Construction Phase Traffic Emissions

There is also the potential for traffic emissions to impact air quality in the short-term over the construction phase. Particularly due to the increase in HGVs accessing the site. The construction stage traffic has been reviewed and an air quality assessment using the UK Highways Agency DMRB screening model was undertaken (UK Highways Agency, 2007). The air quality assessment focussed on the worst-case construction period in 2025 when the greatest number of HGV movements will likely be taking place.

This period was assessed as a worst-case scenario and traffic emissions associated with individual phases of the development will likely be lower than those predicted here. Modelling was undertaken at 2no. worst-case sensitive receptors within 200m of the impacted road links, these include the Rotunda Hospital (R1) and an apartment building on the corner of Moore Street and Parnell Street (R2). Results are compared against the 'Do-Nothing' scenario, which assumes that the implementation of the Dublin Central Masterplan is not in place in future years, in order to determine the degree of impact.

NO_2 emissions as a result of the worst-case construction phase of the implementation of the Dublin Central Masterplan are in compliance with the ambient air quality standards for NO_2 set out in Table 9.1. Concentrations of NO_2 are at most 71% of the annual limit value during the worst-case construction period in 2025. In addition, the maximum 1-hour NO_2 concentration is not predicted to be exceeded at the receptors modelled. Compared to 'Do Nothing' levels, concentrations of NO_2 will increase by 0.1% of the annual limit value at receptor R1 and by 0.2% of the limit value at receptor R2 (see Table 9.12). As per the TII assessment criteria outlined in Appendix 10 of the TII guidance document *"Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes"* (2011) the changes in NO_2 concentrations as a result of the construction phase of the implementation of the Dublin Central Masterplan are considered negligible. Therefore, the impact of construction traffic emissions on air quality is predicted to be **short-term, localised, negative** and **imperceptible.**

Receptor	Impact Construction Year 2025				
	DN	DS	DS – DN	Magnitude	Description
R1: Rotunda Hospital	27.4	27.4	0.06	Imperceptible	Negligible Increase
R2: Parnell Street Apartment Building	28.2	28.3	0.08	Imperceptible	Negligible Increase

Note 1 Calculated using UK DEFRA guidance IAN 170/12 V3 Long Term NO_2 Trend Projections Technique.

Table 9.12: Predicted Annual Mean NO_2 Concentrations – Construction Year 2025 ($\mu g/m^3$).

9.5.1.1.2 Climate

There is the potential for a number of greenhouse gas emissions to atmosphere during the demolition and construction phase of the implementation of the Dublin Central Masterplan. Construction vehicles, generators etc., may give rise to CO_2 and N_2O emissions. The Institute of Air Quality Management document *Guidance on the Assessment of Dust from Demolition and Construction* (2014) states that site traffic and plant is unlikely to make a significant impact on climate. Therefore, the potential impact on climate is considered to be **imperceptible** and **short-term**.

9.5.1.1.3 Human Health

Dust emissions from the demolition and construction phase of the implementation of the Dublin Central Masterplan have the potential to impact human health through the release of PM_{10} and $PM_{2.5}$ emissions. As per Table 9.6 the surrounding area is considered of low sensitivity to significant dust related human health impacts. Therefore, in the absence of mitigation there is the potential for **slight,**

negative, short-term impacts to human health as a result of the implementation of the Dublin Central Masterplan.

Traffic emissions from construction vehicles also have the potential to impact human health. However, as per section 9.4.2.1.1 the change in local air quality as a result of construction traffic is considered **short-term, localised, negative** and **imperceptible.**

9.5.1.2 Operational Stage

9.5.1.2.1 Air Quality

Operational phase traffic has the potential to impact local air quality as a result of increased vehicle movements associated with the implementation of the Dublin Central Masterplan. However, as there is minimal car parking (32no. in total) associated with the Dublin Central Masterplan it is not predicted to significantly change the existing traffic on the nearby road links. Therefore, according to the DMRB scoping criteria in section 9.2.2.1 none of the local road links can be classed as 'affected'. The potential impact to air quality during the operational phase is considered **long-term, neutral** and **imperceptible.**

9.5.1.2.2 Climate

Climate change has the potential to alter weather patterns and increase the frequency of rainfall in future years. As a result of this there is the potential for flooding related impacts on site in future years. However, adequate attenuation and drainage have been provided for to account for increased rainfall in future years as part of the design of Dublin Central. Therefore, the impact will be **long-term**, **localised**, **neutral** and **imperceptible**.

There is also the potential for increased traffic volumes to impact climate. The change in AADT values is not of the magnitude to require a detailed climate assessment as per the DMRB screening criteria outlined in Section 9.2.3.2 (UK Highways Agency, 2019b). It can therefore be determined that traffic related CO_2 and N_2O emissions during the operational phase are **long-term, localised**, **neutral** and **imperceptible**.

In addition, the Dublin Central Masterplan has been designed to minimise the impact to climate where possible during operation. The Energy & Sustainability Statement prepared in relation to the development details the incorporated design measures which will reduce climatic impacts. As per the Energy & Sustainability Statement the following key performance targets have been set for the Dublin Central Masterplan development:

- The buildings are aspiring to meet a Net Zero Carbon strategy to align with the aspirations set out by Dublin City Council within Section 16.2 (Design, Principles & Standards) of the DCC Development Plan.
- The design intent at present for the developments hot water, heating and cooling system designs are based on a combination of highly efficient air source and water to water heat pumps with no fossil fuels being consumed throughout the entire project, avoiding the production of large amounts of local pollution within an urban environment.
- The buildings will meet and exceed the new NZEB (Nearly Zero Energy Buildings) requirements set out in the revised Part L document.
- The development will achieve an "A" rated energy certificate for all buildings.
- The development will target a reduction in mains water consumption of more than 60% when compared to similar developments and this will be further explored post planning.
- The development has set progressive targets for embodied carbon in its brief, based on recently published LETI (London Energy Transformation Initiative) targets for 2030.
- The development has benchmarked itself against Sustainability Assessments including; BREEAM, LEED, WELL Building Standard, WIRED Score and Passive House. As a minimum, the

scheme will adopt the principles of all and pursuing the formal rating and certification will be subject to cost / benefit feasibility post planning.

