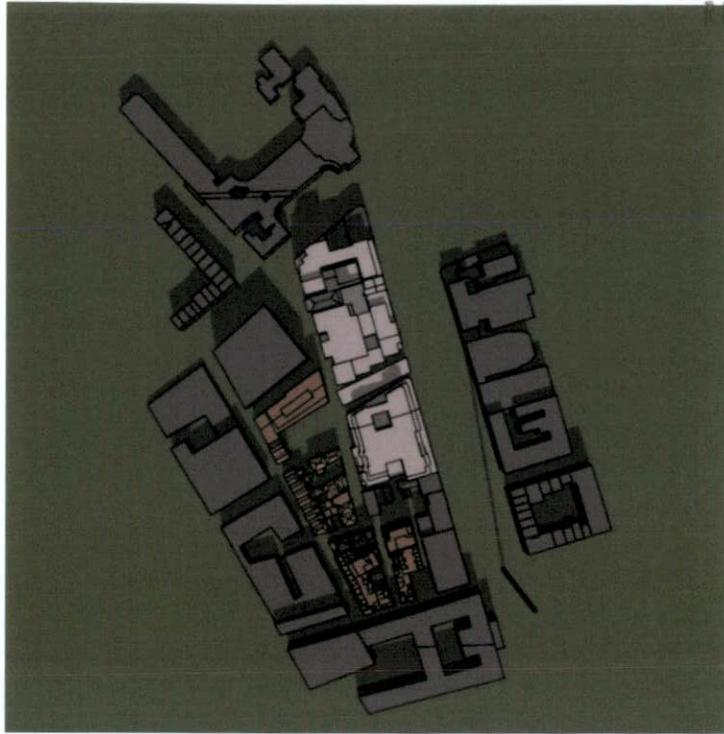
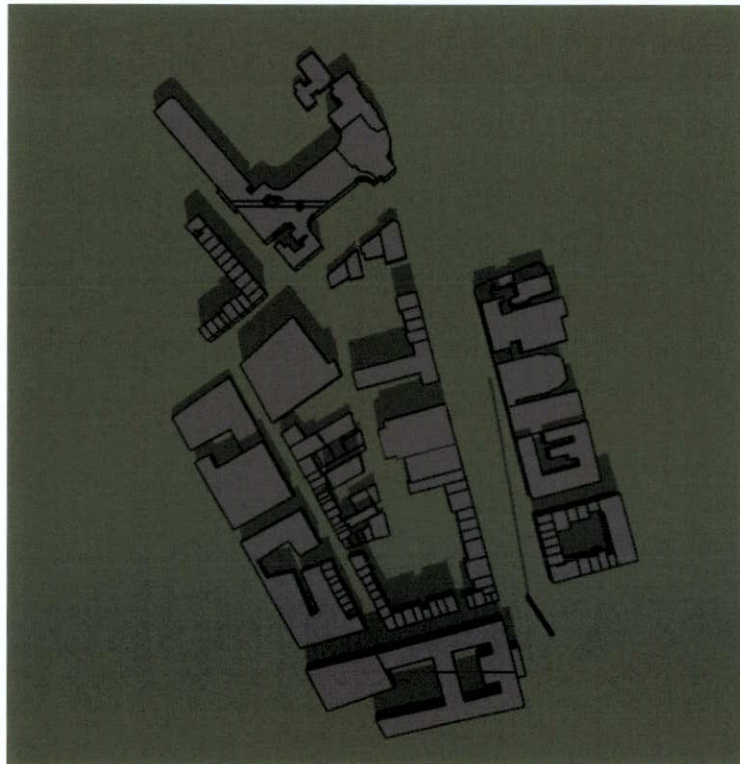


