the environment is minimised.

A full description of the development can be found in Chapter 3: Description of Proposed Development of this EIAR.

The subject site is located within an urban setting and is surrounded by a mixture of commercial, retail and residential buildings. The assessment has been undertaken with reference to the most appropriate guidance documents relating to environmental noise and vibration in line with best practice standards applicable.

Noise and vibration will be considered in terms of two aspects. The first is the outward effect of the development (i.e. the potential effect of the buildings and commercial activities on existing sensitive receptors in the study area) and the inward effect of the existing noise and vibration sources on the development itself.

This Chapter was completed by Dr. Aoife Kelly (Senior Acoustic Consultant) who holds a BSc (Hons) in Environmental Health, a Diploma in Acoustics and Noise Control, a PhD in Occupational Noise and is a member of the Institute of Acoustics. Aoife has specialised in acoustics since 2014 and has extensive knowledge in the field of occupational noise risk assessments, environmental noise and vibration effect assessment and inward effect assessments. She has extensive experience in environmental and occupational noise surveying and environmental acoustics.

This Chapter was completed by Leo Williams (Acoustic Consultant) who holds a BAI and MAI in Mechanical & Manufacturing Engineering, a Diploma in Acoustics and Noise Control and is a Member of the Institute of Acoustics. Leo has specialised in acoustics since 2014 and has extensive knowledge in the field of environmental noise and vibration impact assessment and noise modelling.

The Chapter was reviewed by Stephen Smyth (Associate – Acoustics) who holds a BAI and a PhD in Mechanical Engineering from TCD and is a member of both Engineers Ireland and the Institute of Acoustics. Stephen has worked in the field of acoustics since 2003 gaining experience in both environmental and architectural acoustics.

The assessment has been undertaken with reference to the most appropriate guidance documents relating to environmental noise and vibration which are set out within the relevant sections of this chapter and included in the references section. In addition to specific noise guidance documents, the following guidelines were considered and consulted for the purposes of this chapter: -

- EPA Guidelines on the Information to be contained in Environmental Impact Statements, (EPA, 2002).
- EPA Advice Notes on Current Practice (in the preparation of Environmental Impact Statements), (EPA, 2003).;
- EPA Guidelines on the Information to be contained in Environmental Impact Assessment Reports Draft August 2017 (hereinafter referred to as the EPA EIAR Guidelines).
- EPA Advice Notes for Preparing Environmental Impact Statements, (Draft, September 2015).

### 11.2 ASSESSMENT METHODOLOGY

The following methodology has been prepared based on the requirements of the EPA EIAR Guidelines and on our experience of preparing the noise and vibration chapters for similar large scale developments.



The study has been undertaken using the following methodology: -

- Baseline noise monitoring has been undertaken at the nearest noise sensitive locations (NSLs) and the planning boundary.
- 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 stages of the Proposed Development.
- Predictive calculations have been performed to estimate the likely noise and vibration emissions during the construction stages of the project at the nearest noise and vibration sensitive receptors to the site, inclusive of the Luas transport line.
- Predictive calculations have been performed to assess the potential effects associated with the operation of the development at the most sensitive locations surrounding the development site and inward on the development itself.
- A schedule of mitigation measures has been proposed, where relevant, to control the noise and vibration emissions associated with both the construction and operational stages of the Proposed Development.
- The inward effect of noise from the surrounding environment into the proposed residential buildings has also been assessed to determine the requirements, for additional noise mitigation to ensure a suitable internal noise environment for residential amenity.

Typical ambient noise levels across the local area have been measured and these are used to identify appropriate construction stage noise threshold criteria. Proposed construction activities are also identified and expected noise output data used to predict likely noise levels at surrounding NSLs. Predicted levels are assessed in the context of identified criteria, and mitigation measures, where required, are outlined.

Appendix 11.1 presents a glossary of acoustic terminology that is used throughout this chapter.

## **11.3 RECEIVING ENVIRONMENT**

### **11.3.1 Dublin Central Masterplan**

The Proposed Dublin Central Masterplan Development is located within Dublin City Centre, it is bounded by O'Connell St. to the east, Parnell St. to the north, Moore St. to the west and Henry St. to the south. Moore Lane runs through the middle of the site in a north / south direction. O'Rahilly Parade bounds the northwest of the site and Henry Place to the southwest. A full description of the development is provided in Chapter 3: Description of Proposed Development.

The nearest existing residential NSLs to the Proposed Development are those located at Greeg Court Apartments, to the northwest site boundary. The Rotunda Hospital is located to the north of the site boundary.

Apart from the receptors identified above, there are protected buildings identified at 14 to 17 Moore Street to the northwest of the site boundary.

Commercial NSLs include Jurys Inn Hotel Parnell Street and Lynams Hotel, which are located beyond the north and east boundaries respectively. Other hotels in close proximity to the eastern site boundary are Holiday Inn Express and The Gresham Hotel on O'Connell Street.

A full description of the development is provided in Chapter 3: Description of Proposed Development.

The existing noise and vibration environments across the Dublin Central Masterplan site and in the vicinity of the nearest existing NSLs are dictated by transportation sources in the study area including the existing local road network and Luas line to the north and east of the Dublin Central Masterplan site.

### 11.3.1.1 Desk Based Study of Published Data

Reference has been made to the strategic noise maps produced by the EPA as part of the Round 3 noise mapping study in accordance with the requirements of the Environmental Noise Regulations (S.I. No. 140/2006) to review published data relating to noise sources in the area.

As part of the mapping round, roads with >3 million vehicle movements and rail exceeding the flow threshold of 30,000 vehicle passages per annum are modelled and noise contours produced in terms of two noise indicators,  $L_{den}$  and  $L_{night}$ . These are defined as follows: -

- $L_{den}$  is the day-evening-night noise indicator based on year-long averages of the day (07:00-19:00), evening (19:00-23:00) and night (23:00-07:00) time periods. It is 'weighted' to account for extra annoyance in the evening and night periods.
- $L_{night}$  is the night-time noise indicator over the night-time period (23:00-07:00hrs).

As part of this noise mapping process for the Round 3 study the following roads have been modelled and mapped using traffic flow data for the year 2016: -

- O'Connell Street (Road).
- Parnell Street (Road).

There was no mapped rail traffic noise data available for the Dublin Central Masterplan site as the Luas line to the north and east of the development became operational after 2016 when the EPA noise maps were produced.

Figure 11.1 presents the road noise mapping for the long-term day-evening-night ( $L_{den}$ ) period in the vicinity of the Dublin Central Masterplan site, identified in red.

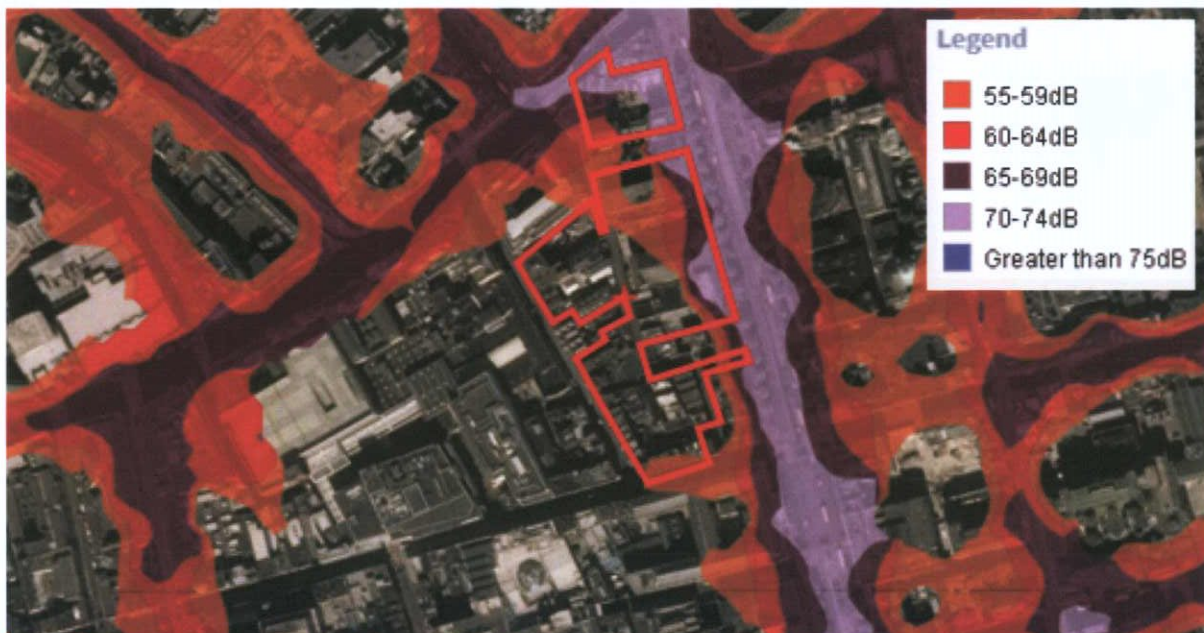
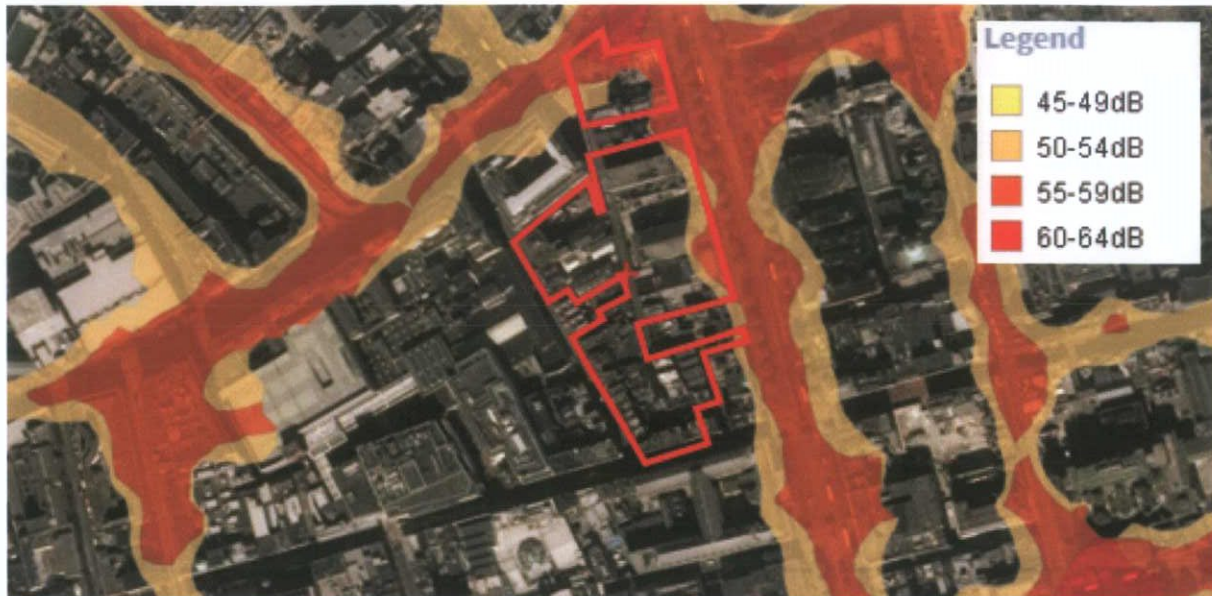


Figure 11.1: Road Traffic  $L_{den}$  Noise Contours (Source: epa.ie).

Reference to Figure 11.2 indicates that road traffic noise across the Dublin Central Masterplan site is in the range of <55 to 74 dB  $L_{den}$  with highest noise levels along the eastern end of the Dublin Central Masterplan site in proximity to the O'Connell Street Upper and at the northern end of the Dublin Central Masterplan in proximity to the Parnell Street junction. The lowest noise values are mapped across the remainder of the Dublin Central Masterplan as the distance from the road traffic sources increases along Henry Street, Moore Street, Henry Lane, O Rahilly Parade and Moore Place.