Due to the location of the development within Dublin City Centre the site has a number of sustainable travel options such as bus, LUAS and cycling. Sustainable travel modes will be encouraged within the Dublin Central development through support facilities for cycling, minimal onsite parking and infrastructure for electrical vehicle charging points. It is also proposed to retain high quality buildings and facades to reduce the environmental impact and embodied carbon of the development. With the inclusion of these sustainability measures the impact to climate during the operational phase will be reduced.

9.5.1.2.3 Human Health

Traffic related air emissions have the potential to impact human health if they do not comply with the ambient Air Quality Standards detailed in Table 9.1. However, as there is minimal car parking associated with the Dublin Central Masterplan, the traffic generated does not satisfy the assessment criteria to require an air modelling assessment as outlined in Section 9.2.3.1 and therefore there is no potential for significant impacts. It can be determined that the impact to human health during the operational stage is **neutral, local, long-term** and **imperceptible**.

9.5.1.3 Do-Nothing Impact

The Do Nothing scenario includes retention of the current site without the Dublin Central Masterplan in place. In this scenario, ambient air quality at the site will remain as per the baseline and will change in accordance with trends within the wider area (including influences from potential new developments in the surrounding area, changes in road traffic, etc).

As the Dublin Central Masterplan site is zoned for development, in the absence of the Proposed Development it is likely that a development of a similar nature would be constructed in the future in line with national policy and the development plan objectives. Therefore, the construction and operational phase impacts outlined in this assessment are likely to occur in the future even in the absence of the implementation of the Dublin Central Masterplan.

9.5.2 Proposed Development – Site 2

9.5.2.1 Construction Stage

9.5.2.1.1 Air Quality

As with the implementation of the Dublin Central Masterplan, the greatest potential impact on air quality during the demolition and construction phase of the Proposed Development (i.e. Site 2) is from construction dust emissions and the potential for nuisance dust.

In order to determine the risk of dust impacts in the absence of mitigation during the proposed works, the potential dust emission magnitude for each dust generating activity needs to be taken into account, in conjunction with the previously established sensitivity of the area (see Section 9.3.4). The magnitude of each of the four dust generating activities: demolition, earthworks, construction and trackout has been determined below based on the Small, Medium or Large classifications outlined in Section 9.2.2.1 for the Proposed Development.

Demolition

The dust emission magnitude for the Site 2 development can be classified as large as per the criteria in Section 9.2.2.1. There will be over than 50,000m^3 of buildings to be demolished (approximately 55,800m^3) as part of the Site 2 works. This results in an overall high risk of dust soiling impacts and a medium risk of human health impacts as a result of the Site 2 demolition activities (see Table 9.13).

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible

Table 9.13: Risk of Dust Impacts - Demolition – Proposed Development Site 2.

Earthworks

Under the IAQM guidance (2014) (see Section 9.2.2.1) the proposed earthworks for the Site 2 development can be classified as large as there will be over 100,000 tonnes of material involved in infill and excavation works and the site area is greater than 10,000m^2. The excavation of the Metro Enabling Works in Site 2AB and Site 2C in particular and basements will be the primary sources of excavated materials. This results in an overall high risk of dust soiling impacts and a low risk of human health impacts as a result of the Site 2 earthworks activities (see Table 9.14).

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table 9.14: Risk of Dust Impacts - Earthworks – Proposed Development Site 2.

Construction

The dust emission magnitude from construction associated with the proposed Site 2 development works can be classified as large due to the total building volume involved exceeding 100,000m^3 over two to eight storeys as per the criteria in Section 9.2.2.1. Therefore, there is an overall high risk of dust soiling impacts and a low risk of human health impacts as a result of the proposed construction activities (Table 9.15).

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table 9.15: Risk of Dust Impacts – Construction – Proposed Development Site 2.

Trackout

The construction stages of the individual sites of the development will overlap and therefore HGVs associated with various sites will access the site simultaneously. For the purposes of this assessment worst-case construction phase traffic figures have been used to determine the dust emission potential from trackout.

The dust emission magnitude from trackout can be classified as large under IAQM guidance as there are likely to be over 50 outward HGV movements per day during worst-case stages of the

development (see Section 9.2.2.1). This results in an overall high risk of dust soiling impacts and a low risk of human health impacts as a result of the proposed trackout activities (see Table 9.16).

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table 9.16: Risk of Dust Impacts – Trackout – Proposed Development Site 2.

Summary of Dust Emission Risk

The risk of dust impacts as a result of the Proposed Development are summarised in Table 9.17 for each activity for the Site 2 development. In the absence of mitigation there is the potential for **short-term, localised, significant** dust related impacts to air quality as a result of the Proposed Development.

As the Proposed Development is part of a wider Dublin Central Masterplan development as per Section 9.4, the level of mitigation required for the masterplan development will be applied to each individual site of the development to ensure the highest level of dust mitigation is employed. Therefore, a high level of dust control will be required across the site.