12pm – 21st March

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Proposed

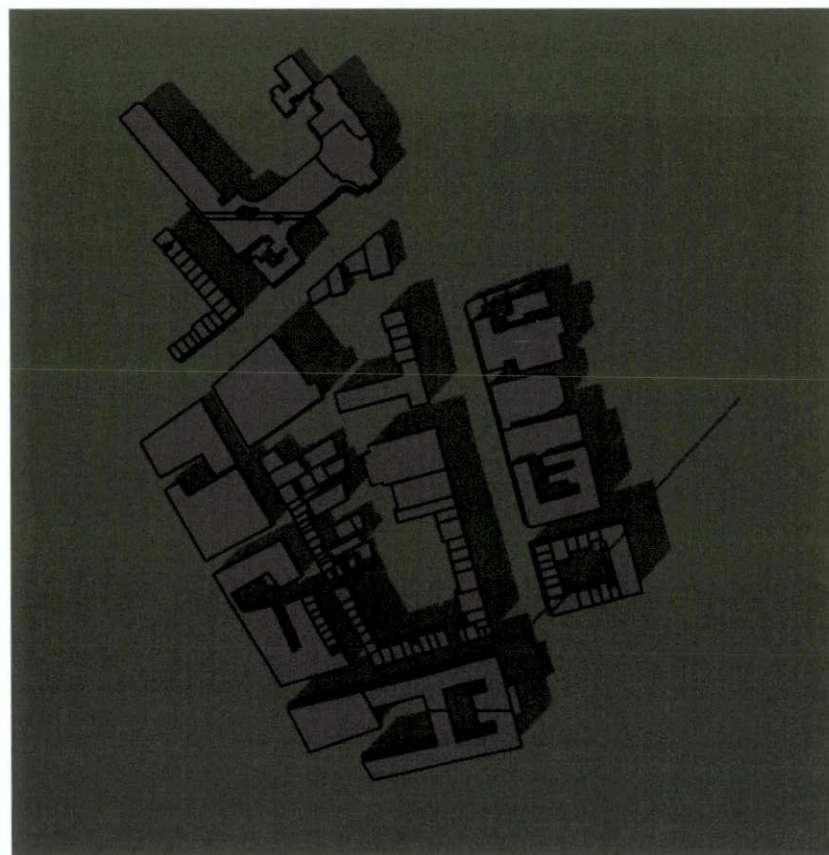


Existing

3pm – 21st March



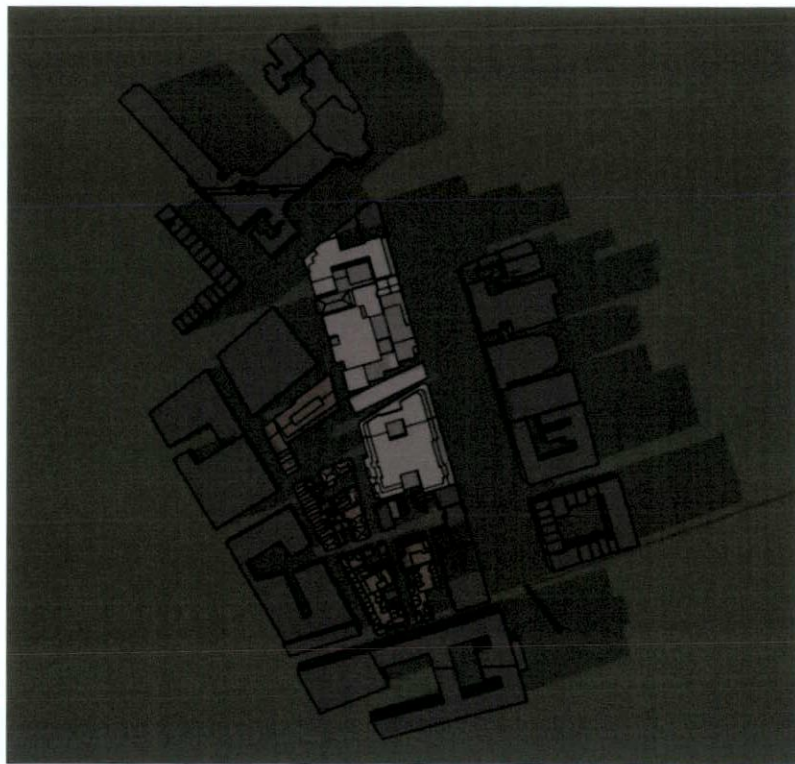
Proposed



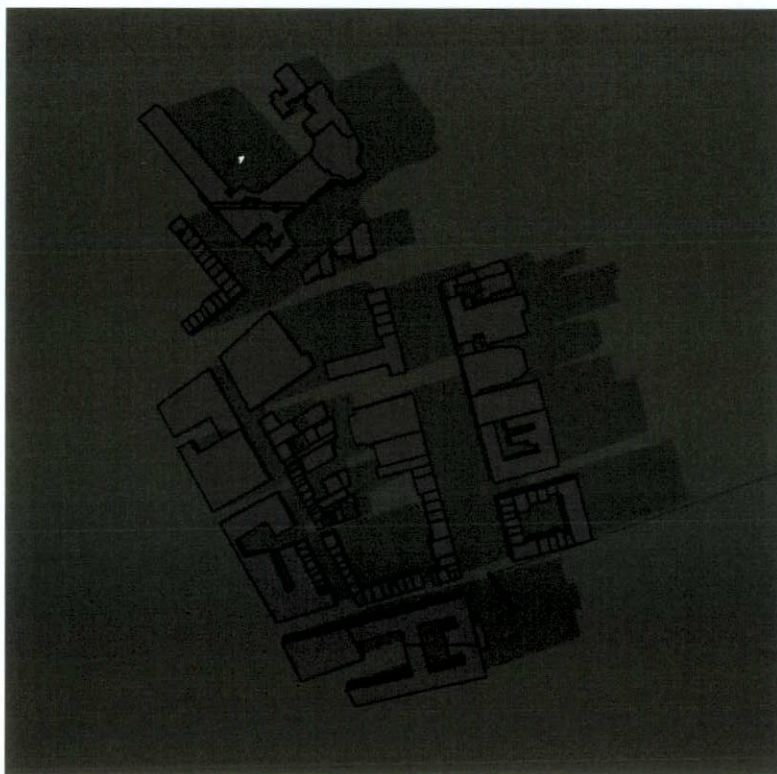
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5pm – 21st March