**Figure 11.2:** Road Traffic  $L_{\text{night}}$  Noise Contours (Source: epa.ie).

Figure 11.2 presents the road traffic noise mapping for the night-time period ( $L_{\text{night}}$ ) period in the vicinity of the Dublin Central Masterplan site, identified in red. Reference to Figure 11.2 indicates that road traffic noise across the Dublin Central Masterplan site is in the range of <45 to 64dB  $L_{\text{night}}$ , similarly with highest noise levels along the eastern and northern end of the Dublin Central Masterplan site and lowest values along remainder of the site.

#### 11.3.1.2 Baseline Noise Environment

In July / August 2020 AWN was commissioned to undertake baseline noise monitoring from the existing site, prior to planning permission. The baseline noise monitoring was undertaken during Level 2 Covid-19 pandemic restrictions i.e. non-essential retail reopened and employees were permitted to return to work in businesses if working from home was not an option. To quantify any potential reductions in baseline noise levels due to the pandemic, a review of historical noise monitoring data from the site in June / July 2019 was also carried out.

Combined the 2019 and 2020 noise surveys quantify the existing varying noise environment across the Dublin Central Masterplan site namely: -

- The screened noise environment at the rear of the existing buildings facing onto O'Connell Street (east of site) and Moore Lane (west of site) and unscreened noise environment for the facades facing directly onto O'Connell Street and Moore Street (inward noise assessment) and,
- The noise environment at the nearest noise sensitive locations (NSLs) (outward noise assessment), including the rear facades of NSLs located along O'Rahilly Parade and Moore Street.

All surveys were conducted in general accordance with ISO 1996-2: 2017: *Acoustics – Description and measurement and assessment of environmental noise. Part 2 – Determination of sound pressure levels*. The specific details will be set out in the following sections.

#### Measurement Parameters

##### Noise Parameters

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

**L<sub>Aeq</sub>** 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<sub>AFMax</sub>** is the instantaneous maximum sound level measured during the sample period using the 'F' time weighting.

**L<sub>A90</sub>** is the sound level that is exceeded for 90% of the sample period. It is typically used as a descriptor for background noise.

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

### Vibration Parameters

Vibration measurements were conducted in general accordance with the guidance contained in British Standard BS 7385. Part 1: *Guide for measurement of vibrations and evaluation of their effects on buildings (1990)*.

Vibration was measured in the three orthogonal axes. The accelerometer was secured in place with a 5kg sandbag.

The equipment was set to log for 5 minute intervals on a continual basis.

The following vibration parameters are discussed within this report.

**PPV** Peak Particle Velocity (PPV) is a measure of the velocity of vibration displacement in terms of millimetres per second (mm/s). It is defined as follows within BS 7385: (1990) as:

*"the maximum instantaneous velocity of a particle at a point during a given time interval"*.

### **Historical Unattended Environmental Noise & Vibration Survey Conducted June / July 2019**

#### Survey Positions

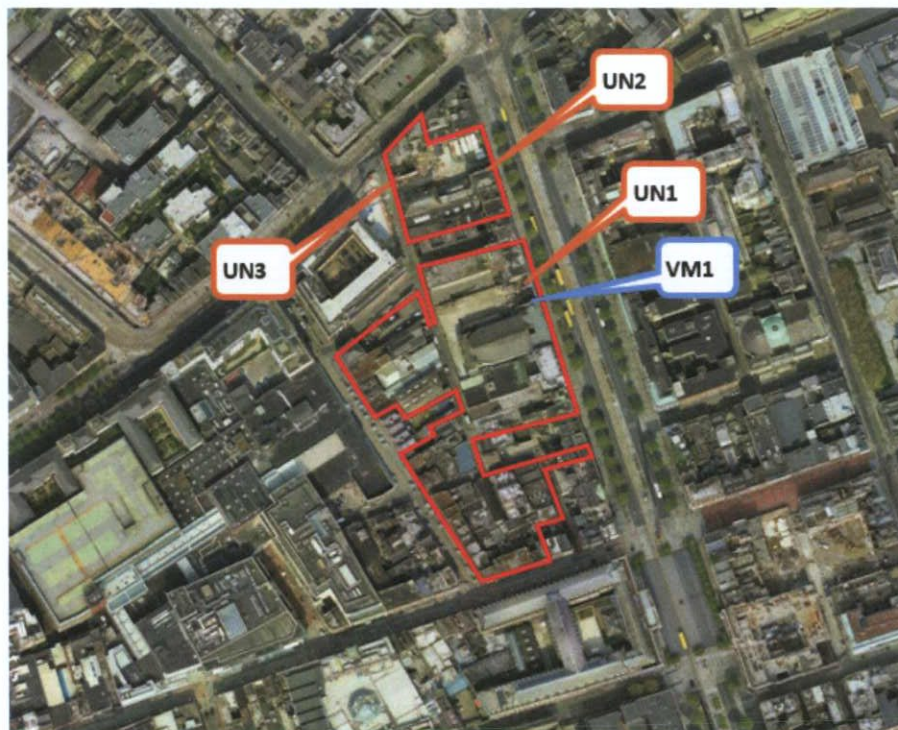
In June and July 2019 unattended noise monitoring was undertaken at three locations within the Dublin Central Masterplan site (UN1 to UN3) representative of the existing noise environment at the closest NSLs and the noise climate within the Dublin Central Masterplan site. The locations are described below in Table 11.1 and shown in Figure 11.3.

Vibration monitoring was undertaken at one location along O'Connell Street to rear of the temporary scaffold façade adjacent to noise monitoring location UN1.

Location	ITM Co-ordinates	Description	Rationale
UN1	715758, 734852	Unattended noise monitor. Externally positioned in line eastern boundary of the proposed site, facing onto O'Connell Street.	The data collected at this location has been used to predict expected noise levels along the eastern facades along the Proposed Development, which in turn will be used to inform the ProPG assessment included in this EIAR chapter.
UN2	715729, 734936	Unattended noise monitor. Externally positioned set back 7m from north-eastern boundary of the proposed site, facing towards O'Connell Street Upper.	The data collected at this location has been used to predict expected noise levels towards the screened centre of the Proposed Development, which in turn will be used to inform the ProPG assessment included in this EIAR chapter.

Location	ITM Co-ordinates	Description	Rationale
UN3	715683, 734915	Unattended noise monitor. Externally positioned to northwest boundary of the proposed site, facing towards Moore Lane.	The data collected at this location has been used to predict expected noise levels along the western facades along across the Proposed Development site, which in turn will be used to inform the ProPG assessment included in this EIAR chapter.
VM1	715758, 734852	Externally positioned in line eastern boundary of the proposed site, facing onto O'Connell Street.	The location was chosen to represent sensitive locations adjacent to existing sources of vibration (i.e. existing Luas line).

**Table 11.1:** Unattended Measurement Locations June / July 2019.



**Figure 11.3:** Noise and Vibration Monitoring Locations UN1 to UN3 (Source: Google Earth).

#### Survey Periods and Personnel

The following equipment was installed by AWN Consulting personnel over the following periods: -

Survey Position	Survey Period
UN1	10:50 hrs 25 June to 09:33 hrs 02 July 2019
UN2	10:52 hrs 18 June to 10:19 hrs 25 June 2019
UN3	10:26 hrs 18 June to 10:14 hrs 25 June 2019
VM1	10:50 hrs 25 June to 09:33 hrs 02 July 2019

**Table 11.2:** Survey Periods June / July 2019.

#### Instrumentation

The surveys were performed using the equipment listed in Table 11.3.

Survey Position	Measurement	Manufacturer	Equipment Model	Serial Number	Calibration date
UN1	Sound Level Meter	Rion	NL-52	1076328	15 August 2018
UN2				586940	
UN3					
All	Calibrator	Brüel & Kjær	Type 4231	2394086	26 February 2019
VM1	Vibration Meter	Rion	VM-56	680043	01 November 2019

**Table 11.3:** Noise Monitoring Equipment Details June / July 2019.

The unattended microphones were protected using WS-15 outdoor microphone kit. Before and after the survey the measurement apparatus was checked calibrated using a Brüel & Kjær Type 4231 Sound Level Calibrator. Calibration certificates are available on request.

Vibration measurements were conducted in general accordance with the guidance contained in *British Standard BS 7385. Part 1: Guide for measurement of vibrations and evaluation of their effects on buildings (1990)*.

Vibration was measured in the three orthogonal axes. The accelerometer was secured in place with a 5kg sandbag. The equipment was set to log for 5 minute intervals on a continual basis.

#### Noise Survey Results June / July 2019

##### *Survey Position UN1*

Table 11.4 summarises the measured day, evening and night-time noise levels for survey location UN1. Subjective observations during the setup and removal of the monitoring equipment noted that the primary contributors to noise build-up were road traffic along O'Connell Street, and the Luas rail line in addition to traffic along the surrounding road network. Local sources from retail and commercial units in addition to local urban sources (e.g. pedestrian movements, plant noise etc.) also contribute to the noise environment at this location.

Day	Sound Pressure Level (dB re. $2 \times 10^{-5}$ Pa)					
	Daytime (07:00 to 19:00 hrs)		Evening (19:00 to 23:00 hrs)		Night (07:00 to 23:00 hrs)	
	L <sub>Aeq</sub>	L <sub>A90</sub>	L <sub>Aeq</sub>	L <sub>A90</sub>	L <sub>Aeq</sub>	L <sub>A90</sub>
Tues, 25 June 2019	67	62	66	60	63	52
Wed, 26 June 2019	66	61	67	61	63	53
Thurs, 27 June 2019	66	61	67	61	64	54
Fri, 28 June 2019	67	62	66	62	64	56
Sat, 29 June 2019	72	63	66	61	65	56
Sun, 30 June 2019	66	61	65	60	63	53
Mon, 1 July 2019	66	62	67	61	62	51
<i>Average</i>	<i>68<sup>1</sup></i>	<i>62<sup>2</sup></i>	<i>66<sup>3</sup></i>	<i>61<sup>4</sup></i>	<i>63<sup>3</sup></i>	<i>54<sup>4</sup></i>

**Table 11.4:** Summary of Measured Noise Levels at UN1 (dB re.  $2 \times 10^{-5}$  Pa)

<sup>1</sup> Logarithmically averaged.

<sup>2</sup> Arithmetically averaged.

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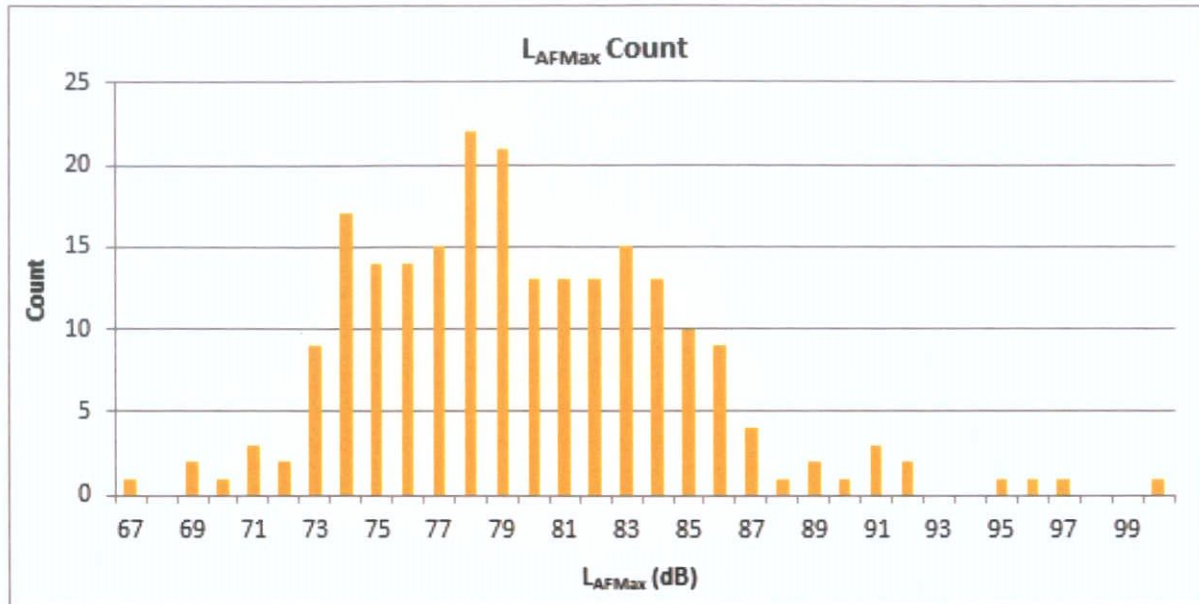


Figure 11.4: Number of L<sub>AFMax</sub> events at each decibel level measured during the night period at location UN1.