Potential Impact	Dust Emission Category			
	Demolition	Earthworks	Construction	Trackout
Site 2				
Dust Emission Magnitude	Large	Large	Large	Large
Dust Soiling Risk	High Risk	High Risk	High Risk	High Risk
Human Health Risk	Medium Risk	Low Risk	Low Risk	Low Risk

Table 9.17: Summary of Dust Impact Risk used to Define Site-Specific Mitigation – Proposed Development Site 2.

Construction Phase Traffic Emissions

There is also the potential for traffic emissions to impact air quality in the short-term over the construction phase. Particularly due to the increase in HGVs accessing the site. A detailed air dispersion model of worst-case construction stage traffic emissions was conducted (see Section 9.5.1.11.). This included traffic associated with the worst-case construction phase of the development and traffic emissions during individual phases of the development will be lesser than predicted within this assessment. It was determined that the impact to air quality is **short-term, localised, negative** and **imperceptible.**

9.5.2.1.2 Climate

As per the IAQM guidance, site traffic and machinery are unlikely to have a significant impact on climate. Therefore, the potential impact on climate is considered to be **imperceptible** and **short-term.**

9.5.2.1.3 Human Health

Dust emissions from the demolition and construction phase of the Proposed Development have the potential to impact human health through the release of PM_{10} and $PM_{2.5}$ emissions. As per Table 9.6

the surrounding area is considered of low sensitivity to significant dust related human health impacts. There is an overall medium risk of significant human health impacts as a result of the demolition works and a low risk of human health impacts as a result of the construction works from the Proposed Development (see Table 9.17). Therefore, in the absence of mitigation there is the potential for **slight, negative, short-term** impacts to human health as a result of the Proposed Development.

Traffic emissions from construction vehicles also have the potential to impact human health. However, as per section 9.5.1.1.1 the change in local air quality as a result of construction traffic is considered **short-term, localised, negative** and **imperceptible.**

9.5.2.2 Operational Stage

9.5.2.2.1 Air Quality

As per section 9.5.1.2.1, a detailed air dispersion model of operational traffic emissions has been scoped out of this assessment as the traffic generated by the Proposed Development does not meet the assessment criteria. The cumulative traffic data for the full Dublin Central Masterplan development was assessed as a worst-case scenario, this also included traffic for existing and permitted developments within the area where available. The operational phase impact to air quality is deemed **long-term, localised, neutral** and **imperceptible.**

9.5.2.2.2 Climate

As per Section 9.5.1.2.2, the traffic generated by the Proposed Development did not meet the screening criteria requiring a detailed modelling assessment of CO_2 emissions. Operational traffic impacts to climate are considered **long-term, neutral** and **imperceptible.**

As per Section 9.5.1.2.2 a number of sustainable design measures have been incorporated into the Proposed Development in order to reduce the impact to climate during operation. These measures will be incorporated throughout each Site within the Dublin Central Masterplan in order to ameliorate potential operational phase climate impacts.

9.5.2.2.3 Human Health

Traffic related air emissions have the potential to impact human health if they do not comply with the ambient Air Quality Standards detailed in Table 9.1. However, as mentioned above the traffic generated by the development does not satisfy the assessment criteria to require an air modelling assessment as outlined in Section 9.2.3.1 and therefore there is no potential for significant impacts. It can be determined that the impact to human health during the operational stage is **neutral, local, long-term** and **imperceptible.**

9.5.2.3 Do-Nothing Impact

The Do Nothing impact outlined in Section 9.5.1.3 for the proposed Dublin Central Masterplan development is also applicable to the Proposed Development.

9.5.3 Proposed Development – No. 61 O'Connell Street Upper

9.5.3.1 Construction Stage

9.5.3.1.1 Air Quality

As with the implementation of the Dublin Central Masterplan, the greatest potential impact on air quality during the demolition and construction phase of the Proposed Development (i.e. No. 61 O'Connell Street Upper) is from construction dust emissions and the potential for nuisance dust.

In order to determine the risk of dust impacts in the absence of mitigation during the proposed works, the potential dust emission magnitude for each dust generating activity needs to be taken into account, in conjunction with the previously established sensitivity of the area (see Section 9.3.4). The magnitude of each of the four dust generating activities: demolition, earthworks, construction and trackout has been determined below based on the Small, Medium or Large classifications outlined in Section 9.2.2.1 for the Proposed Development.

Demolition

The dust emission magnitude for the No. 61 O'Connell Street Upper development can be classified as small as per the criteria in Section 9.2.2.1. There will be significantly less than 20,000m^3 of buildings to be demolished (approximately 430m^3) as part of the No, 61 O'Connell Street Upper works. This results in an overall medium risk of dust soiling impacts and a negligible risk of human health impacts as a result of the No. 61 O'Connell Street Upper demolition activities (see Table 9.18).

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible

Table 9.18: Risk of Dust Impacts – Demolition – Proposed Development No. 61 O'Connell Street Upper.

Earthworks

Under the IAQM guidance (2014) (see Section 9.2.2.1) the proposed earthworks for the No. 61 O'Connell Street upper development can be classified as small as there will be less than 20,000 tonnes of material involved in infill and excavation works associated with this individual element of the proposal. This results in a low risk of dust soiling impacts and a negligible risk of human health impacts as a result of the No. 61 O'Connell Street upper earthworks activities (see Table 9.19).

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table 9.19: Risk of Dust Impacts - Earthworks – Proposed Development No. 61 O'Connell Street upper.

Construction

The dust emission magnitude from construction associated with the proposed No. 61 O'Connell Street upper development works can be classified as small as per the criteria in Section 9.2.2.1 as the total building volume involved will be significantly less than 25,000m^3. Therefore, there is an overall low risk of dust soiling impacts and a negligible risk of human health impacts as a result of the proposed construction activities (Table 9.20).