DCC PLAN NO. 2861/21
REVISED: 01/06/2021

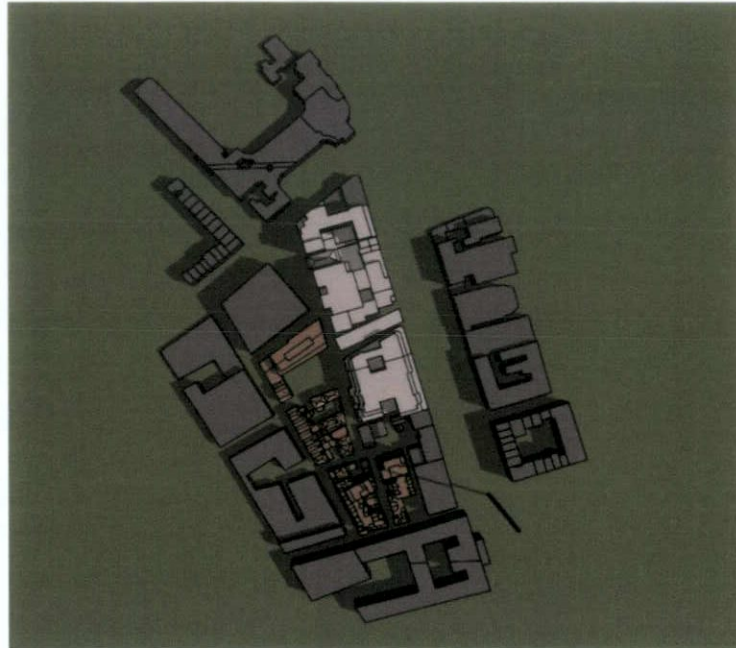


Proposed

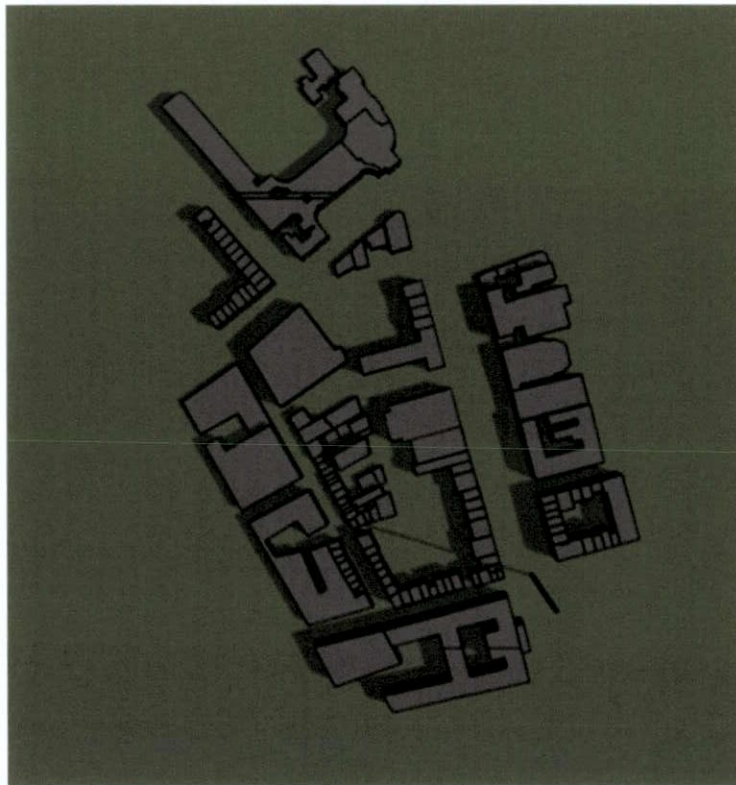


Existing

9am – 21st June

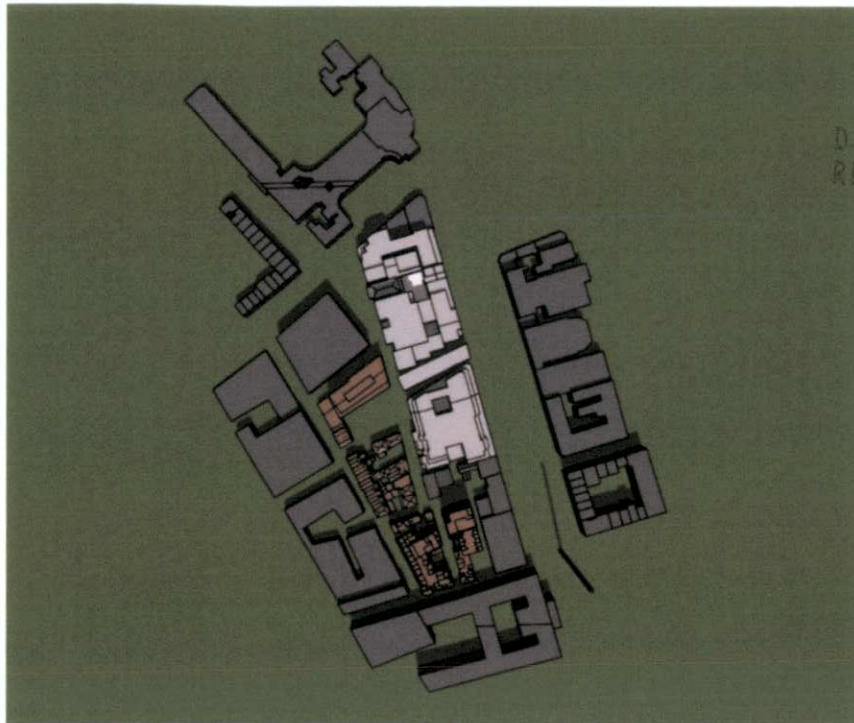


Proposed Site

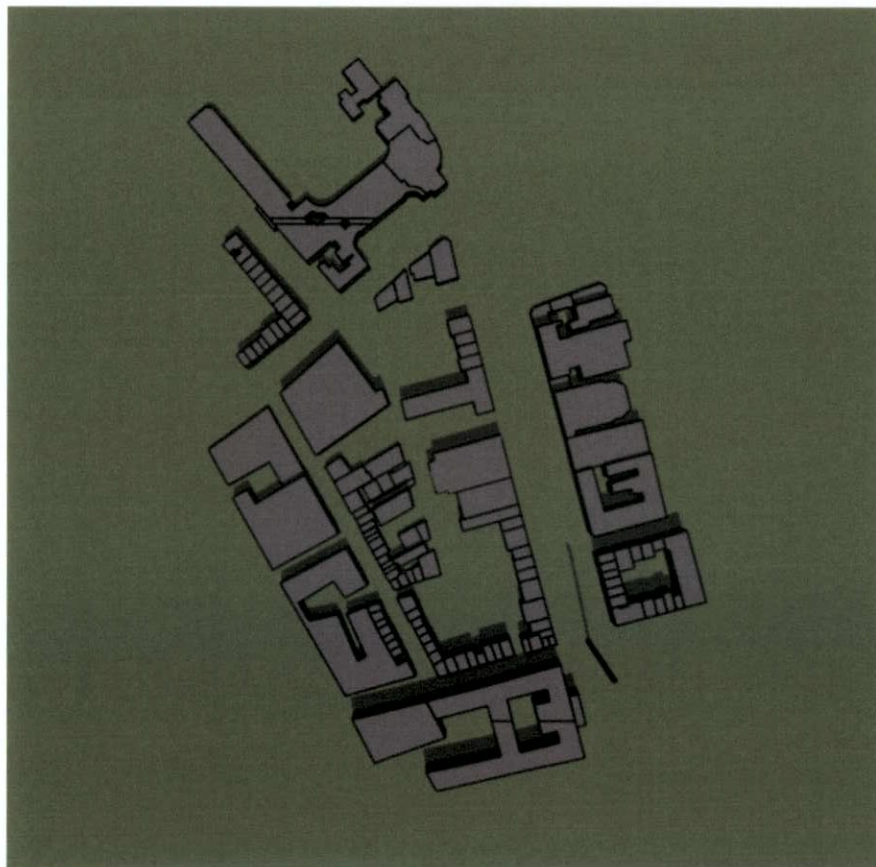


Existing Site

12pm – 21st June

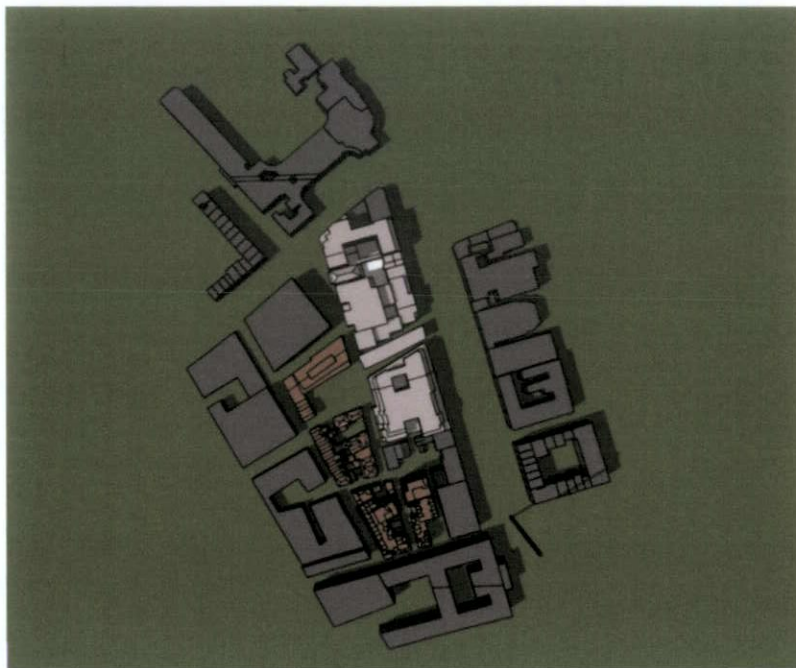


Proposed Site

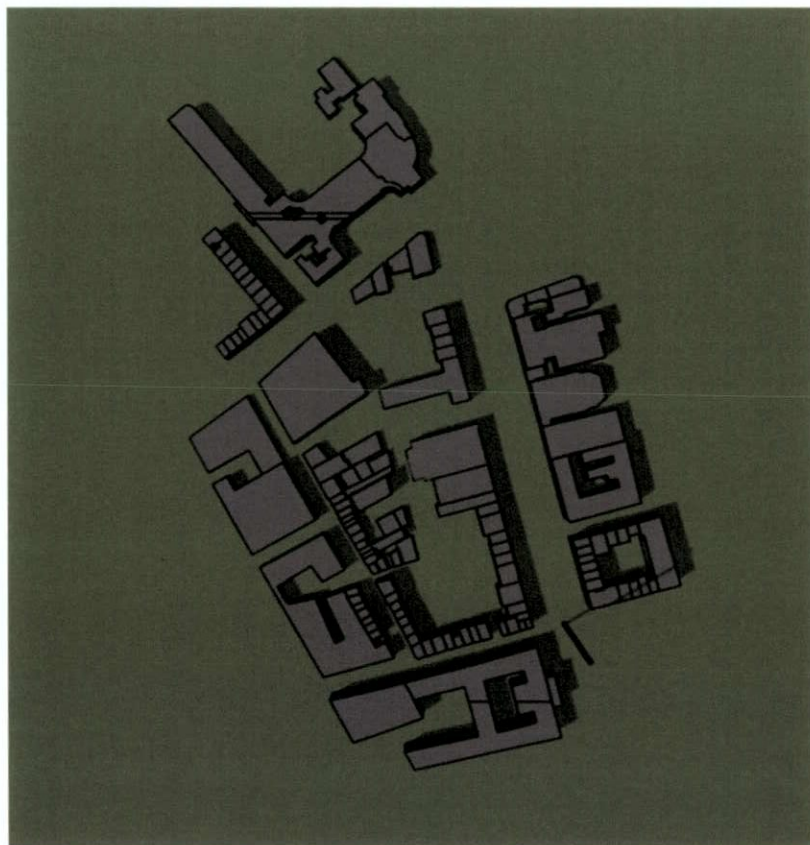


Existing Site

3pm – 21st June

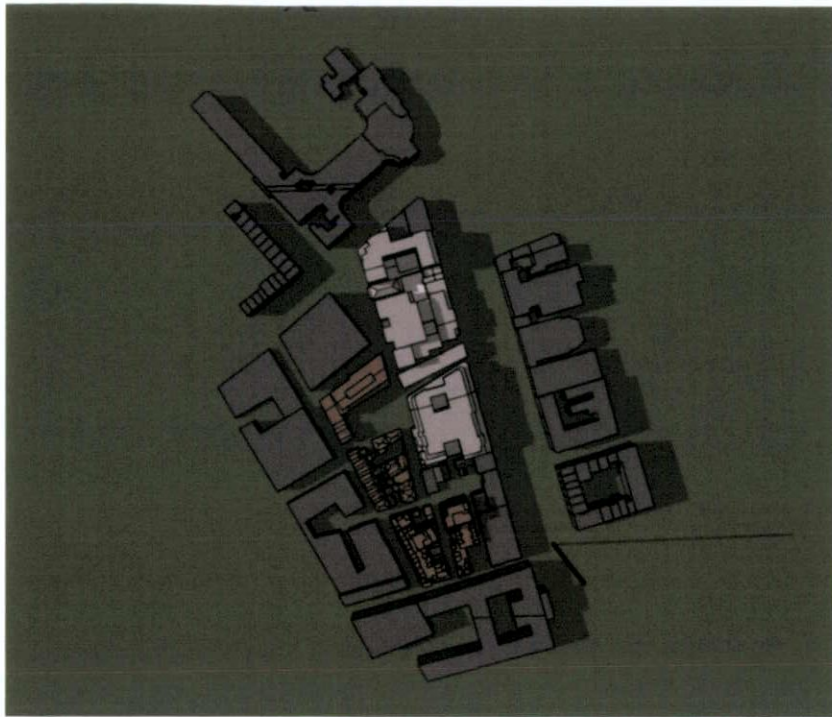


Proposed Site

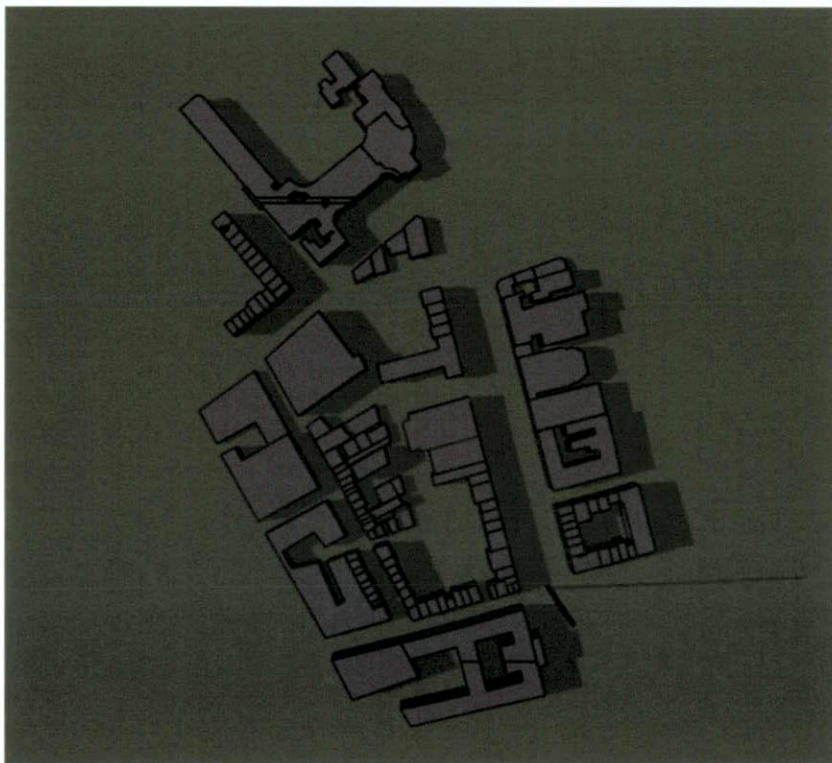


Existing Site

5pm – 21st June



Proposed Site

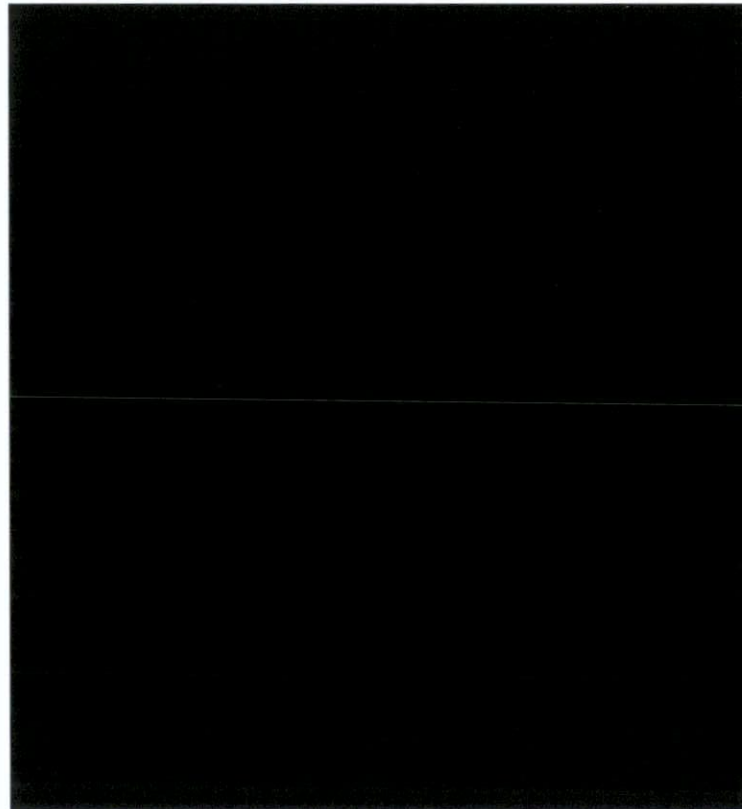


Existing Site

9am – 21st December



Proposed Site



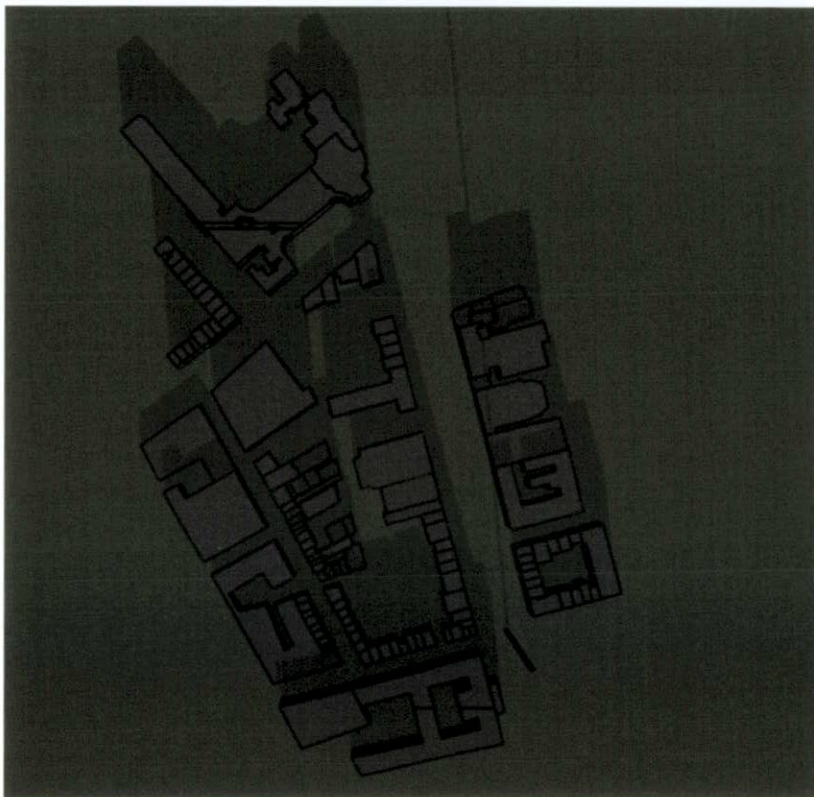
Existing Site

12pm – 21st December

DCC PLAN NO. 2861/21
RECEIVED: 01/06/2021

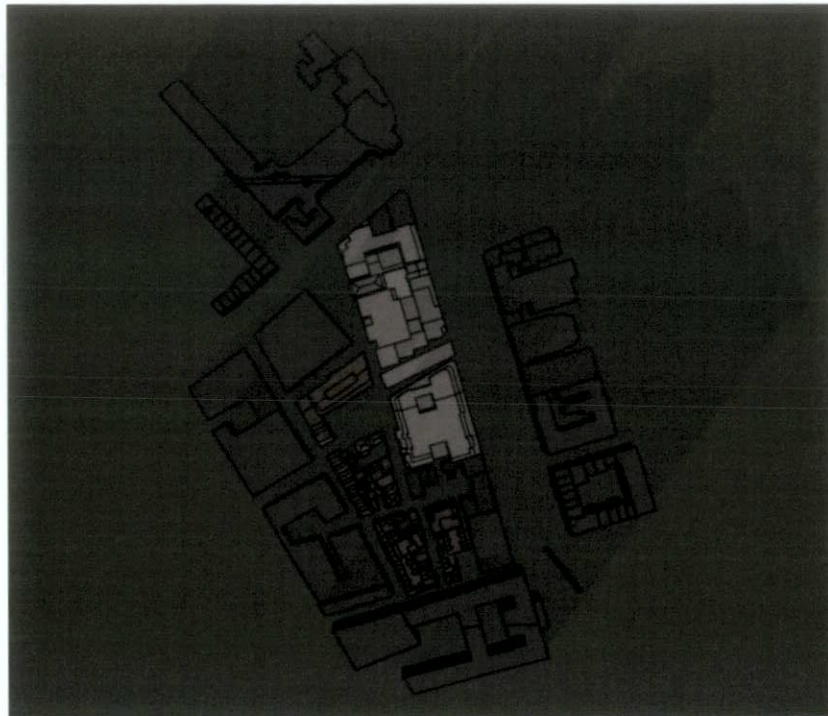


Proposed Site

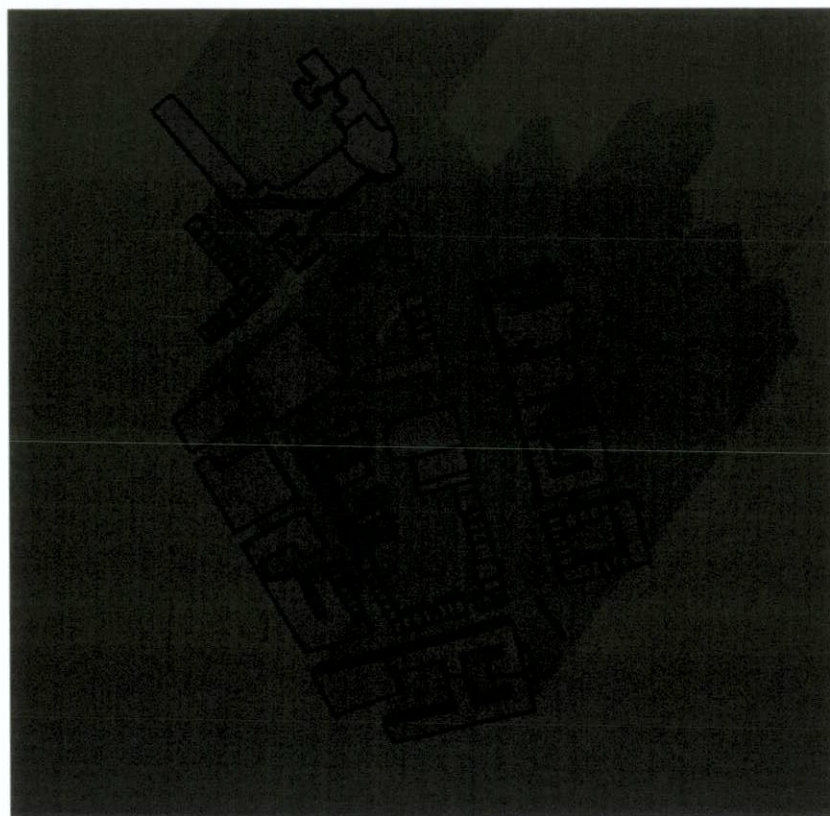


Existing Site

3pm – 21st December



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.



DCC PLAN NO. 2861/21