During the 7 day survey period at UN1 all events measured above 60 dB L<sub>AFMax</sub>. More than 100 events were measured at or above 80 dB L<sub>AFMax</sub>, however no survey day exceeded 20 events in one night period. Based on the Figure above the most commonly occurring L<sub>AFMax</sub> value is 78 dB. The arithmetic L<sub>AFMax</sub> value is 79 dB.

#### Survey Position UN2

Table 11.5 summarises the measured day, evening and night-time noise levels for survey location UN2. Subjective observations during the setup and removal of the monitoring equipment noted that the primary contributors to noise build-up were road traffic along O'Connell Street, Parnell Street and the Luas rail line in addition to traffic along the surrounding road network. Local sources from retail and commercial units in addition to local urban sources (e.g. pedestrian movements, plant noise etc.) also contribute to the noise environment at this location.

Day	Sound Pressure Level (dB re. 2x10 <sup>-5</sup> Pa)					
	Daytime (07:00 to 19:00 hrs)		Evening (19:00 to 23:00 hrs)		Night (07:00 to 23:00 hrs)	
	L <sub>Aeq</sub>	L <sub>A90</sub>	L <sub>Aeq</sub>	L <sub>A90</sub>	L <sub>Aeq</sub>	L <sub>A90</sub>
Tues, 18 June 2019	60	54	57	52	54	48
Wed, 19 June 2019	59	54	58	54	55	50
Thurs, 20 June 2019	59	54	57	53	56	50
Fri, 21 June 2019	59	54	58	54	57	50
Sat, 22 June 2019	58	54	58	53	55	50
Sun, 23 June 2019	58	54	59	56	56	49
Mon, 24 June 2019	59	54	58	52	55	47
<i>Average</i>	<i>59<sup>3</sup></i>	<i>54<sup>4</sup></i>	<i>58<sup>3</sup></i>	<i>54<sup>4</sup></i>	<i>56<sup>3</sup></i>	<i>49<sup>4</sup></i>

Table 11.5: Summary of Measured Noise Levels at UN2 (dB re. 2x10<sup>-5</sup> Pa)

<sup>3</sup> Logarithmically averaged.

<sup>4</sup> Arithmetically averaged.

Note these levels were measured 7m inside the perimeter of the Dublin Central Masterplan site and some consideration needs to be given to slightly elevated noise levels that will be expected at the facades of the proposed buildings, in line with UN2. This will be discussed and considered as appropriate in relation to the inward noise impact assessment presented in the body of this report.

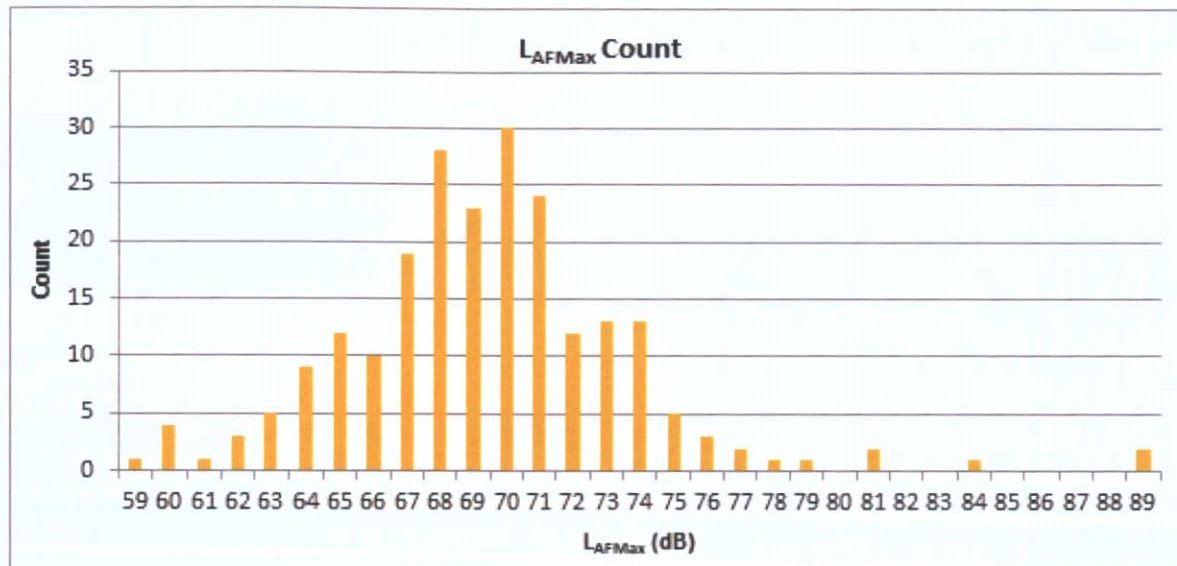


Figure 11.5: Number of L<sub>AFMax</sub> events at each decibel level measured during the night period at location UN2.

During the 7 day survey period at UN2 all but one event measured above 60 dB L<sub>AFMax</sub>. Five events were measured at or above 80 dB L<sub>AFMax</sub>. Based on the Figure above the most commonly occurring L<sub>AFMax</sub> value is 70 dB. The arithmetic L<sub>AFMax</sub> value is 69 dB.

Survey Position UN3

Table 11.6 summarises the measured day, evening and night-time noise levels for survey location UN3. Subjective observations during the setup and removal of the monitoring equipment noted that the primary contributors to noise build-up were road traffic along Parnell Street and the Luas rail line in addition to traffic along the surrounding road network. Local sources from retail and commercial units in addition to local urban sources (e.g. pedestrian movements, plant noise etc.) also contribute to the noise environment at this location.

Day	Sound Pressure Level (dB re. 2x10 <sup>-5</sup> Pa)					
	Daytime (07:00 to 19:00 hrs)		Evening (19:00 to 23:00 hrs)		Night (07:00 to 23:00 hrs)	
	L <sub>Aeq</sub>	L <sub>A90</sub>	L <sub>Aeq</sub>	L <sub>A90</sub>	L <sub>Aeq</sub>	L <sub>A90</sub>
Tues, 18 June 2019	61	54	58	52	57	48
Wed, 19 June 2019	61	55	59	53	58	50
Thurs, 20 June 2019	60	55	59	53	58	51
Fri, 21 June 2019	61	55	60	53	57	50
Sat, 22 June 2019	59	53	58	53	57	50
Sun, 23 June 2019	59	54	61	55	59	50
Mon, 24 June 2019	61	56	58	52	56	48



Day	Sound Pressure Level (dB re. 2x10 <sup>-5</sup> Pa)					
	Daytime (07:00 to 19:00 hrs)		Evening (19:00 to 23:00 hrs)		Night (07:00 to 23:00 hrs)	
	L <sub>Aeq</sub>	L <sub>A90</sub>	L <sub>Aeq</sub>	L <sub>A90</sub>	L <sub>Aeq</sub>	L <sub>A90</sub>
Average	60 <sup>5</sup>	55 <sup>6</sup>	59 <sup>3</sup>	53 <sup>4</sup>	58 <sup>3</sup>	50 <sup>4</sup>

Table 11.6: Summary of Measured Noise Levels at UN3 (dB re. 2x10<sup>-5</sup> Pa).

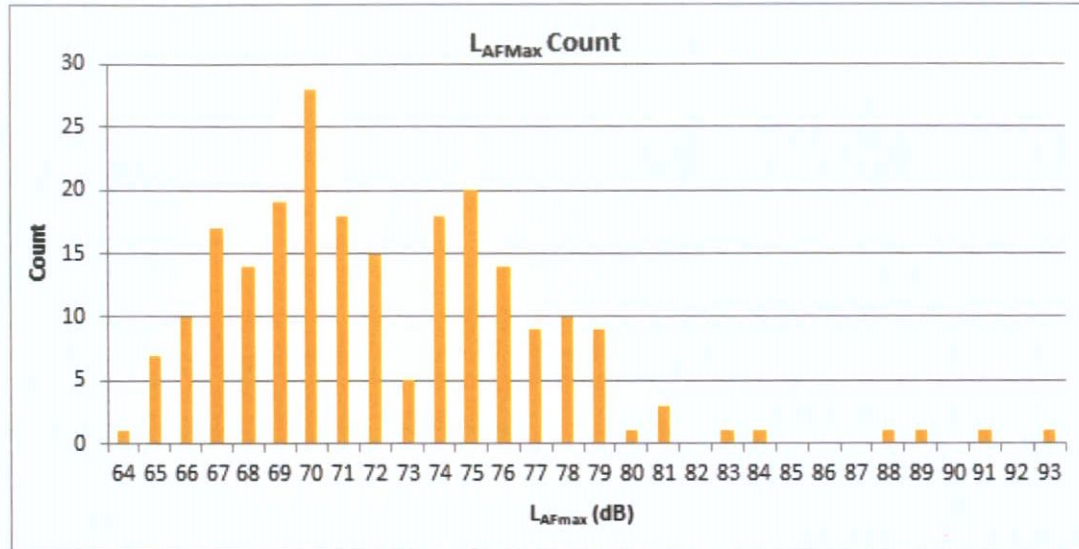


Figure 11.6: Number of L<sub>AFMax</sub> events at each decibel level measured during the night period at location UN3.

During the 7 day survey period at UN3 all events measured above 60 dB L<sub>AFMax</sub>. Fifteen events were measured at or above 80 dB L<sub>AFMax</sub>, and as a result no survey days exceeded 20 events in one night period. Based on the Figure above the most commonly occurring L<sub>AFMax</sub> value is 70 dB. The arithmetic L<sub>AFMax</sub> value is 72 dB.

Vibration Survey Results June / July 2019

*Survey Position VM1*

Unattended vibration monitoring was undertaken at one location within the Dublin Central Masterplan site (VM1) representative of the existing noise environment at the closest NSLs and the noise climate within the Dublin Central Masterplan site.

The monitoring data has been reviewed against the Luas timetables to align measurement periods against passing tram times along the adjacent line. Measured vibration values significantly in excess of those associated with tram pass by's have been removed as outlier values associated with the activities at the accelerometer which were noted to occur for a small number of periods.