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table 9.20: Risk of Dust Impacts – Construction – Proposed Development No. 61 O'Connell Street upper.

Trackout

The construction stages of the individual sites of the development will overlap and therefore HGVs associated with various sites will access the site simultaneously. For the purposes of this assessment worst-case construction phase traffic figures have been used to determine the dust emission potential from trackout.

The dust emission magnitude from trackout can be classified as large under IAQM guidance as there are likely to be over 50 outward HGV movements per day during worst-case stages of the development (see Section 9.2.2.1). This results in an overall high risk of dust soiling impacts and a low risk of human health impacts as a result of the proposed trackout activities (see Table 9.21).

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table 9.21: Risk of Dust Impacts – Trackout – Proposed Development No. 61 O'Connell Street upper.

Summary of Dust Emission Risk

The risk of dust impacts as a result of the Proposed Development are summarised in Table 9.22 for each activity for the Site 2 development. In the absence of mitigation there is the potential for **short-term, localised, significant** dust related impacts to air quality as a result of the Proposed Development.

As the Proposed Development is part of a wider Dublin Central Masterplan development as per Section 9.4, the level of mitigation required for the masterplan development will be applied to each individual site of the development to ensure the highest level of dust mitigation is employed. Therefore, a high level of dust control will be required across the site.

Potential Impact	Dust Emission Category			
	Demolition	Earthworks	Construction	Trackout
No. 61 O'Connell Street Upper				
Dust Emission Magnitude	Small	Small	Small	Large
Dust Soiling Risk	Medium Risk	Low Risk	Low Risk	High Risk
Human Health Risk	Negligible Risk	Negligible Risk	Negligible Risk	Low Risk

Table 9.22: Summary of Dust Impact Risk used to Define Site-Specific Mitigation – Proposed Development No. 61 O'Connell Street Upper.

Construction Phase Traffic Emissions

There is also the potential for traffic emissions to impact air quality in the short-term over the construction phase. Particularly due to the increase in HGVs accessing the site. A detailed air dispersion model of worst-case construction stage traffic emissions was conducted (see Section 9.5.1.11.). This included traffic associated with the worst-case construction phase of the development and traffic emissions during individual phases of the development will be lesser than predicted within this assessment. It was determined that the impact to air quality is **short-term, localised, negative** and **imperceptible.**

9.5.3.1.2 Climate

As per the IAQM guidance, site traffic and machinery are unlikely to have a significant impact on climate. Therefore, the potential impact on climate is considered to be **imperceptible** and **short-term.**

9.5.3.1.3 Human Health

Dust emissions from the demolition and construction phase of the Proposed Development have the potential to impact human health through the release of PM_{10} and $PM_{2.5}$ emissions. As per Table 9.6 the surrounding area is considered of low sensitivity to significant dust related human health impacts. There is an overall negligible risk of significant human health impacts as a result of the demolition works and a low risk of human health impacts as a result of the construction works from the Proposed Development (see Table 9.22). Therefore, in the absence of mitigation there is the potential for **imperceptible, negative, short-term** impacts to human health as a result of the Proposed Development.

Traffic emissions from construction vehicles also have the potential to impact human health. However, as per section 9.5.1.1.1 the change in local air quality as a result of construction traffic is considered **short-term, localised, negative** and **imperceptible.**

9.5.3.2 Operational Stage

9.5.3.2.1 Air Quality

As per section 9.5.1.2.1, a detailed air dispersion model of operational traffic emissions has been scoped out of this assessment as the traffic generated by the Proposed Development does not meet the assessment criteria. The cumulative traffic data for the full Dublin Central Masterplan development was assessed as a worst-case scenario, this also included traffic for existing and permitted developments within the area where available. The operational phase impact to air quality is deemed **long-term, localised, neutral** and **imperceptible.**

9.5.3.2.2 Climate

As per Section 9.5.1.2.2, the traffic generated by the Proposed Development did not meet the screening criteria requiring a detailed modelling assessment of CO_2 emissions. Operational traffic impacts to climate are considered **long-term, neutral** and **imperceptible.**

As per Section 9.5.1.2.2 a number of sustainable design measures have been incorporated into the Proposed Development in order to reduce the impact to climate during operation. These measures will be incorporated throughout each Site within the Dublin Central Masterplan in order to ameliorate potential operational phase climate impacts.

9.5.3.2.3 Human Health

Traffic related air emissions have the potential to impact human health if they do not comply with the ambient Air Quality Standards detailed in Table 9.1. However, as mentioned above the traffic

generated by the development does not satisfy the assessment criteria to require an air modelling assessment as outlined in Section 9.2.3.1 and therefore there is no potential for significant impacts. It can be determined that the impact to human health during the operational stage is **neutral, local, long-term** and **imperceptible.**

9.5.3.3 Do-Nothing Impact

The Do Nothing impact outlined in Section 9.5.1.3 for the proposed Dublin Central Masterplan development is also applicable to the Proposed Development.

9.6 MITIGATION MEASURES (AMELIORATIVE, REMEDIAL OR REDUCTIVE MEASURES)

9.6.1 Dublin Central Masterplan

9.6.1.1 Construction Stage

A detailed dust minimisation plan associated with a high level risk of dust impacts is outlined in Appendix 9.2. This plan draws on best practice mitigation measures from Ireland, the UK and the USA in order to ensure the highest level of mitigation possible. Care has specifically been paid to the requirements and recommendations within the Dublin City Council's guidance entitled "*Air Quality Monitoring and Noise Control Unit's Good Practice Guide for Construction and Demolition*".