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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.

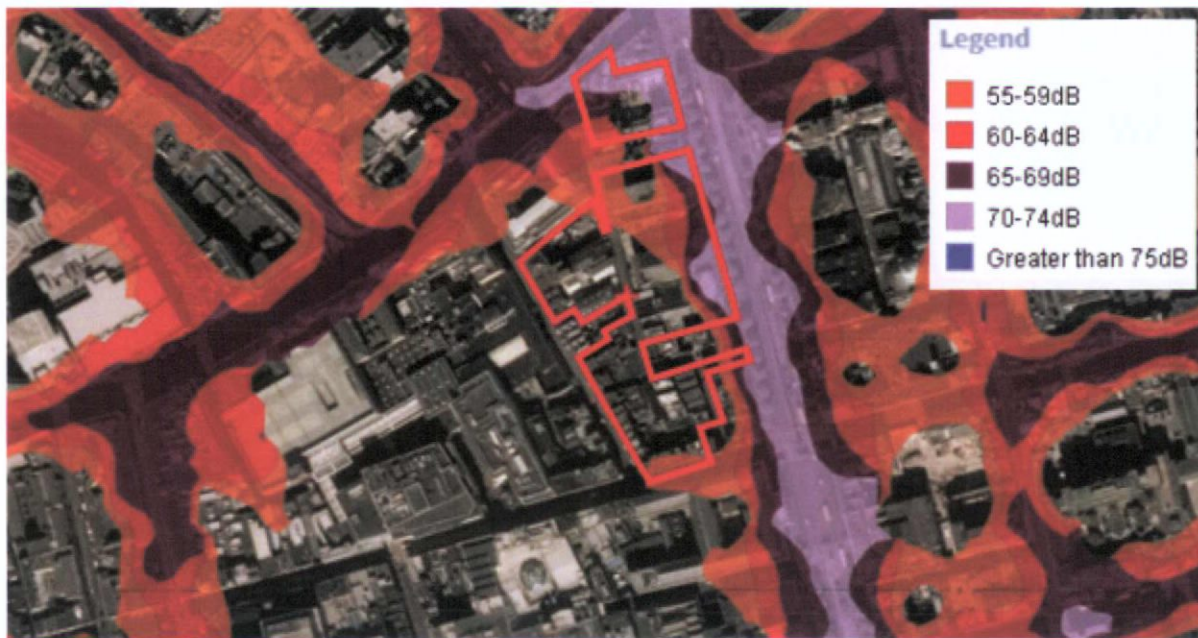


Figure 11.1: Road Traffic L_{den} Noise Contours (Source: epa.ie).

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_{night} Noise Contours (Source: epa.ie).

Figure 11.2 presents the road traffic noise mapping for the night-time period (L_{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_{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_{Aeq} is the equivalent continuous sound level. It is a type of average and is used to describe a fluctuating noise in terms of a single noise level over the sample period.

L_{AFMax} is the instantaneous maximum sound level measured during the sample period using the 'F' time weighting.

L_{A90} is the sound level that is exceeded for 90% of the sample period. It is typically used as a descriptor for background noise.

The "A" suffix denotes the fact that the sound levels have been "A-weighted" in order to account for the non-linear nature of human hearing. All sound levels in this report are expressed in terms of decibels (dB) relative to 2x10⁻⁵ 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.