*Peak Particle Velocity*

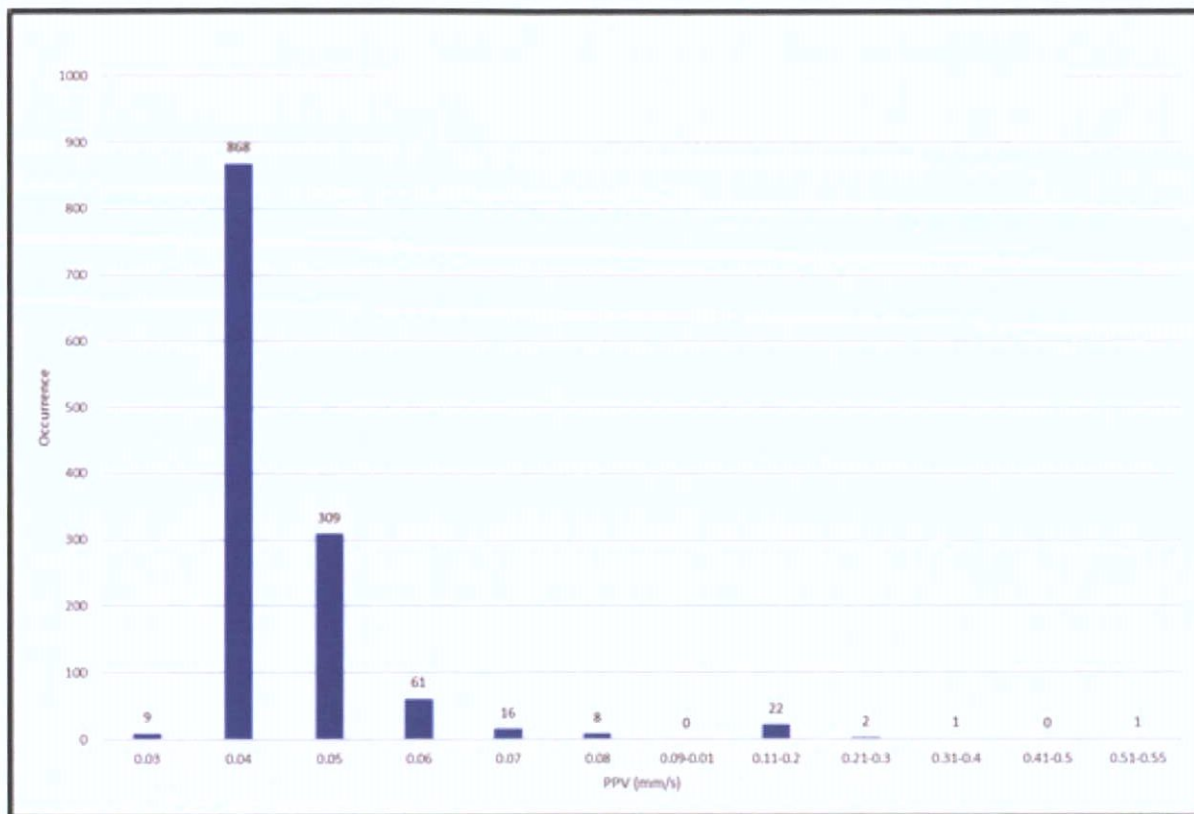
Table 11.7 summarises the monitoring results for this location for the horizontal and vertical axes. The range of maximum, minimum and median PPV values recorded over each daytime period (07:00 to 23:00hrs) and each night-time period (23:00 to 07:00hrs) over the 8 day monitoring period are presented. The typical PPV value associated with tram pass by's are also included.

<sup>5</sup> Logarithmically averaged  
<sup>6</sup> Arithmetically averaged

							Typical train pass by - PPV (mm/s)
	Maximum PPV mm/s	Minimum PPV mm/s	Median PPV mm/s	Maximum PPV mm/s	Minimum PPV mm/s	Median PPV (mm/s)	
	0.15 – 0.4	0.03	0.04	-0.13		0.03	0.05 – 0.08

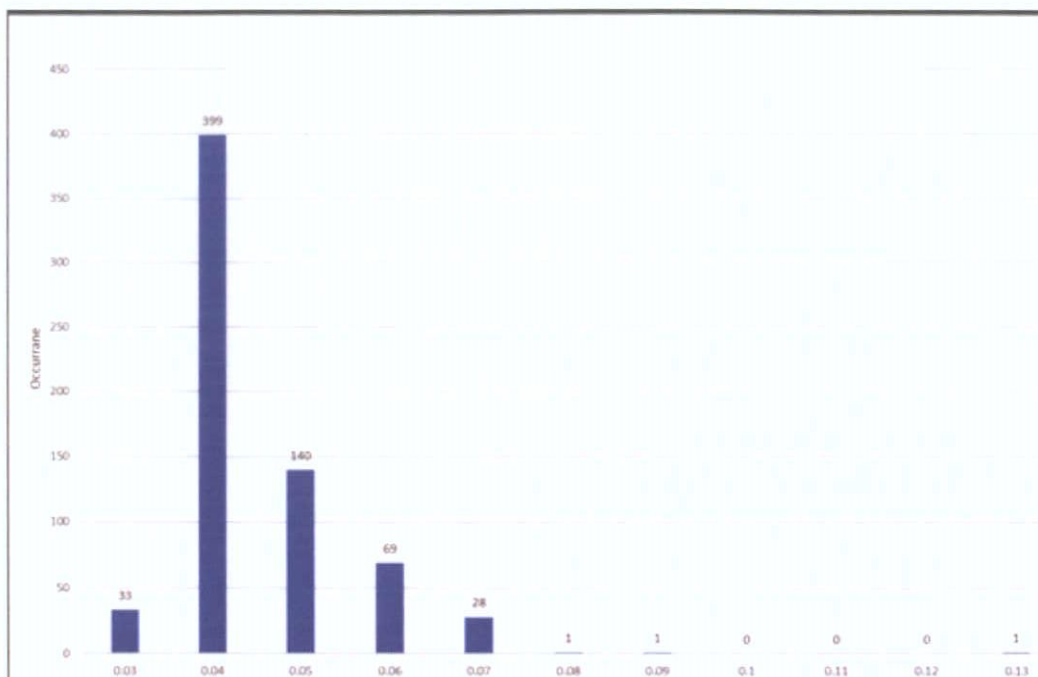
Table 11.7: PPV values for VM1.

Figure 11.7 presents the distribution of measured PPV values over the 8 day monitoring period during daytime hours (07:00 to 23:00hrs) for the vertical axis.



PPV values are in the range of 0.03 to 0.04 in the absence of passing trains. During a passing train event, measured PPV values are measured in the range of 0.05 to 0.08mm/s. The dominant frequency associated with a tram pass by is in the range of 15 to 20Hz. A low number of PPV events were recorded in the range of 0.1 to 0.5mm/s over day and night-time periods which are also potentially attributed to tram pass by's. The maximum events recorded are expected, however, to be as a result of activities adjacent to the accelerometer.

Figure 11.8 presents the distribution of measured PPV values over the 8 day monitoring periods during night-time hours (23:00 to 07:00hrs) for the vertical axis.



**Figure 11.8:** Night-time PPV Vertical Distribution at VM1

PPV values are in the range of 0.03 to 0.04mm/s in the absence of passing trams. During a passing train event, measured PPV values are measured in the range of 0.05 to 0.07mm/s. The dominant frequency associated with a train pass by is in the range of 20 to 40Hz.

Vibration Baseline Overview

The baseline vibration environment is low. Vibration levels associated with passing tram traffic was detectable above the baseline environment. The overall range of vibration levels measured was however, low and would not give rise to levels of vibration typically perceptible to building occupants.

**Environmental Noise Survey Conducted July / August 2020**

Survey Positions

In July and August 2020 unattended noise monitoring was undertaken at one location within the Dublin Central Masterplan site (UN4). An additional four attended monitoring locations (AN1 to AN4) were undertaken in the close vicinity of the Dublin Central Masterplan site, representative of the existing noise environment at the closest NSLs and the noise climate within the Dublin Central Masterplan site. The locations are described below in Table 11.8 and shown in Figure 11.9.

Location	Coordinates	Description	Notes
UN4	5741, 1924	tended noise monitor. Externally ioned 1m outside first storey ow to north-eastern boundary e proposed site, overlooking nell Street.	The data collected at this location has been cross referenced with UN and used to predict expected noise levels across the Proposed Development site which in turn will be used to inform the ProPG assessment to be presented in the full EIAR chapter.

Location	ITM Co-ordinates	Description	Rationale
AN1	715626, 734915	Attended monitoring approximately 50m northwest of northern boundary of site, in line with facades of nearest NSLs (Rotunda Hospital).	Representative of the nearest NSLs situated to the north of the site along Parnell Street.
AN2	715762, 734853	Attended monitoring approximately 2.5m from mid-point along eastern boundary of site, in line with facades of nearest NSLs (Lynam Hotel) along O'Connell Street.	Representative of the nearest NSLs situated to the east of the site along O'Connell Street.
AN3	715751, 734682	Attended monitoring approximately 2.5m from southern boundary of site, in line with commercial property facades. Located 60m from O'Connell Street junction.	Representative of the nearest commercial properties situated to the south of the site, along Henry Street.
AN4	715642, 734793	Attended monitoring approximately 10m northwest of western boundary of site, in line with facades of nearest NSLs (Greeg Court Apartments) along Moore Street. Located 80m from Parnell Street Junction.	The data collected at this location is representative of the nearest commercial NSLs along More Street and has been used to predict expected noise levels across the Proposed Development site which in turn will be used to inform the ProPG assessment to be presented in the full EIAR chapter.

Table 11.8: Measurement Locations.

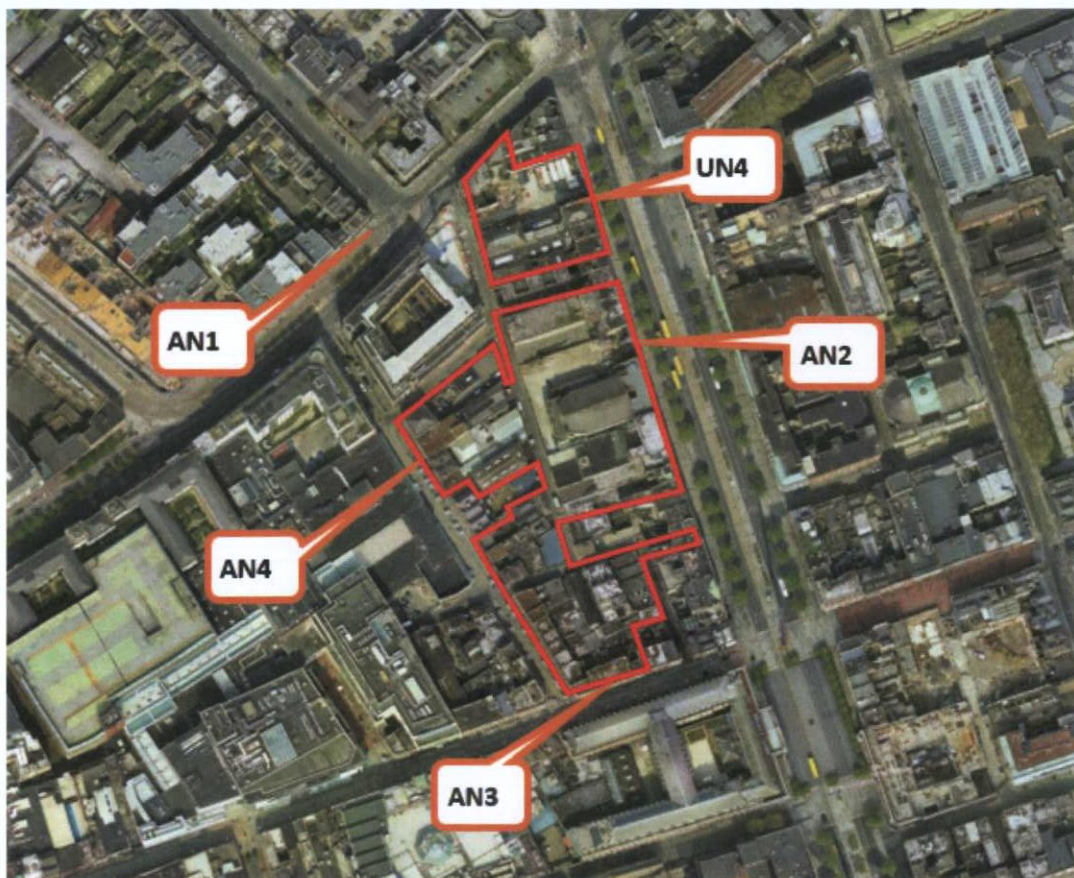


Figure 11.9: Noise Monitoring Locations UN4, AN1 to AN4 (Source : Google Earth)

### Survey Periods and Personnel

The following equipment was installed by AWN Consulting personnel over the following periods:

Survey Position	Survey Period
UN4	11:00 hrs 28 July 2020 to 08:25 hrs 08 August 2020
AN 1 to AN4	11:54 hrs to 15:33 hrs 11 August 2020
AN 1 to AN4	23:00 hrs 11 August to 02:16 hrs 12 August 2020

**Table 11.9:** Survey Periods.

### Instrumentation

The surveys were performed using the equipment listed in Table 11.10.