In summary some of the measures which will be implemented will include: -

- Prior to demolition blocks should be soft striped inside buildings (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).
- During the demolition process, water suppression should be used, preferably with a hand-held spray. Only the use of cutting, grinding or sawing equipment fitted or used in conjunction with a suitable dust suppression technique such as water sprays/local extraction should be used.
- Drop heights from conveyors, loading shovels, hoppers and other loading equipment should be minimised, if necessary fine water sprays should be employed.
- Hard surface roads will be swept to remove mud and aggregate materials from their surface while any un-surfaced roads will be restricted to essential site traffic.
- Any road that has the potential to give rise to fugitive dust will be regularly watered, as appropriate, during dry and/or windy conditions.
- Vehicles exiting the site shall make use of a wheel wash facility where appropriate, prior to entering onto public roads.
- Vehicles using site roads will have their speed restricted, and this speed restriction will be enforced rigidly. On any un-surfaced site road, this will be 20 kph, and on hard surfaced roads as site management dictates.
- Public roads and footpaths outside the site will be regularly inspected for cleanliness and cleaned as necessary. If sweeping using a road sweeper is not possible due to the nature of the surrounding area then a suitable smaller scale street cleaning vacuum will be used.
- Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind. Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods.
- During movement of materials both on and off-site, trucks will be stringently covered with tarpaulin at all times. Before entrance onto public roads, trucks will be adequately inspected to ensure no potential for dust emissions.
- Hoarding or screens shall be erected around works areas to reduce visual impact. This will also have an added benefit of preventing larger particles of dust from travelling off-site and impacting receptors.

At all times, these procedures will be strictly monitored and assessed. In the event of dust nuisance occurring outside the site boundary, movements of materials likely to raise dust will be curtailed and satisfactory procedures implemented to rectify the problem before the resumption of construction operations.

9.6.1.2 Operational Stage

The impact of the Proposed Development on air quality and climate is predicted to be imperceptible with respect to the operational phase in the long term. Therefore, no additional site specific mitigation measures are required beyond the incorporated design mitigation as described in Section 9.5.1.2.2 and 9.5.2.2.2.

9.6.2 Proposed Development – Site 2

9.6.2.1 Construction Stage

The mitigation measures outlined in Section 9.6.1.1 and Appendix 9.2 will be applied across the site for each phase of the development.

9.6.2.2 Operational Stage

No mitigation is required for the operational phase of the development as no significant impacts to air quality or climate are predicted.

9.6.3 Proposed Development – No. 61 O'Connell Street Upper

9.6.3.1 Construction Stage

The mitigation measures outlined in Section 9.6.1.1 and Appendix 9.2 will be applied across the site for each phase of the development.

9.6.3.2 Operational Stage

No mitigation is required for the operational phase of the development as no significant impacts to air quality or climate are predicted.

9.7 RESIDUAL IMPACT

9.7.1 Dublin Central Masterplan

9.7.1.1 Construction Stage

9.7.1.1.1 Air Quality

In order to minimise dust emissions during construction, a series of mitigation measures have been prepared in the form of a dust minimisation plan which will be incorporated into the construction environmental management plan (CEMP) for the site. Provided the dust minimisation measures outlined in the plan (see Appendix 9.2 and Section 9.6.1.1) are adhered to, the air quality impacts during the construction phase will be short-term, negative, localised and imperceptible.

Construction traffic emissions will have a **long-term, localised, negative** and **imperceptible** impact on air quality as per Section 9.5.1.1.1.

9.7.1.1.2 Climate

According to the IAQM guidance (2014) site traffic and plant are unlikely to make a significant impact on climate during the construction phase. Therefore, the potential impact on climate is considered to be **imperceptible** and **short-term.**

9.7.1.1.3 Human Health

Best practice mitigation measures are proposed for the construction phase of the Proposed Development which will focus on the pro-active control of dust and other air pollutants to minimise generation of emissions at source. The mitigation measures that will be put in place during construction of the Proposed Development will ensure that the impact of the development complies with all EU ambient air quality legislative limit values which are based on the protection of human health (see Table 9.1). Therefore, the impact of construction of the Proposed Development is likely to be **negative, short-term** and **imperceptible** with respect to human health.

9.7.1.2 Operational Stage

9.7.1.2.1 Air Quality

As the traffic generated by the Proposed Development does not meet the criteria detailed in Section 9.2.2.1 for requiring a detailed air quality assessment the impact to air quality from traffic emissions during the operational stage is **neutral, long-term** and **imperceptible.**

9.7.1.2.2 Climate

The traffic associated with the operational phase of the Proposed Development is below the criteria requiring a detailed climate assessment. The impact to climate as a result of traffic emissions is predicted to be **long-term, neutral** and **imperceptible.**

In addition, the Proposed Development has been designed to reduce the impact to climate where possible through incorporated design measures. Full details of all measures included are outlined within the Energy & Sustainability Statement submitted as part of the planning application.

9.7.1.2.3 Human Health

Emissions of air pollutants are predicted to be significantly below the ambient air quality standards which are based on the protection of human health, impacts to human health are **long-term, neutral** and **imperceptible.**

9.7.1.3 Worst Case Impact

In terms of construction phase impacts, worst-case assumptions regarding volumes of excavation materials and number of vehicle movements have been used in order to determine the highest level of mitigation required in relation to potential dust impacts (see Section 9.5.1.1). The Dublin Central Masterplan development is the worst-case scenario in terms of dust emissions, emissions from each individual phase will be lower than the cumulative Dublin Central Masterplan.

Worst-case traffic data was used in the assessment of construction and operational phase impacts. In addition, conservative background concentrations were used in order to ensure a robust assessment. Thus, the predicted results of the construction and operational stage assessment are worst-case and the significance of effects is most likely overestimated.