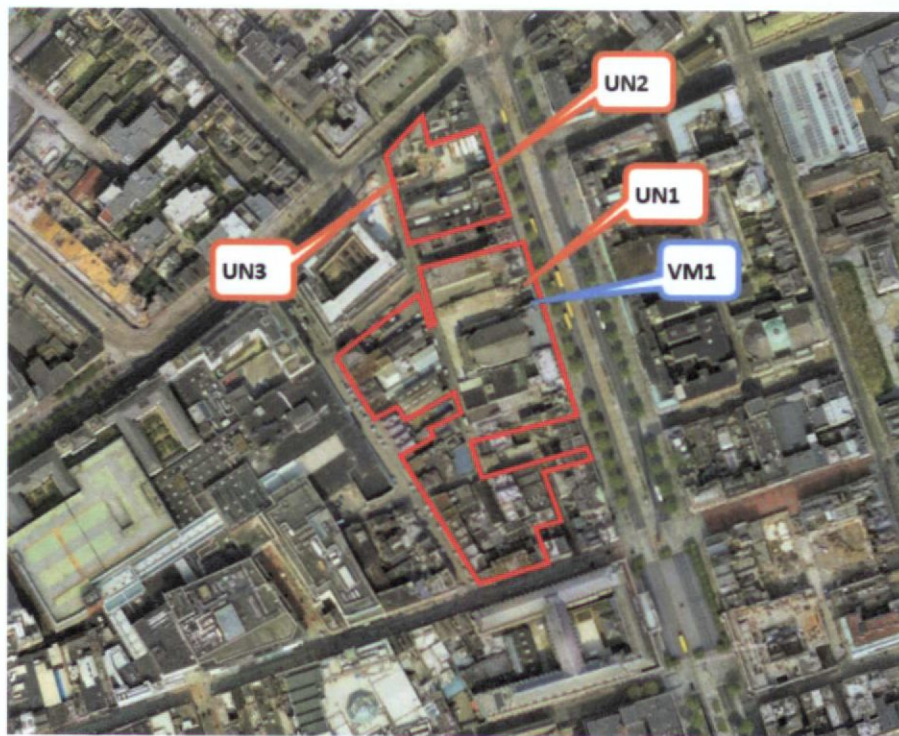


Figure 11.3: Noise and Vibration Monitoring Locations UN1 to UN3 (Source: Google Earth).

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 | 16 August 2018 |
| 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 check 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. 2×10^{-5} Pa) | | | | | |
|---------------------|---|-----------------------|---------------------------------|-----------------------|-------------------------------|-----------------------|
| | Daytime (07:00 to 19:00 hrs) | | Evening (19:00 to 23:00 hrs) | | Night (07:00 to 23:00 hrs) | |
| | L _{Aeq} | L _{A90} | L _{Aeq} | L _{A90} | L _{Aeq} | L _{A90} |
| 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>68¹</i> | <i>62²</i> | <i>66³</i> | <i>61⁴</i> | <i>63³</i> | <i>54⁴</i> |

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

¹ Logarithmically averaged.
² Arithmetically averaged.