Survey Position	Measurement	Manufacturer	Equipment Model	Serial Number	Calibration date
UN4	Sound Level Meter	Rion	NL-52	586940	15 August 2018
AN1 to AN4				186668	07 May 2020
All	Calibrator	Brüel & Kjær	Type 4231	2394086	3 March 2020

**Table 11.10:** Noise Monitoring Equipment Details.

The unattended microphone was protected using WS-15 outdoor microphone kit and the attended microphone was protected using a proprietary windshield. Before and after the survey the measurement apparatus was check calibrated using a Brüel & Kjær Type 4231 Sound Level Calibrator. Calibration certificates for the equipment are available on request.

### Noise Environment Results

#### *Survey Position UN4*

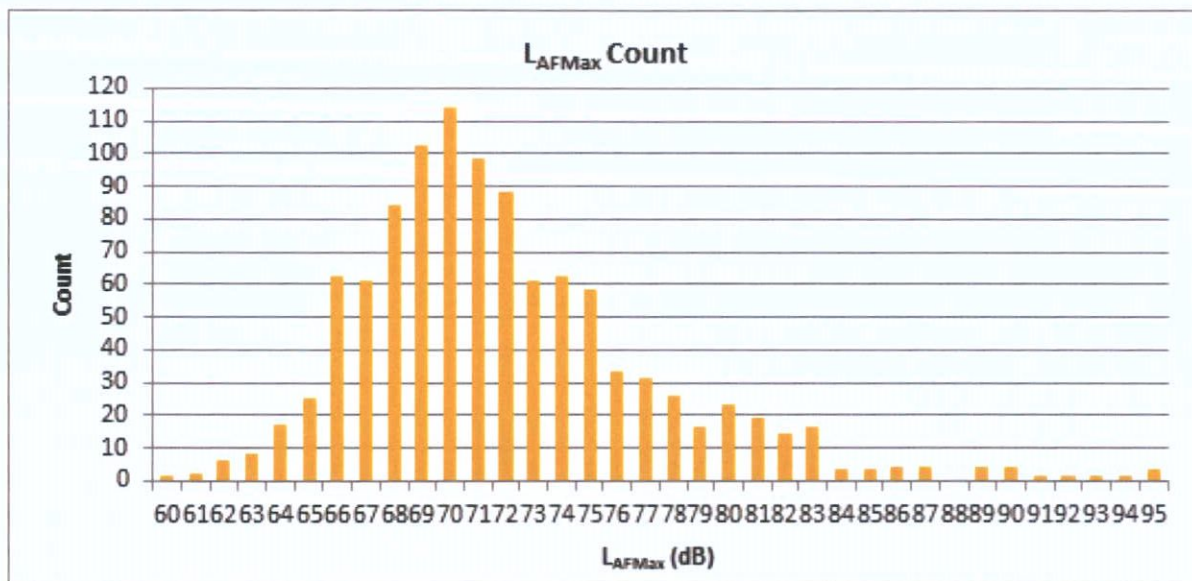
Table 11.11 summarises the measured day, evening and night-time noise levels for survey location UN4. Subjective observations during the setup and removal of the monitoring equipment noted that the primary contributor to noise build-up was road traffic noise from O'Connell Street with intermittent Luas pass-by and bell ringing.

Day	Sound Pressure Level (dB re. 2x10 <sup>-5</sup> Pa)					
	Daytime (07:00 to 19:00 hrs)		Evening (19:00 to 23:00 hrs)		Night (07:00 to 23:00 hrs)	
	L <sub>Aeq</sub>	L <sub>A90</sub>	L <sub>Aeq</sub>	L <sub>A90</sub>	L <sub>Aeq</sub>	L <sub>A90</sub>
Tues, 28 July 2020	65	58	64	56	62	48
Wed, 29 July 2020	64	57	65	55	63	52
Thurs, 30 July 2020	66	59	64	56	64	49
Fri, 31 July 2020	66	59	64	57	61	50
Sat, 01 August 2020	64	56	65	56	62	50
Sun, 02 August 2020	62	54	64	57	59	48
Mon, 03 August 2020	62	54	64	55	59	47

Day	Sound Pressure Level (dB re. 2x10 <sup>-5</sup> Pa)					
	Daytime (07:00 to 19:00 hrs)		Evening (19:00 to 23:00 hrs)		Night (07:00 to 23:00 hrs)	
	L <sub>Aeq</sub>	L <sub>A90</sub>	L <sub>Aeq</sub>	L <sub>A90</sub>	L <sub>Aeq</sub>	L <sub>A90</sub>
Tues, 04 August 2020	65	58	65	57	58	47
Wed, 05 August 2020	64	57	64	57	60	47
Thurs, 06 August 2020	64	58	65	57	61	48
Fri, 07 August 2020	66	58	65	57	61	49
<i>Average</i>	65 <sup>7</sup>	57 <sup>8</sup>	65 <sup>3</sup>	56 <sup>4</sup>	61 <sup>3</sup>	49 <sup>4</sup>

**Table 11.11:** Summary of Measured Noise Levels at UN1 (dB re. 2x10-5 Pa)

The L<sub>AFMax</sub> values were measured at 5 minute intervals over the duration of the unattended monitoring survey. Figure 11.10 presents the distribution of the magnitude of L<sub>AFMax</sub> events during the night period.



**Figure 11.10:** Number of L<sub>AFMax</sub> events at each decibel level measured during the night period at location UN4.

During the 11 day survey period all events measured above 60 dB L<sub>AFMax</sub>. More than 100 events were measured at or above 80 dB L<sub>AFMax</sub>, however none survey days exceeded 20 events in one night period. The most commonly occurring L<sub>AFMax</sub> value is 70 dB. The arithmetic L<sub>AFMax</sub> value is 72 dB.

Table 11.12 presents the L<sub>AFMax</sub> noise level assumed for the purpose of this assessment. Spectral data has been derived from the mode of the frequency content measured at the magnitude of 72 dB L<sub>AFMax</sub>. At survey locations UN1 to UN3, the spectrum has been adjusted accordingly<sup>9</sup> from the frequency content collated at UN4.

<sup>7</sup> Logarithmically averaged.

<sup>8</sup> Arithmetically averaged.

<sup>9</sup> The L<sub>AFMax</sub> value for each unattended location (UN1 to UN3) was chosen from either the most commonly occurring value or arithmetic average, whichever is the higher value.

Survey Location Reference	Overall dB L <sub>AFMax</sub>	Octave Band Centre Frequency (Hz)					
		125	250	500	1k	2k	4k
UN4	72	64	66	65	66	63	60
UN1	79	71	73	72	73	70	67
UN2	70	62	64	63	64	61	58
UN3	72	64	66	65	66	63	60

**Table 11.12:** Night-time L<sub>AFMax</sub> Noise Levels.

#### Survey Position AN1

All daytime measurements were affected to some degree by construction works that are ongoing in the surrounding area. The contribution from construction noise has been minimised through location of the noise monitor and careful operation of the meter to remove any excessive noise emissions that are not considered a part of the normal noise environment.

The survey results for Location AN1 are presented in Table 11.13. During the day time period road traffic noise from Parnell Street and the surrounding city centre roads were the dominant noise source at this location with intermittent Luas pass-by and bell ringing, sirens, distant construction noise and pedestrian activity. At night-time road traffic noise continued as the dominant noise source with intermittent street sweeper pass-by, and alarms sounding in the distance.

Date	Period	Measurement Period	Measured Noise Levels, dB re 2×10 <sup>-5</sup> Pa		
			L <sub>Aeq</sub>	L <sub>AFMax</sub>	L <sub>AF90</sub>
Tues, 11 August 2020	Day	11:54 – 12:09	69	86	63
		13:09 – 13:24	72	99	63
		14:23 – 14:38	78	104	63
	Night	23:00 – 23:15	67	83	52
		23:15 – 23:00	65	81	54
		23:30 – 23:45	67	86	57

**Table 11.13:** Measured Noise Levels at Location AN1.

Daytime ambient noise levels at this location were dominated by road traffic noise from Parnell Street and local roads. Noise levels were in the range of 69 to 78 dB L<sub>Aeq,15min</sub> and in the order of 63 dB L<sub>A90,15min</sub> during the measurement periods. The third day time measurement was influenced by a fire engine passing by towards the end of the measurement period.

Night-time ambient noise levels at this location were dominated by road traffic noise from Parnell Street and local roads. Noise levels were in the range of 65 to 67 dB L<sub>Aeq,15min</sub> and in the range of 52 to 57 dB L<sub>A90,15min</sub> during the measurement periods.

No significant level of vibration was noted at this location during site attendance.

### Survey Position AN2

The survey results for Location AN2 are presented in Table 11.14. During the day time period road traffic noise from O'Connell Street and the surrounding city centre roads were the dominant noise source at this location with intermittent Luas pass-by and bell ringing, street sweeper pass-by, car horns, sirens, pedestrian activity and birdsong. At night-time road traffic noise continued as the dominant noise source with constant plant noise audible. Intermittent street sweeper, pedestrians and a traffic light beacon were also noted as contributors to the noise build up.

Date	Period	Measurement Period	Measured Noise Levels, dB re $2 \times 10^{-5}$ Pa		
			L <sub>Aeq</sub>	L <sub>AFMax</sub>	L <sub>AF90</sub>
Tues, 11 August 2020	Day	12:50 – 13:05	67	79	61
		14:04 – 14:19	67	76	61
		15:18 – 15:33	69	93	61
Wed, 12 August 2020	Night	01:30 – 01:45	63	79	48
		01:45 – 02:00	67	88	45
		02:00 – 02:15	59	74	49

**Table 11.14:** Measured Noise Levels at Location AN2.

Daytime ambient noise levels at this location were dominated by road traffic noise from O'Connell Street. Noise levels were in the range of 67 to 69 dB L<sub>Aeq,15min</sub> and in the order of 61 dB L<sub>A90,15min</sub> during the measurement periods.

Night-time ambient noise levels at this location were dominated by road traffic noise from O'Connell Street and continuous plant noise sources. Noise levels were in the range of 59 to 67 dB L<sub>Aeq,15min</sub> and in the range of 45 to 49 dB L<sub>A90,15min</sub> during the measurement periods.

No significant level of vibration was noted at this location during site attendance.

### Survey Position AN3

The survey results for Location AN3 are presented in Table 11.15. During the day time period pedestrians passing by with distant buskers, road traffic noise and Luas noise from O'Connell Street were the dominant noise sources at this location. Intermittently aircraft flyover and street sweepers pass-by also contributed to the noise build up. At night-time distant road traffic noise continued as the dominant noise source. Intermittent street sweeper, pedestrians, running water, distant alarms / sirens were also noted as contributors to the noise build up.

Date	Period	Measurement Period	Measured Noise Levels, dB re $2 \times 10^{-5}$ Pa		
			L <sub>Aeq</sub>	L <sub>AFMax</sub>	L <sub>AF90</sub>
Tues, 11 August 2020	Day	12:31 – 12:46	65	82	61
		13:45 – 14:00	65	88	61
		14:59 – 15:14	67	84	61
Wed, 12 August 2020	Night	00:40 – 00:55	53	67	47
		00:55 – 01:10	52	69	46
		01:11 – 01:26	54	67	48

**Table 11.15:** Measured Noise Levels at Location AN3.



Daytime ambient noise levels at this location were dominated by city centre activity along Henry Street, namely buskers and pedestrians, along with distant road / Luas traffic noise from O'Connell Street. Noise levels were in the range of 65 to 67 dB  $L_{Aeq,15min}$  and in the order of 61 dB  $L_{A90,15min}$  during the measurement periods.

Night-time ambient noise levels at this location were dominated by road traffic noise from O'Connell Street. Noise levels were in the range of 52 to 54 dB  $L_{Aeq,15min}$  and in the range of 46 to 48 dB  $L_{A90,15min}$  during the measurement periods.

No significant level of vibration was noted at this location during site attendance.