9.7.2 Proposed Development – Site 2

9.7.2.1 Construction Stage

9.7.2.1.1 Air Quality

Once the dust minimisation measures outlined in Section 9.6.1.1 and Appendix 9.2 are adhered to, the air quality impacts during the construction phase will be **short-term, negative, localised** and **imperceptible.**

9.7.2.1.2 Climate

According to the IAQM guidance (2014) site traffic and plant are unlikely to make a significant impact on climate during the construction phase. Therefore, the potential impact on climate is considered to be **neutral, imperceptible** and **short-term.**

9.7.2.1.3 Human Health

Best practice mitigation measures are proposed for the construction phase of the Proposed Development which will focus on the pro-active control of dust and other air pollutants to minimise generation of emissions at source. The mitigation measures that will be put in place during construction of the Proposed Development will ensure that the impact of the development complies with all EU ambient air quality legislative limit values which are based on the protection of human health (see Table 9.1). Therefore, the impact of construction of the Proposed Development is likely to be **negative, short-term** and **imperceptible** with respect to human health.

9.7.2.2 Operational Stage

9.7.2.2.1 Air Quality

As the traffic generated by the Proposed Development does not meet the criteria detailed in Section 9.2.2.1 for requiring a detailed air quality assessment the impact to air quality from traffic emissions during the operational stage is **neutral, long-term** and **imperceptible.**

9.7.2.2.2 Climate

The traffic associated with the operational phase of the Proposed Development is below the criteria requiring a detailed climate assessment. The impact to climate as a result of traffic emissions is predicted to be **long-term, neutral** and **imperceptible.**

In addition, the Proposed Development has been designed to reduce the impact to climate where possible through incorporated design measures. Full details of all measures included are outlined within the Energy & Sustainability Statement submitted as part of the planning application.

9.7.2.2.3 Human Health

Emissions of air pollutants are predicted to be significantly below the ambient air quality standards which are based on the protection of human health, impacts to human health are **long-term, neutral** and **imperceptible.**

9.7.2.3 Worst Case Impact

The worst case impact described in Section 9.7.1.3 for the implementation of the Dublin Central Masterplan is also applicable to the Proposed Development.

9.7.3 Proposed Development – No. 61 O'Connell Street Upper

9.7.3.1 Construction Stage

9.7.3.1.1 Air Quality

Once the dust minimisation measures outlined in Section 9.6.1.1 and Appendix 9.2 are adhered to, the air quality impacts during the construction phase will be **short-term, negative, localised** and **imperceptible.**

9.7.3.1.2 Climate

According to the IAQM guidance (2014) site traffic and plant are unlikely to make a significant impact on climate during the construction phase. Therefore, the potential impact on climate is considered to be **neutral**, **imperceptible** and **short-term.**

9.7.3.1.3 Human Health

Best practice mitigation measures are proposed for the construction phase of the Proposed Development which will focus on the pro-active control of dust and other air pollutants to minimise generation of emissions at source. The mitigation measures that will be put in place during construction of the Proposed Development will ensure that the impact of the development complies with all EU ambient air quality legislative limit values which are based on the protection of human health (see Table 9.1). Therefore, the impact of construction of the Proposed Development is likely to be **negative, short-term** and **imperceptible** with respect to human health.

9.7.3.2 Operational Stage

9.7.3.2.1 Air Quality

As the traffic generated by the Proposed Development does not meet the criteria detailed in Section 9.2.2.1 for requiring a detailed air quality assessment the impact to air quality from traffic emissions during the operational stage is **neutral, long-term** and **imperceptible.**

9.7.3.2.2 Climate

The traffic associated with the operational phase of the Proposed Development is below the criteria requiring a detailed climate assessment. The impact to climate as a result of traffic emissions is predicted to be **long-term, neutral** and **imperceptible.**

In addition, the Proposed Development has been designed to reduce the impact to climate where possible through incorporated design measures. Full details of all measures included are outlined within the Energy & Sustainability Statement submitted as part of the planning application.

9.7.3.2.3 Human Health

Emissions of air pollutants are predicted to be significantly below the ambient air quality standards which are based on the protection of human health, impacts to human health are **long-term, neutral** and **imperceptible.**

9.7.3.3 Worst Case Impact

The worst case impact described in Section 9.7.1.3 for the implementation of the Dublin Central Masterplan is also applicable to the Proposed Development.

9.7.4 Cumulative

9.7.4.1 Construction Stage

The proposed Dublin Central Masterplan development will be constructed in a number of sites (Site 1 – 5), the construction stage for the individual phases will overlap with each other thus leading to cumulative construction dust emissions. However, a high level of dust control will be implemented across the full Dublin Central Masterplan site which will control dust emissions from each phase of the development. Therefore, cumulative dust emissions associated with the full Dublin Central Masterplan development will be **short-term, localised, negative** and **imperceptible.**

According to the IAQM guidance (2014) should the construction phase of the Proposed Development or Dublin Central Masterplan development coincide with the construction phase of any other development within 350m then there is the potential for cumulative construction dust impacts. However, as stated above a high level of dust control will be implemented across the full Dublin Central Masterplan site which will avoid significant dust emissions. Provided these mitigation measures are in place for the duration of the demolition and construction phase cumulative dust related impacts to nearby sensitive receptors are not predicted to be significant. Cumulative impacts to air quality will be **short-term, localised, negative** and **imperceptible.**

Due to the short-term duration of the construction phase and the low potential for significant CO_2 and N_2O emissions cumulative impacts to climate are considered neutral.