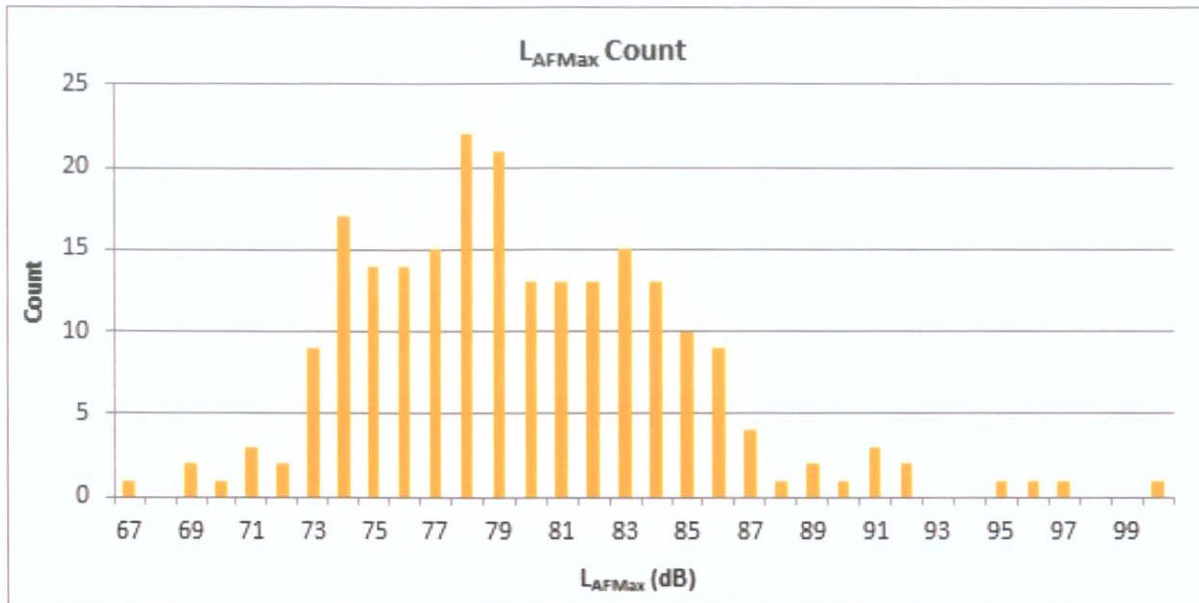


Figure 11.4: Number of LAFMax events at each decibel level measured during the night period at location UN1.

During the 7 day survey period at UN1 all events measured above 60 dB LAFMax. More than 100 events were measured at or above 80 dB LAFMax, however no survey day exceeded 20 events in one night period. Based on the Figure above the most commonly occurring LAFMax value is 78 dB. The arithmetic LAFMax 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 ⁻⁵ Pa) | | | | | |
|---------------------|---|-----------------|---------------------------------|-----------------|-------------------------------|-----------------|
| | Daytime (07:00 to 19:00 hrs) | | Evening (19:00 to 23:00 hrs) | | Night (07:00 to 23:00 hrs) | |
| | LAeq | LA90 | LAeq | LA90 | LAeq | LA90 |
| 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 |
| Average | 59 ³ | 54 ⁴ | 58 ³ | 54 ⁴ | 56 ³ | 49 ⁴ |

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

³ Logarithmically averaged.
⁴ 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.

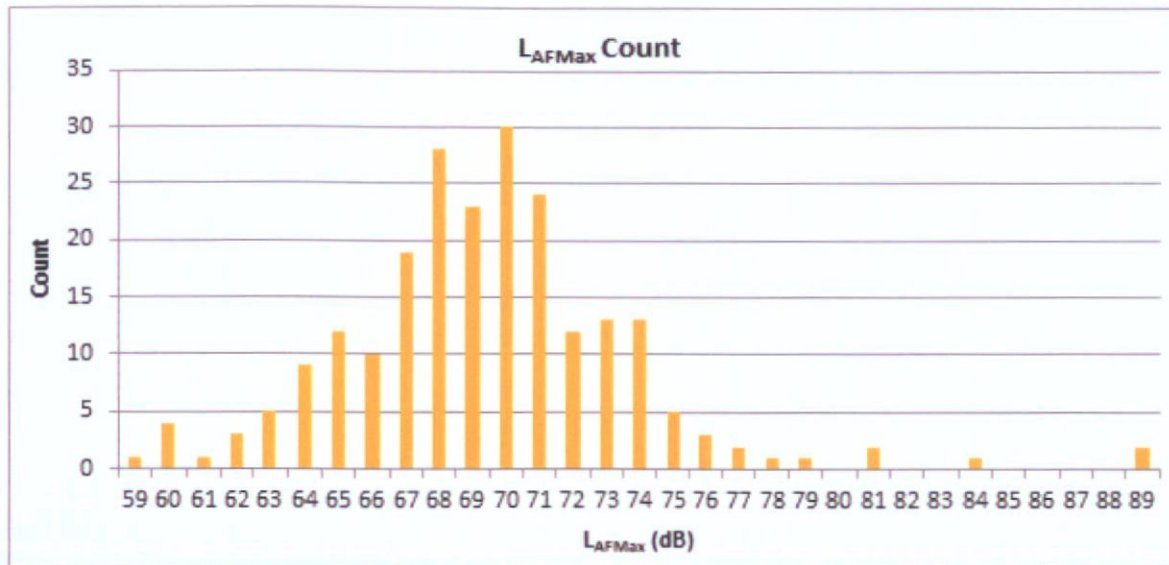


Figure 11.5: Number of L_{AFMax} events at each decibel level measured during the night period at location UN2.

During the 7 day survey period at UN2 all but one event measured above 60 dB L_{AFMax}. Five events were measured at or above 80 dB L_{AFMax}. Based on the Figure above the most commonly occurring L_{AFMax} value is 70 dB. The arithmetic L_{AFMax} 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 ⁻⁵ Pa) | | | | | |
|---------------------|---|------------------|---------------------------------|------------------|-------------------------------|------------------|
| | Daytime (07:00 to 19:00 hrs) | | Evening (19:00 to 23:00 hrs) | | Night (07:00 to 23:00 hrs) | |
| | L _{Aeq} | L _{A90} | L _{Aeq} | L _{A90} | L _{Aeq} | L _{A90} |
| 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. 2×10^{-5} Pa) | | | | | |
|---------|---|-----------------|---------------------------------|-----------------|-------------------------------|-----------------|
| | Daytime (07:00 to 19:00 hrs) | | Evening (19:00 to 23:00 hrs) | | Night (07:00 to 23:00 hrs) | |
| | L_{Aeq} | L_{A90} | L_{Aeq} | L_{A90} | L_{Aeq} | L_{A90} |
| Average | 60 ⁵ | 55 ⁶ | 59 ³ | 53 ⁴ | 58 ³ | 50 ⁴ |

Table 11.6: Summary of Measured Noise Levels at UN3 (dB re. 2×10^{-5} Pa).

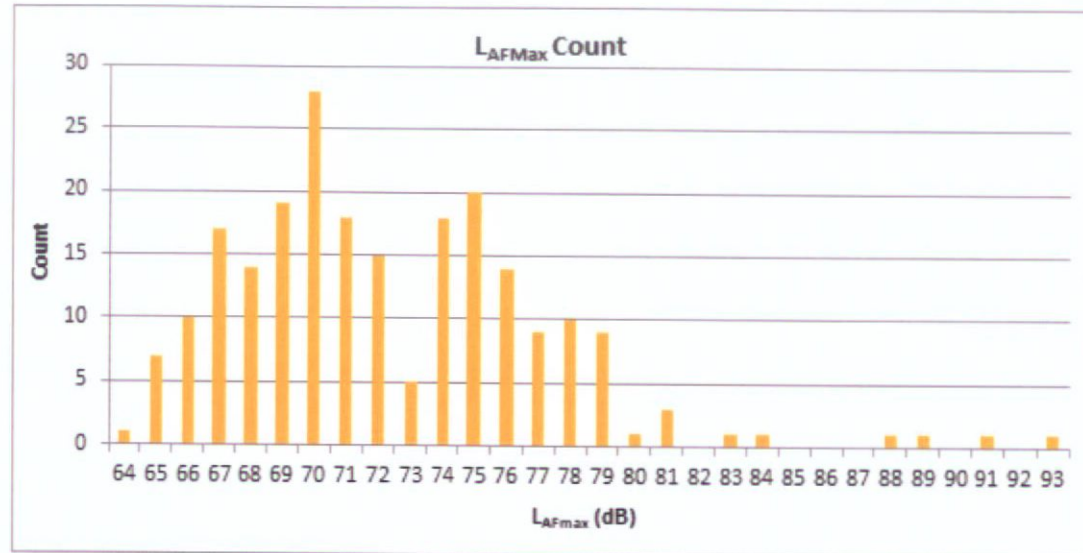


Figure 11.6: Number of L_{AFMax} events at each decibel level measured during the night period at location UN3.