#### Survey Position AN4

The survey results for Location AN4 are presented in Table 11.16. During the day time period pedestrians passing by with plant noise and intermittent road traffic were the dominant noise sources at this location. Distant construction noise, intermittent street sweeper pass-by and alarms ringing also contributed to the noise build up. During the first two night-time noise measurements a delivery along Moore Street with truck pass-by and idling with pallet truck movements were the dominant noise sources. Continuous plant noise, distant road traffic noise, intermittent Luas pass-by and shouting from pedestrians along Parnell Street were also noted as contributors to the noise build up. During the final measurement, the truck delivery had finished and the dominant noise source was continuous plant noise with distant road traffic noise also audible.

Date	Period	Measurement Period	$L_{Aeq}$	$L_{AFMax}$	$L_{A90}$	$L_{Aeq}$ Octave Band Centre Frequency (Hz)					
						125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz
Tues, 11 August 2020	Day	12:12 – 12:27	65	82	62	61	59	57	55	52	45
		13:27 – 13:42	64	83	61	60	57	58	56	51	45
		14:41 – 14:56	69	93	63	62	60	64	62	58	52
Wed, 12 August 2020	Night	23:49 – 00:04	72	98	54	61	65	69	64	58	51
		00:04 – 00:19	68	91	54	60	55	58	67	54	48
		00:20 – 00:35	51	68	49	49	41	40	37	33	26

**Table 11.16:** Measured Noise Levels at Location AN4.

Daytime ambient noise levels at this location were dominated by plant noise and intermittent local road traffic and pedestrians passing by. Noise levels were in the range of 64 to 69 dB  $L_{Aeq,15min}$  and in the range of 61 to 63 dB  $L_{A90,15min}$  during the measurement periods.

Night-time ambient noise levels at this location were dominated by truck deliveries and plant noise from Moore Street commercial developments. Noise levels were in the range of 51 to 72 dB  $L_{Aeq,15min}$  and in the range of 49 to 54 dB  $L_{A90,15min}$  during the measurement periods.

No significant level of vibration was noted at this location during site attendance.

#### Noise Baseline Overview

The measured noise levels reflect typical city centre locations. At roadside positions, traffic on the busy main road and pedestrian activity dominate while at positions further from main roads, individual vehicle movements and pedestrian activity dominate with constant distant traffic contributing to measured levels.

#### *Comment on Covid-19 Pandemic on 2020 Survey Noise Environment*

The unattended noise monitor at UN4 installed in 2020 was positioned on eastern boundary of the Dublin Central Masterplan site, in a comparable location to the 2019 UN1 noise monitor. Comparison between the average  $L_{Aeq}$  values at the two locations indicate that there was a reduction no greater than 3 dB at the UN4 location due to the Covid-19 travel restrictions.

As a worst-case assessment, the highest noise environments identified during 2019 or 2020 will be used to inform the inward impact assessment, with the lowest noise environments used to inform the outward impact assessment.

### **11.3.2 Proposed Development – Site 3, 4 & 5**

The receiving environment in terms of baseline noise and vibration is expected to be the same for the Dublin Central Masterplan development and each individual site within the development. Therefore, the baseline environment outlined in Section 11.3.1 do not differentiate between the Dublin Central masterplan development or the individual site of the development being assessed within this EIAR chapter.

In the Proposed Development (Sites 3, 4 and 5) the nearest existing residential NSLs to the Proposed Development are those located at Greeg Court Apartments, to the northwest site boundary along Moore Street. The Rotunda Hospital is located to the north of the site boundary on Parnell Street.

Apart from the receptors identified above, there are protected buildings identified at 14 to 17 Moore Street to the northwest of the site boundary.

Commercial NSLs include Jurys Inn Hotel Parnell Street and Lynams Hotel, which are located beyond the northern boundary on O' Rahilly Parade and eastern boundary on Henry Place respectively. Other hotels in close proximity to the eastern site boundary are Holiday Inn Express and The Gresham Hotel on O'Connell Street.

#### **11.3.2.1 Proposed Development Site 3**

Site 3 site is located to the south west of the Dublin Central Masterplan development and is bounded by Henry Place to the north and east, Henry Street to the south and Moore Street to the west. A full description of the development is provided in Chapter 3: Description of Proposed Development.

#### **11.3.2.2 Proposed Development Site 4**

Site 4 is located to the west of the Dublin Central Masterplan development, and is bounded by Moore Lane to the east, Henry Place to the south, Moore Street to the west and the proposed Site 5 to the north. A full description of the development is provided in Chapter 3: Description of Proposed Development.

#### **11.3.2.3 Proposed Development Site 5**

Site 5 site is located to the northwest of the Dublin Central Masterplan development and is bounded by Moore Street to the west, O' Rahilly Parade to the north, Moore Lane to the east and the proposed Site 4 to the south. A full description of the development is provided in Chapter 3: Description of Proposed Development.

### **11.4 CHARACTERISTICS OF PROPOSED DEVELOPMENT**

When considering a development of this nature, the potential noise and vibration impacts on the surroundings are considered for each of two distinct stages, the short to medium-term construction stage and the long term operational stage.

## 11.4.1 Dublin Central Masterplan

### 11.4.1.1 Construction Stage

The construction stage of the development of the Dublin Central Masterplan will be undertaken over all five sites, each which involve key stages which will involve site preparation, demolition, basement excavation and building construction. Site 2AB and Site 2C also includes the construction of a basement under 43 to 60 O'Connell Street which will facilitate the future provision of the MetroLink Station by Transport Infrastructure Ireland (TII), the CEMP for which will be made by the TII under a separate application. The full assessment of Site 2AB and Site 2C and the cumulative impact of the development of the MetroLink Station by TII will be assessed fully as part of a subsequent planning application.

The different stages will involve a number of potential noise and vibration sources including excavators, crushing plant, piling rigs, demolition equipment and other general building construction works including landscaping. In addition, there will be construction traffic to and from the development site over the course of the works. The construction stage of the Dublin Central Masterplan development is expected to have the highest potential for noise and vibration impacts on the surrounding environment. This stage will be of medium-term impact and is assessed in the following sections.

The phasing of construction works over the Dublin Central Masterplan will need to consider potential impacts on NSLs external to the development site and those within the earlier stages of the Dublin Central Masterplan for the following scenarios: -

- Site 3 and Site 4 may be in construction phase when Site 1 is completed and may be occupied.
- Site 2AB and Site 2C may be in construction phase when Sites 1, 3 and 4 are completed and may be occupied.
- Site 5 may be in construction phase when Sites 1, 2AB, 2C, 3 and 4 are completed and may be occupied.

### 11.4.1.2 Operational Stage

During the operational stage the Dublin Central Masterplan will comprise several functions including residential, commercial offices, retail, café / restaurant and cultural units, hotel accommodation and transport link.

Noise sources associated with the operational phase will include noise from mechanical plant items serving the various buildings, traffic noise associated with private vehicles of residents, workers and visitors journeying to and from the development, delivery and servicing vehicles and entertainment noise.

The inward impact of the noise environment on the development itself is also considered during the operational stage.

## 11.4.2 Proposed Development – Site 3, 4 & 5

### 11.4.2.1 Construction Stage

Due to the nature of the Proposed Development under consideration, typically the same characteristics apply to both the Proposed Development (Sites 3, 4 and 5) and the Dublin Central Masterplan. Outlined in the sections below, the specific works associated with each site within the Proposed Development are listed.

#### 11.4.2.1.1 Construction Stages – Site 3

Site 3 involves the construction of two separate multistorey buildings, Block A and Block B. As discussed in Section 11.4.1.1 the main site activities will include: -

- Site preparation.
- Demolition.
- Basement excavation, including piling works and secant retaining wall construction.
- General construction.
- Landscaping.

These activities will have the greatest potential noise and vibration impacts on the surrounding environment, however the construction stage will be of short-term impact.

During the stages of construction works on Site 3, the assessment will need to consider potential impacts on noise sensitive locations external to the development site only i.e. none of the buildings constructed in the earlier stages of the Dublin Central Masterplan site will be occupied.

#### 11.4.2.1.2 Construction Stages – Site 4

Site 4 involves the construction of a mixture of two and three storey structures and includes the retention the protected buildings identified at 14 to 17 Moore Street adjacent to the centre of the Site 4 boundary. As discussed in Section 11.4.1.1 the main site activities will include: -

- Site preparation.
- Demolition.
- It is proposed to re-use the existing foundations to support new floor slab and rising walls. The existing basements, where present will also be retained and incorporated into the scheme. Therefore, no significant ground works are anticipated.
- General construction.
- Landscaping.

These activities will have the greatest potential noise and vibration impacts on the surrounding environment, however the construction stage will be of short-term impact.

During the stages of construction works on Site 4, the assessment will need to consider potential impacts on noise sensitive locations external to the development site only i.e. none of the buildings constructed in the earlier stages of the Dublin Central Masterplan site will be occupied.

#### 11.4.2.1.3 Construction Stages – Site 5

Site 5 involves the construction of a six storey building. As discussed in Section 11.4.1.1 the main site activities will include: -

- Site preparation.
- Demolition, including façade demolition.
- Basement excavation, including piling works and secant retaining wall construction.
- General construction.
- Landscaping.

These activities will have the greatest potential noise and vibration impacts on the surrounding environment, however the construction stage will be of short-term impact.

During the stages of construction works on Site 5, the assessment will need to consider potential impacts on NSLs external to the development site. Additionally as it is expected that Site 5 will commence construction when Sites 1, 2, 3 and 4 are completed and may be occupied, therefore the assessment will also consider potential impacts on NSLs within the Dublin Central Masterplan development site.

### 11.4.2.2 Operational Stage

#### 11.4.2.2.1 Operational Phase – Site 3

Site 3 comprises two separate multistorey buildings, Block A (hotel, retail and café / restaurant) Block B (residential, retail, café / restaurant and cultural). The anticipated operational noise sources associated with this site include: -

- Mechanical plant noise.
- Entertainment noise.
- Servicing and delivery noise.

The above noise sources are linked to the operation of the development and are therefore the resultant impacts are designated permanent in duration.

#### 11.4.2.2.2 Operational Phase – Site 4

Site 4 comprises a mixture of two and three storey structures and includes the retention the protected buildings identified at 14 to 17 Moore Street adjacent to the centre of the Site 4 boundary. This site provides for residential, retail and café / restaurant uses. The anticipated operational noise sources associated with this site include: -

- Mechanical plant noise.
- Entertainment noise.
- Servicing and delivery noise.

The above noise sources are linked to the operation of the development and are therefore the resultant impacts are designated permanent in duration.

#### 11.4.2.2.3 Operational Phase – Site 5

Site 5 comprises a six storey office building that also provides café / restaurant uses at ground floor. As above the anticipated operational noise sources associated with this site include: -

- Mechanical plant noise.
- Entertainment noise.
- Servicing and delivery noise.

The above noise sources are linked to the operation of the development and are therefore the resultant impacts are designated permanent in duration.

## 11.5 POTENTIAL IMPACTS

### 11.5.1 Dublin Central Masterplan

#### 11.5.1.1 Construction Stage

##### 11.5.1.1.1 Relevant Criteria – Noise

There is no published statutory Irish guidance relating to the maximum permissible noise level that may be generated during the construction stage of a project. Dublin City Council (DCC) typically controls construction activities by imposing limits on the hours of operation and consider noise limits at their discretion.

## DCC – Air Quality Monitoring and Noise Control Unit’s Good Practice Guide for Construction and Demolition

Dublin City Council’s “Air Quality Monitoring and Noise Control Unit’s Good Practice Guide for Construction and Demolition” (hereinafter referred to as DCC GPG) outlines a risk assessment methodology directly applicable to the specific construction activities on the proposed site.

The Proposed Development has been classed as a high risk category site based on the DCC GPG risk assessment factors as detailed below: -

- Duration of the works.
- Distance to NSLs.
- Ambient noise levels.
- Site operating hours.
- Location of works.
- Duration of demolition.
- Intrusive noise activities, including vibration generating activities.