There are no significant cumulative impacts to air quality or climate predicted for the construction phase.

9.7.4.2 Operational Stage

The traffic data reviewed for the operational stage impacts to air quality and climate included the cumulative traffic associated with other existing and permitted developments in the local area as well as traffic associated with the full Dublin Central Masterplan development. Therefore, the cumulative impact is included within the operational stage impact for the Proposed Development. The impact is predicted to be **long-term, neutral** and **imperceptible** with regards to air quality and climate.

In addition, the proposed Dublin Central Masterplan development will facilitate the development of the proposed Metrolink with a station located within the development. The development of the Metrolink, if permitted, will provide for an alternative, more sustainable method of transport in comparison to personal passenger cars. This will result in a positive impact to air quality and climate by reducing emissions associated with cars.

The likely evolution of the current state of the environment (the baseline scenario) with the MetroLink project involves passengers using the intended station, using the railway infrastructure and all associated apparatus necessary for the station and metro.

Having regard to the standards proposed to be complied with by TII, the Dublin Central Proposed Development is not likely to have any significant impact on the MetroLink project to report within this EIAR, or any different effect on the environment, after its evolution to include the MetroLink project.

Strictly, the likely effect of the MetroLink project on the Dublin Central Proposed Development is a matter to be examined, analysed and evaluated within the EIAR for the MetroLink project, and by An Bord Pleanála, the competent authority that must complete the assessment of the application for a Railway Order. Even so, for the sake of completeness, the Applicant is pleased to confirm that, on the basis of available information, at the date of this application, including the standards proposed to be complied with by TII, no significant adverse effect from the MetroLink project on those occupying and using the Dublin Central Proposed Development is predicted.

9.7.4.3 Worst Case Impact

The worst case impact described in Section 9.7.1.3 for the development of the Dublin Central Masterplan is also applicable to the cumulative development.

9.8 MONITORING

9.8.1 Dublin Central Masterplan

9.8.1.1 Construction Stage

Monitoring of construction dust deposition along the site boundary to nearby sensitive receptors during the construction phase of the Proposed Development is recommended to ensure mitigation measures are working satisfactorily. This can be carried out using the Bergerhoff method in accordance with the requirements of the German Standard VDI 2119. The Bergerhoff Gauge consists of a collecting vessel and a stand with a protecting gauge. The collecting vessel is secured to the stand with the opening of the collecting vessel located approximately 2m above ground level. The TA Luft limit value is 350 mg/(m^2*day) during the monitoring period between 28 - 32 days. Monitoring shall ensure that all sites within the Dublin Central Masterplan are adequately covered as demolition and construction works progress

9.8.1.2 Operational Stage

There is no monitoring recommended for the operational phase of the development as impacts to air quality and climate are predicted to be imperceptible.

9.8.2 Proposed Development – Site 2

9.8.2.1 Construction Stage

The monitoring set out in Section 9.8.1.1 for the proposed Dublin Central Masterplan development will ensure that each Site is adequately monitored to ensure dust emissions are not causing nuisance at nearby sensitive receptors.

9.8.2.2 Operational Stage

No monitoring is proposed for the operational phase as impacts will be imperceptible.

9.8.3 Proposed Development – No. 61 O'Connell Street Upper

9.8.3.1 Construction Stage

The monitoring set out in Section 9.8.1.1 for the proposed Dublin Central Masterplan development will ensure that each Site is adequately monitored to ensure dust emissions are not causing nuisance at nearby sensitive receptors.

9.8.3.2 Operational Stage

No monitoring is proposed for the operational phase as impacts will be imperceptible.

9.9 REINSTATEMENT

9.9.1 Dublin Central Masterplan

Not applicable to air quality and climate.

9.9.2 Proposed Development – Site 2

Not applicable to air quality and climate.

9.9.3 Proposed Development – No. 61 O'Connell Street Upper

Not applicable to air quality and climate.

9.10 DIFFICULTIES ENCOUNTERED

There were no difficulties encountered when undertaking this assessment.

10 CLIMATE (DAYLIGHT & SUNLIGHT)

10.1 INTRODUCTION

This chapter of the Environmental Impact Assessment Report (EIAR) provides an assessment of the impact on the surrounding environment in relation to daylight, sunlight and overshadowing of the Proposed Development. The Proposed Development which is the subject of this planning application consists of Site 2 of Dublin Central. Dublin Central is underpinned by a Masterplan (refer to Figure 10.2 below indicating the Dublin Central Masterplan area) which will be assessed also.

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

TII is expected to make an application for a Railway Order for the MetroLink project, including a future MetroLink Station serving O'Connell Street within the Dublin Central site.

The Proposed Development accommodates a structural box (c. 120m length, c. 26m width, c. 34.5m depth) beneath the ground floor level that has been designed to accommodate the independent construction and operation of the planned O'Connell Street MetroLink Station by TII, including provision of the structural envelope and co-ordinated voids to accommodate station entrances, ventilation and fire escape shafts through this part of the Proposed Development (Metro Enabling Works – 'MEW'). These ensure that the Proposed Development is structurally independent of, and not prejudicial to, the MetroLink project.

This application does not include any request for permission for railway works, the use of railway works or the operation of a railway. The MetroLink project will be the subject of a separate application for railway order to be made by TII. In the event that MetroLink project is delayed or does not proceed, the Proposed Development can be completed, occupied and used regardless. The Proposed Development is not dependent on the MetroLink project in any way, whether functionally or otherwise. The MetroLink project is not, therefore, part of the project the subject of this EIAR. The description of the likely significant effects on the environment of the Proposed Development within this EIAR is not required to include effects on the environment resulting from the cumulation of effects with the MetroLink project.