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

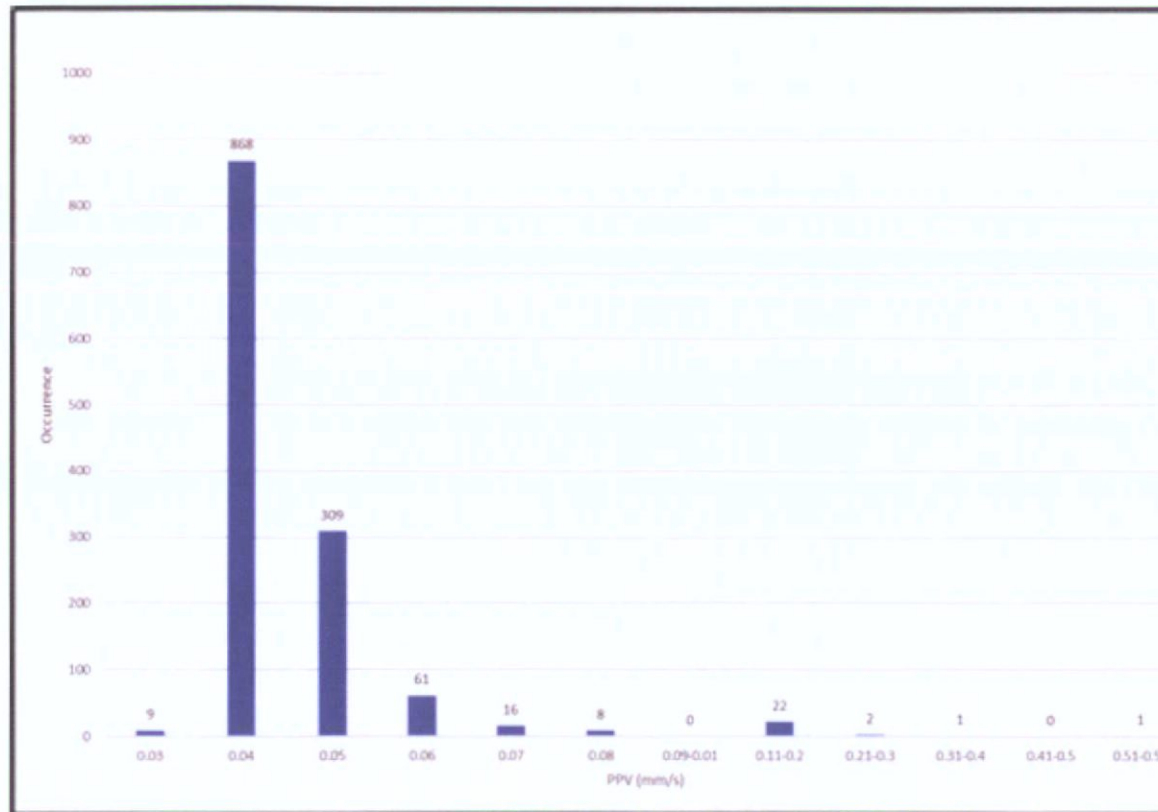
⁵ Logarithmically averaged

⁶ Arithmetically averaged

| | Maximum PPV mm/s | Minimum PPV mm/s | Median PPV (mm/s) | Maximum PV mm/s | Minimum ' mm/s | | Typical train pass by - PP (mm/s) |
|--|------------------|------------------|-------------------|-----------------|----------------|--|-----------------------------------|
| | | | | | | | |
| | 0.15 – 0.4 | 0.03 | 0.04 | 0.07 – 0.13 | 3 | | 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.

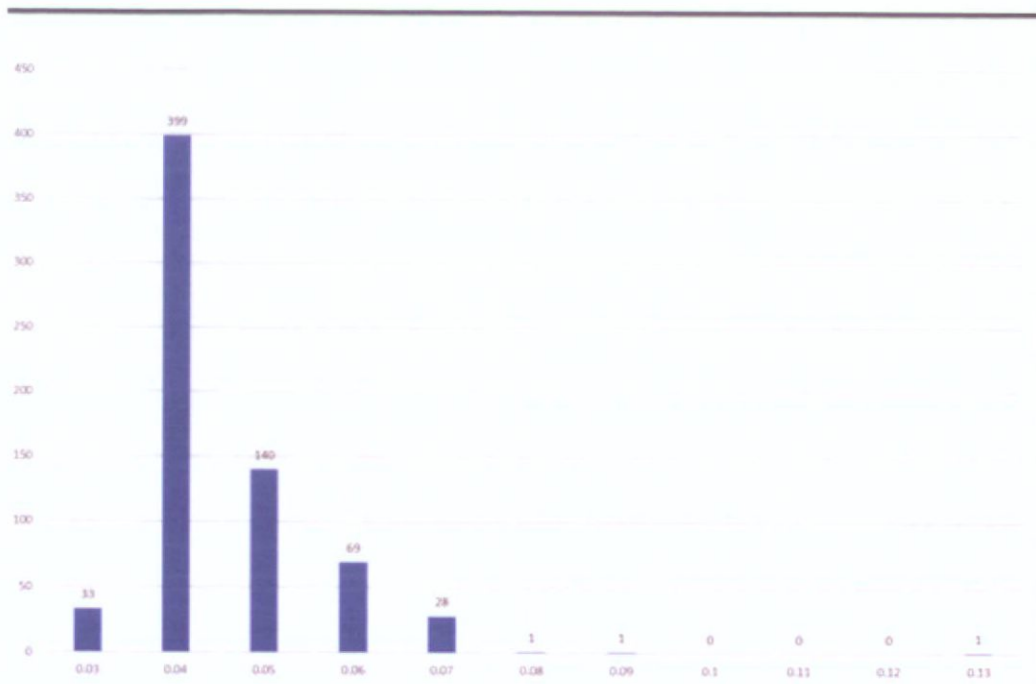


Figure 11.8: Night-time PPV Vertical Distribution at VM1

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 ID | Description | Notes |
|-------------|--|--|
| UN4 | Unattended noise monitor. Externally positioned 1m outside first storey window to north-eastern boundary of the proposed site, overlooking O’Connell Street. | data collected at this location been cross referenced with UN1 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 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.