As the Proposed Development is in the high risk category, the monitoring section (S.6) of the DCC GPG document identifies that: -

*“The ABC Method detailed in Paragraph E.3.2 of BS 5228-1:2009 shall be used to determine acceptable noise levels for day, evening and night time work.”*

Please note that construction works in relation to this development are proposed during normal working hours only as set out below: -

- Monday to Friday: 08:00 to 18:00hrs
- Saturdays: 08:00 to 14:00hrs
- Sundays and Bank Holidays: No construction works.

### British Standard BS 5228 – 1: 2009+A1:2014

DCC GPG refers to British Standard BS 5228 – 1: 2009+A1:2014: *Code of practice for noise and vibration control on construction and open sites – Noise* (hereinafter referred to as BS 5228-1:2009+A1:2014) as appropriate criteria relating to permissible construction noise threshold levels for a development of this scale may be found in BS 5228-1:2009+A1:2014.

Potential noise impacts during the construction stage of a project are often assessed in accordance with BS 5228-1:2009+A1:2014. Various mechanisms are presented as examples of determining if an impact is occurring, these are discussed in the following paragraphs.

### ABC Method

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

This document sets out guidance on permissible noise levels relative to the existing noise environment. Table 11.17 sets out the values which, when exceeded, signify a potential significant effect at the facades of residential receptors as recommended by BS 5228-1:2009+A1:2014.

Assessment Category and Threshold Value Period (L <sub>Aeq</sub> )	Threshold Value (dB)		
	Category A <sup>A</sup>	Category B <sup>B</sup>	Category C <sup>C</sup>
Night-time (23:00 to 07:00hrs)	45	50	55
Evenings & Weekends <sup>D</sup>	55	60	65
Daytime (07:00 – 19:00hrs) and Saturdays (07:00 – 13:00hrs)	65	70	75

**Table 11.17:** Maximum Permissible Noise Levels at the Façade of Dwellings during the Construction Stage

*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.*

It should be noted that this assessment method is only valid for residential properties and if applied to commercial premises without consideration of other factors may result in an excessively onerous thresholds being set.

#### Fixed Limits

BS 5228-1:2009+A1:2014 gives several examples of acceptable limits for construction or demolition noise, the most simplistic being based upon the exceedance of fixed noise limits. For example, paragraph E.2 states: -

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

Paragraph E.2 goes on to state: -

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

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

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

#### **Other Largescale Developments Granted Permission in Dublin City**

It is also appropriate to reference other large developments that have been granted planning permission in Dublin City. In this instance the following two project examples are presented: -

- DART Underground.
- New Children’s Hospital, St. James’ Hospital.

The following tables present the noise limits for each of these developments at the façade of residential NSLs.

Day	Period & Limit	Notes
Monday to Friday	75dB L <sub>Aeq,1hr</sub> 07:00 – 19:00hrs 65dB L <sub>Aeq,1hr</sub> 19:00 – 22:00hrs 45dB L <sub>Aeq,15mins</sub> 22:00 – 07:00hrs *	*Non tonal, non impulsive
Saturdays	70dB L <sub>Aeq,1hr</sub> 08:00 – 16:30hrs 55dB L <sub>Aeq,1hr</sub> 16:30 – 22:00hrs 45dB L <sub>Aeq,15mins</sub> 22:00 – 08:00hrs *	
Sundays, Bank & Public Holidays	60dB L <sub>Aeq,1hr</sub> 08:00 – 16:30hrs 50dB L <sub>Aeq,1hr</sub> 16:30 – 22:00hrs 45dB L <sub>Aeq,15mins</sub> 22:00 – 08:00hrs *	

**Table 11.18:** Dart Underground Construction Noise Level Criteria at any Façade of a Normal Residence

Day	Period & Limit	Notes
Monday to Friday	70dB L <sub>Aeq,1hr</sub> 07:00 – 19:00hrs 60dB L <sub>Aeq,1hr</sub> 19:00 – 22:00hrs * The higher of 45dB L <sub>Aeq,1hr</sub> or the ambient level 22:00 – 07:00hrs *	* Construction activity at these times, other than that required for emergency works, will require the explicit permission of the relevant local authority
Saturdays	65dB L <sub>Aeq,1hr</sub> 08:00 – 16:00hrs 45dB L <sub>Aeq,1hr</sub> outside of these hours*	
Sundays, Bank & Public Holidays	60dB L <sub>Aeq</sub> 08:00 – 16:00hrs *	

**Table 11.19:** New Children’s Hospital Construction Noise Level Criteria at any Façade of a Normal Residence

### Proposed Threshold Levels for Noise

Taking into account the proposed documents outlined above and making reference to the baseline noise environment monitored around the development site (see Section 11.3.1.2), BS 5228-1:2009+A1:2014 has been used to inform the assessment approach for construction noise in line with the DCC GPG.

The following construction noise threshold levels are proposed for the construction stage of this development: -

- For residential NSLs it is considered appropriate to adopt the 70 dB(A) threshold level, given the baseline monitoring carried out, it would indicate that Category B values are appropriate using the ABC method.
- For commercial NSLs it is considered appropriate to adopt the 75 dB(A) threshold level, given the urban environment in which the closest commercial properties reside, in line with BS 5228-1:2009+A1:2014 and DCC GPG.
- For clinical NSLs it is considered appropriate to adopt the 75 dB(A) threshold level, given the urban environment in which the Rotunda Hospital resides. In addition, if the ABC method were applied to the Rotunda Hospital, given the baseline monitoring carried out, it would indicate that Category C values are appropriate i.e. 75 dB(A) threshold level.

### Interpretation of the Construction Noise Levels (CNL)

In order to assist with interpretation of CNL, Table 11.20 includes guidance as to the likely magnitude of impact associated with construction activities, relative to the threshold value. This guidance is taken from Table 3.16 of DMRB: Noise and Vibration (UKHA 2020) and adapted to include the EPA EIAR Guidelines.



Impact Guidelines for Noise Impact Assessment Significance (Adapted from DMRB)	CNL per Period	EPA EIAR Guidelines	Determination
Negligible	Below or equal to baseline noise level	Not Significant	Depending on range of CNL and baseline noise level
Minor	Above baseline and below or equal to CNL	Slight to Moderate	
Moderate	Above CNL and below or equal to CNL +5 dB	Moderate to Significant	
Major	Above CNL +5 dB	Significant to Very Significant	

**Table 11.20:** Example Threshold of Significant Effect at Dwellings

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

#### Additional Traffic on Public Roads – Construction Stage

In order to assist with interpretation of construction traffic noise, Table 11.21 includes guidance as to the likely magnitude of impact associated with changes in traffic noise levels along an existing road. This guidance is taken from Table 3.17 of DMRB: Noise and Vibration (UKHA 2020).

Change in Sound Level, dB(A)	Magnitude of Impact
<1.0	Negligible
1.0 – 2.9	Minor
3 – 4.9	Moderate
<5.0	Major

**Table 11.21:** Likely Effect Associated with Change in Traffic Noise Level – Construction Noise. Source: (DMRB 2020).

In accordance with the DMRB guidance (UKHA 2020), construction traffic shall constitute a significant effect where it is determined that a major or moderate magnitude will occur for a duration exceeding: -

- Ten or more days or nights in any 15 consecutive day or night period.
- A total number of days exceeding 40 in any 6 consecutive months.

The DMRB guidance outlined will be used to assess the predicted increases in traffic levels on public roads associated with the Proposed Development and comment on the likely impacts during the construction stage.

#### 11.5.1.1.2 Potential Impacts During Construction

Given that the construction stage is highly transient in nature and involves a number of various stages which will encompass a range of different activities on a day to day and week to week basis, it is not possible to calculate with a high degree of accuracy the specific levels of noise associated with each stage. The construction stage will be undertaken over a number of stages from site preparation through to building construction and internal fit out. In terms of the potential noise and vibration impacts, the key stages and activities are expected to involve: -

- Site Preparation & Demolition.
- Façade Demolition.
- Secant Piled Wall.
- Basement Excavation.
- Retaining Wall.
- Piling & Basement Foundation Slab Construction.
- Super-Structure Construction.
- General Construction.

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, known as the “on-time”.
- the distance between the noise source and the receptor.
- the attenuation due to ground absorption or barrier screening effects from walls, buildings, site hoarding etc.

The construction phase will be controlled through the use of construction noise threshold values which the contractor will be required to work within as much as is practicable. In this regard, the choice of plant, scheduling of works on site, provision of localised screening and other best practice control measures will be employed.

#### **Sensitive Receptors**

Noise and vibration impacts will be assessed to the nearest sensitive locations to the Dublin Central Masterplan site boundaries i.e. a worst-case assessment of the closest sensitive locations during any

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of the construction stages of the five sites. These closest locations are identified in



Figure 11.11.

- NSL1 Residential apartments on Moore Lane located approximately 15m to the west of Site 5 boundary.
- NSL 2 The Rotunda Hospital on Parnell Street located approximately 20m to the north of Site 1 boundary.
- NSL 3 AIB Bank offices on O'Connell Street / Parnell Street located directly adjacent to the north of Site 1 boundary.
- NSL 4 Hotel rooms located in Jurys Inn Hotel Parnell Street, located approximately 10m to the north of the Site 5 boundary and 10m to the west of Site 1 and Site 2C boundaries.
- NSL 5 Hotel rooms located in Holiday Inn Express on O'Connell Street Upper, located approximately 45m to east of the Site 1 boundary.
- NSL 6 Hotel rooms located in Gresham Hotel on O'Connell Street Upper, located approximately 45m to east of the Site 1 and Site 2C boundaries.
- NSL 7 Hotel rooms located in Lynams Hotel on Henry Place, located approximately 10m to the east of the Site 3 boundary.
- NSL 8 Commercial properties located on Henry Street, located directly adjacent to the southeast of Site 3 boundary.
- VSL 1 The Rotunda Hospital on Parnell Street located approximately 20m to the north of Site 1 boundary.
- VSL 2 Protected buildings at 14 to 17 Moore Street, located directly adjacent to the Site 4 boundary.
- VSL 3 The Luas Line rail tracks located on O'Connell Street, located approximately 20m to the east of the Site 2AB boundary.



**Figure 11.11:** Dublin Central Masterplan Boundary with Noise (Green) and Vibration (Yellow) Sensitive Locations (Image Source: Google Earth).

During the construction of the Dublin Central Masterplan, as a worst-case assessment the closest NSLs within the development site at any stage of construction are: -

- Hotel rooms in Site 1 building, located adjacent to Site 2C northern boundary.
- Hotel rooms in Site 3 Block A, located approximately 10m from Site 2AB southern boundary.
- Residential apartments in Site 3 Block B, located approximately 15m from Site 2AB southern boundary.
- Residential dwellings in Site 4, located adjacent to Site 5 southern boundary.
- Office spaces in Site 2AB, located approximately 10m from Site 2C southern boundary.
- Office spaces in Site 2C, located approximately 10m from Site 5 eastern boundary.

### Construction Noise Impacts

The construction programme will create typical construction activity related noise onsite. During the construction stage of the Dublin Central Masterplan, a variety of items of plant will be in use, such as breakers, excavators, lifting equipment, dumper trucks, compressors and generators.

Due to the nature of daytime activities undertaken on a construction site of this nature, there is potential for generation of significant levels of noise. The flow of vehicular traffic to and from a construction site is also a potential source of relatively high noise levels.

Due to the fact that the construction programme has been established in outline form only, it is difficult to calculate the actual magnitude of noise emissions to the local environment. Indicative ranges of noise levels associated with construction may be calculated in accordance with the methodology set out in BS 5228-1:2009+A1:2014 *Code of Practice for Noise and Vibration Control on Construction and Open Sites – Noise*. 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. However, it is not possible to conduct detailed accurate prediction calculations for the construction phase of a project in support of the EIAR due to the level of variability during different construction stages over short periods of time.

The following section discusses typical noise levels associated with the Proposed Development and comments on potential noise impacts at distances to the nearest NSLs.