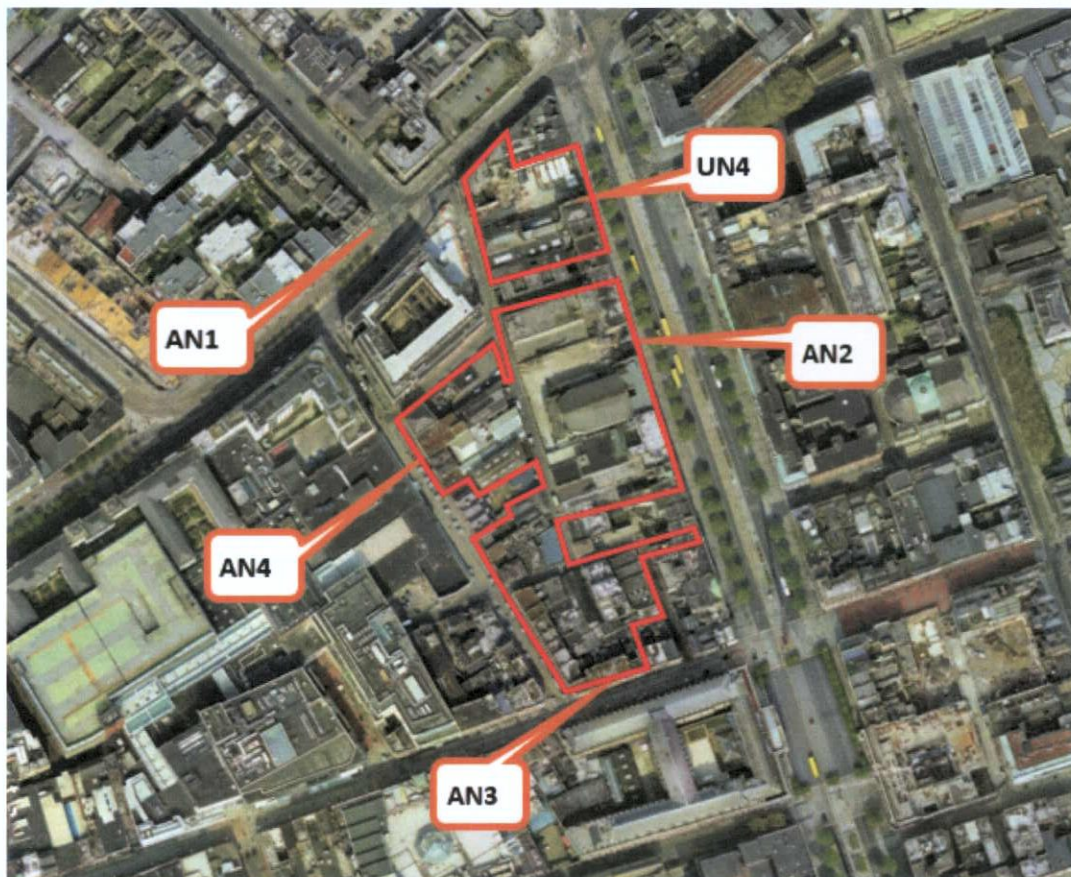


Figure 11.9: Noise Monitoring Locations UN4, AN1 to AN4 (Source : Google Earth)

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 checked 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. 2×10^{-5} Pa) | | | | | |
|---------------------|---|------------------|---------------------------------|------------------|-------------------------------|------------------|
| | Daytime (07:00 to 19:00 hrs) | | Evening (19:00 to 23:00 hrs) | | Night (07:00 to 23:00 hrs) | |
| | L _{Aeq} | L _{A90} | L _{Aeq} | L _{A90} | L _{Aeq} | L _{A90} |
| 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 ⁻⁵ Pa) | | | | | |
|-----------------------|---|------------------|---------------------------------|------------------|-------------------------------|------------------|
| | Daytime (07:00 to 19:00 hrs) | | Evening (19:00 to 23:00 hrs) | | Night (07:00 to 23:00 hrs) | |
| | L _{Aeq} | L _{A90} | L _{Aeq} | L _{A90} | L _{Aeq} | L _{A90} |
| 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 ⁷ | 57 ⁸ | 65 ³ | 56 ⁴ | 61 ³ | 49 ⁴ |

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

The L_{AFMax} 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_{AFMax} events during the night period.

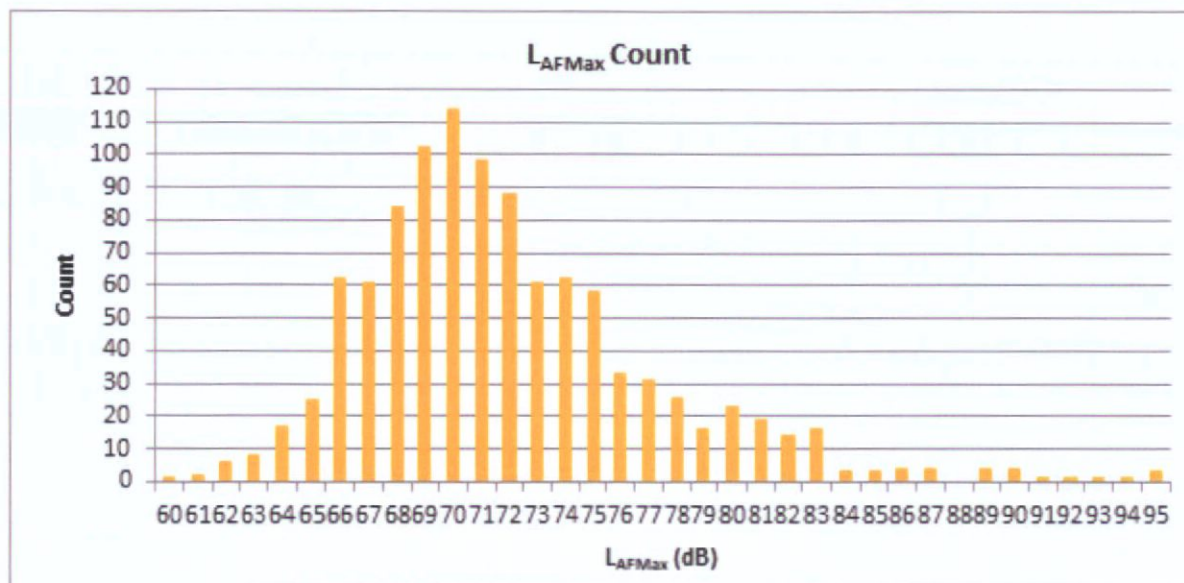


Figure 11.10: Number of L_{AFMax} events at each decibel level measured during the night period at location UN4.

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

Table 11.12 presents the L_{AFMax} 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_{AFMax}. At survey locations UN1 to UN3, the spectrum has been adjusted accordingly⁹ from the frequency content collated at UN4.

⁷ Logarithmically averaged.

⁸ Arithmetically averaged.

⁹ The L_{AFMax} 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 _{AFMax} | 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_{AFMax} 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 ⁻⁵ Pa | | |
|----------------------|--------|--------------------|--|--------------------|-------------------|
| | | | L _{Aeq} | L _{AFMax} | L _{AF90} |
| 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_{Aeq,15min} and in the order of 63 dB L_{A90,15min} 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_{Aeq,15min} and in the range of 52 to 57 dB L_{A90,15min} 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 2×10^{-5} Pa | | |
|----------------------|--------|--------------------|--|--------------------|-------------------|
| | | | L _{Aeq} | L _{AFMax} | L _{AF90} |
| 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_{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 and continuous plant noise sources. Noise levels were in the range of 59 to 67 dB L_{Aeq,15min} and in the range of 45 to 49 dB L_{A90,15min} 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 2×10^{-5} Pa | | |
|----------------------|--------|--------------------|--|--------------------|-------------------|
| | | | L _{Aeq} | L _{AFMax} | L _{AF90} |
| 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 |
| | Night | 23:49 – 00:04 | 72 | 98 | 54 | 61 | 65 | 69 | 64 | 58 | 51 |
| Wed, 12 August 2020 | | 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 EIA 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.

DCC PLAN NO.2861/21
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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 _{Aeq}) | Threshold Value (dB) | | |
|--|-------------------------|-------------------------|-------------------------|
| | Category A ^A | Category B ^B | Category C ^C |
| Night-time (23:00 to 07:00hrs) | 45 | 50 | 55 |
| Evenings & Weekends ^D | 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 _{Aeq,1hr} 07:00 – 19:00hrs 65dB L _{Aeq,1hr} 19:00 – 22:00hrs 45dB L _{Aeq,15mins} 22:00 – 07:00hrs * | *Non tonal, non impulsive DCC PLAN NO.2861/21 RECEIVED: 01/06/2021 |
| Saturdays | 70dB L _{Aeq,1hr} 08:00 – 16:30hrs 55dB L _{Aeq,1hr} 16:30 – 22:00hrs 45dB L _{Aeq,15mins} 22:00 – 08:00hrs * | |
| Sundays, Bank & Public Holidays | 60dB L _{Aeq,1hr} 08:00 – 16:30hrs 50dB L _{Aeq,1hr} 16:30 – 22:00hrs 45dB L _{Aeq,15mins} 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 _{Aeq,1hr} 07:00 – 19:00hrs 60dB L _{Aeq,1hr} 19:00 – 22:00hrs * The higher of 45dB L _{Aeq,1hr} 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 _{Aeq,1hr} 08:00 – 16:00hrs 45dB L _{Aeq,1hr} outside of these hours* | |
| Sundays, Bank & Public Holidays | 60dB L _{Aeq} 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: -