#### Intrusive Works and High Noise Activities Including Façade Demolition and Basement Excavation

Reference to BS 5288:2009+A1: Part 1 indicates that highest noise levels likely to be required on the site are associated with activities associated with site enabling and ground breaking associated with the initial demolition and ground clearance phase. Noise levels from these activity types are typically in the range of 80 to 90 dB  $L_{Aeq}$  at 10m.

For construction activities associated with hard ground breaking, crushing etc, a total construction noise level of 92 dB  $L_{Aeq}$  at 10m has been used for the purposes of indicative calculations. This would involve for example, one item of plant at 90 dB  $L_{Aeq}$  and two items of plant at 85 dB  $L_{Aeq}$  and one item of plant at 80 dB  $L_{Aeq}$  operating simultaneously within one work area which is considered a highly worst-case scenario.

#### Utilities and Structural Works Including Secant Piled Walls, Retaining Walls, Piling and Basement Foundation Slab Construction

For construction works associated with activities such as site clearance, excavation and structural works including excavators, loaders, dozers, cranes, generators, concreting works and piling 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 and 85 dB  $L_{Aeq}$  at 10m has been used for the purposes of indicative calculations for these activities representing variety over this stage. This would include, for example two items of plant at 80 dB  $L_{Aeq}$  and three items of plant at 75 dB  $L_{Aeq}$  operating simultaneously within one work area resulting in a total noise level of 85 dB  $L_{Aeq}$  and up to six items of plant with a noise level of between 70 and 75 dB  $L_{Aeq}$  resulting in a total noise level of 82 dB  $L_{Aeq}$  at 10m.

#### Superstructure and Lower Noise Activities

For construction work areas with lower noise levels such as site compounds (for storage, offices and material handling, generators etc.), smaller items of mobile plant (excavators, cranes, dozers), landscaping and concreting works 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.

Given the variations of on-site activities and noise levels over any one day and considering that all activities will not operate simultaneously, the values noted above are considered robust for the purposes of assessing potential construction impacts.

### Indicative Construction Noise Calculations at Varying Distances

The closest external NSLs to the Dublin Central Masterplan are directly adjacent to the site boundaries to the north and southeast, with the remaining closest NSLs at distances of approximately 10m to 45m. Remaining properties are located at distances greater than 45 m from different work stages.

The closest internal NSLs within the Dublin Central Masterplan are directly adjacent to the site boundaries to the north and south, with the remaining closest NSLs at distances of approximately 10m to 15m.

Table 11.22 presents the calculated noise levels at distances between 10m and 100m representing the closest NSLs to the construction works. The calculations assume that plant items are operating for 66%<sup>10</sup> of the time. For the purpose of the assessment, a standard site hoarding of 2.4m high has been included in the calculations for noise sensitive boundaries. Screening from existing buildings have not been included in the calculations. It must be stated that for most of the time, plant and equipment will be a greater distance from the nearest NSLs than those used within the calculations in and consequently will have lower impact. Our assessment is therefore representative of a “worst-case” scenario representing construction activities at a minimum distance from the NSLs.

Construction Programme Activity	Combined $L_{Aeq}$ at 10 m	Cumulative Predicted Construction Noise Level at a Specific Distance with plant operating at 66% On-Time (dB $L_{Aeq,1hour}$ )					
		10 m	15 m	20 m	30 m	50 m	100 m
Initial Works Stage including Intrusive Works e.g. Rock Breaking / Drilling / Rock Crushing	92	86 (89)	82 (85)	75 (78)	71 (74)	67 (70)	61 (64)
Utilities and Structural Works including Secant Piled Walls, Retaining Walls, Piling and Basement Foundation Slab Construction	85	78 (81)	74 (77)	67 (70)	63 (66)	59 (62)	53 (56)
	82	75 (78)	72 (75)	64 (67)	61 (64)	56 (59)	50 (53)
General Site Work including Site Compounds and Landscaping	78	71 (74)	68 (71)	60 (63)	57 (60)	52 (55)	46 (49)

**Table 11.22:** Indicative Construction Noise Calculations at Varying Distances (with worst case cumulative Dublin Central Masterplan predicted values presented in parenthesis).

In order to assess the cumulative impacts from the Dublin Central Masterplan it has been assumed that there would be an increase in noise level by no more than 3 dB, as shown in parenthesis in Table 11.22 above. While a 3 dB increase is a doubling of sound energy, subjectively any change in noise level below 3 dB would be barely perceptible. This 3 dB increase (maximum doubling of plant items) is based on the practical number of plant and equipment items that could be reasonably assumed at the closest boundaries to the NSLs i.e. there will be a greater separation between plant / equipment and the NSL, which will result in a reduction in the predicted noise level at the closest NSL. In addition, the construction activities in the closest site to the NSL will be the dominant noise source, with very little contribution from sites at greater distances to the NSL i.e. where the contribution from the specific phase is more than 10 dB below noise contribution from the closest phase to the NSL. Our assessment is therefore representative of a “worst-case” scenario representing Dublin Central Masterplan construction activities at a minimum distance from the NSLs. This worst-case scenario would be expected to take place over a very short period of time, if at all.

<sup>10</sup> This estimate assumes that the plant will operate for approximately 6.5 hours over the proposed 10 hour working period which equates to a 66% on time over a daytime period or 40 minutes over a 1 hour period. The dynamic nature of construction sites is such that this is deemed to be a conservative estimate, particularly for breaking and drilling work.

#### *Comment on Dublin Central Masterplan Cumulative Intrusive Works and High Noise Activities*

The reference values outlined in Table 11.22 indicate that for construction activities with highest combined noise levels ( $L_{Aeq}$  up to 92 dB at 10 m), commercial NSLs at a distance of 20m or less from the north, southeast and west works boundaries are above the recommended construction noise threshold value of 75 dB  $L_{Aeq}$  Monday through Friday (08:00 to 18:00hrs). All other commercial receivers at a distance of 30m or greater from the works boundary would be at or below the construction noise threshold value in the absence of any noise mitigation.

At distances beyond the immediate site boundary (greater than 50m), with the presence of existing buildings and distance attenuation, the construction threshold value for residential receivers is likely to be achieved during the various stages of works. For the closest residential properties 15m west of the Dublin Central Masterplan, calculated noise levels during this stage are above the recommended construction noise threshold value of 70 dB  $L_{Aeq}$  Monday through Friday (08:00 to 18:00hrs). However, works at this minimum distance to the NSLs are during boundary site works at Site 5 only. The second closest boundary is Site 4, is 30m from the NSL and more than 10 dB below the noise contribution from Site 5. Therefore, once works in Site 5 are at a distance of 30m or greater from the western works boundary, the residential NSL would be at or below the construction noise threshold value in the absence of any noise mitigation.

For the closest clinical receptors, the works at Site 1 are at 20m to the north of the Dublin Central Masterplan boundary. The second closest boundary is Site 2C, is 80m from the NSL and more than 10 dB below the noise contribution from Site 1. Therefore, assuming that there is no cumulative increase in noise levels, the clinical receptor is at or below the construction noise threshold value of 75 dB  $L_{Aeq}$  Monday through Friday (08:00 to 18:00hrs).

Whilst this construction stage will be intermittent and transient specific noise mitigation measures in line with the DCC GPG for high risk sites will be required to control construction noise levels during these intrusive works and high noise activities at the north, southeast and west works boundaries.

#### *Comment on Dublin Central Masterplan Cumulative Utilities and Structural Works*

During utilities and structural works etc. with combined site works up to 85 dB  $L_{Aeq}$  at 10m, the recommended construction threshold value of 75 dB  $L_{Aeq}$  Monday through Friday (08:00 to 18:00hrs) at commercial receivers will be exceeded at distances of up to 15m from the works boundary in the absence of any noise mitigation. At distances beyond 15m of the immediate site boundary, with the presence of existing buildings and distance attenuation, the construction noise threshold value are likely to be achieved at commercial receptors during the various stages of works.

For the closest residential properties 15m west of the Dublin Central Masterplan development, calculated noise levels during this stage are above the recommended construction noise threshold value of 70 dB  $L_{Aeq}$  Monday through Friday (08:00 to 18:00hrs). Once works in Site 5 are at any distance greater than 20m from the western works boundary, the residential NSL would be at or below the construction noise threshold value in the absence of any noise mitigation.

For the closest clinical receptors, calculated noise levels during this stage are below the construction noise threshold value and below the measured ambient baseline environment in the area (71 dB  $L_{Aeq}$ ).

Whilst this construction stage will be intermittent and transient specific noise mitigation measures in line with the DCC GPG for high risk sites will be required to control construction noise levels during these intrusive works and high noise activities at the north, southeast and west works boundaries.

#### *Comment on Dublin Central Masterplan Cumulative General Site Works*

During general site work with combined site works up to 78 dB  $L_{Aeq}$  at 10m, the recommended construction noise threshold value of 75 dB  $L_{Aeq}$  Monday through Friday (08:00 to 18:00hrs) at commercial receivers is likely to be complied with at the closest Dublin Central Masterplan site boundaries and beyond.

For the closest residential properties, calculated noise levels during this stage are 1 dB above the construction noise threshold value.

For the closest clinical receptors, calculated noise levels during this stage are significantly below the construction noise threshold value and below the measured ambient baseline environment in the area (71 dB  $L_{Aeq}$ ).

#### *Comment on Commercial NSLs within the Dublin Central Masterplan*

During all activities with the exception of the general construction works, the commercial receivers (in Sites 1, 2AB, 2C and 3) within the Dublin Central Masterplan at the minimum distance to works boundaries would exceed the recommended construction threshold value of 75 dB  $L_{Aeq}$  Monday through Friday (08:00 to 18:00hrs).

During initial site works, at distances within 25m of the immediate site boundaries to the south of Site 2AB, north of Site 2C and east of Site 5 would exceed the recommended construction threshold value. At distances beyond 25m of the immediate site boundaries noted above, with distance attenuation, the construction noise threshold value is likely to be achieved at the Dublin Central Masterplan commercial receptors during the cumulative initial site works.

During utilities and structural works, at distances within 15m of the immediate site boundaries to the south of Site 2AB, north of Site 2C and east of Site 4 and Site 5 would exceed the recommended construction threshold value. At distances beyond 15m of the immediate site boundaries noted above, with distance attenuation, the construction noise threshold value is likely to be achieved at the Dublin Central Masterplan commercial receptors during the cumulative utilities and structural works.

Whilst this construction stage will be intermittent and transient specific noise mitigation measures in line with the DCC GPG for high risk sites will be required to control construction noise levels during these initial site works, high noise activities, utilities and structural works to the south of Site 2AB, north of Site 2C and east of Site 4 and Site 5

#### *Comment on Residential NSLs within the Dublin Central Masterplan*

During all activities the residential receivers (in Sites 3 and 4) within the Dublin Central Masterplan at the minimum distance to works boundaries would exceed the recommended construction threshold value of 70 dB  $L_{Aeq}$  Monday through Friday (08:00 to 18:00hrs).

During initial site works, at distances within 40m of the immediate site boundaries to the south of Sites 2AB and 5 would exceed the recommended construction threshold value. At distances at or beyond 50m of the immediate site boundaries noted above, with distance attenuation, the construction noise threshold value is likely to be achieved at the Dublin Central Masterplan residential receptors during the cumulative initial site works.

During utilities and structural works, at distances within 20m of the immediate site boundaries to the south of Sites 2AB and 5 would exceed the recommended construction threshold value. At distances at 20m and beyond the immediate site boundaries noted above, with distance attenuation, the construction noise threshold value is likely to be achieved at the Dublin Central Masterplan residential receptors during the cumulative utilities and structural works.

During general site works, at distances within 15m of the immediate site boundaries to the south of Sites 2AB and 5 would exceed the recommended construction threshold value. At distances beyond 15 m of the immediate site boundaries noted above, with distance attenuation, the construction noise threshold value is likely to be achieved at the Dublin Central Masterplan residential receptors during the cumulative general site works.

Whilst this construction stage will be intermittent and transient specific noise mitigation measures in line with the DCC GPG for high risk sites will be required to control construction noise levels during all construction activities to the south of Sites 2C and 5.