This EIAR describes, in outline, the likely evolution of the current state of the environment (the baseline scenario), both with and without the MetroLink project. This outline has been completed with reasonable effort on the basis of available information, at the date of this application. For this purpose, the potential for the Proposed Development to impact on a future environment that includes the MetroLink project has been carefully considered, by the Applicant and TII. The MEW has been designed and incorporated to the Proposed Development to ensure that it is structurally independent of, and not prejudicial to, the MetroLink project. It follows that the Proposed Development is not likely to have any significant impact on the MetroLink project to report within this EIAR, or any different effect on the environment, after its evolution to include the MetroLink project.

This chapter was completed by Patrick Kavanagh of Building Design Partnership. Patrick is a Chartered Engineer with a BE Hons degree in Building Services Engineering. Patrick is an SEAI Energy Auditor, BER Assessor, LEED Green Associate, BREEAM and WELL Accredited Professional.

10.2 ASSESSMENT METHODOLOGY

The assessment of daylight and impact of overshadowing was prepared using the methodology set out in BRE 209, 'Site Layout Planning for Daylight and Sunlight: A Guide to Good Practice', Third Edition 2022, by P.J. Littlefair. This is the non-statutory guide referred to in the Dublin City Council Development Plan 2016 – 2022, and sets out guidelines that are most commonly used in Ireland and the UK to assess the impacts of development on daylight, sunlight and overshadowing.

The BRE 209 guide provides advisory numerical targets that represent good practice; however, the location specific characteristics of each site must also be taken into account. It should be noted that the BRE 209 guidance document is for guidance only and not standards that a development must achieve in order to receive development consent.

The daylight modelling and shadow assessment were assessed and created using Integrated Environmental Solutions (IES). IES is a software package that dynamically calculates environmental conditions within a defined space. The software uses 3D geometry to represent the building design, configuration and external shading provisions, as well as the shape and form of any surrounding buildings that could have an influence on the solar access of the building. IES is certified in accordance with the ANSI/ASHRAE Standard 140-2007 "Standard Method of Test for Evaluation of Building Energy Analysis Computer Programs". (*Green Buildings modelled below are existing neighbours*).

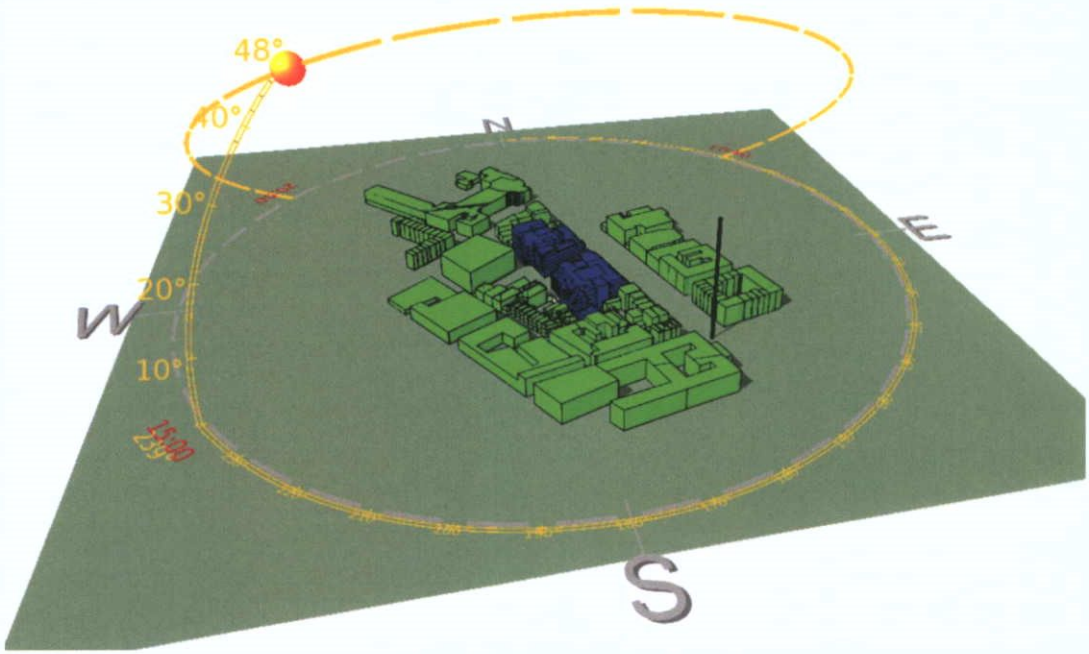


Figure 10.1: IES Geometric Model of Site 2 in Dublin Central and Surrounding Context.

A Daylight Sunlight and Overshadowing assessment is normally carried out with particular regard to potential impacts on the living spaces and private open spaces of neighbouring residential properties both within the site curtilage itself and neighbouring properties. In the case of the Proposed Development, there are no existing residential properties or private open spaces materially impacted by overshadowing due to the site location and orientation to other existing buildings. This is illustrated in the shadow plans appended to this report.

IES VE Simulation software uses an application called SunCast (based on Sunpath diagram) which calculates the position of the sun in the sky, tracks solar penetration through the building interior and calculates shadows. The software was therefore used to plot the direction and altitude of the sun for every two minutes and every day of the year and checks whether any elements of the 3D model obstruct the line of sight from the sun to particular reference points. It then calculates the total number of hours of daylight during which sun obstruction will occur.

The guidance documents, referenced above, indicate that site specific characteristics be taken into account when carrying out assessments. As such, the locations of the spaces assessed in this chapter are provided below in Section 10.3.

10.2.1 Percentage Impact

Using the IES VE software an approximate amount of sunlight hours can be evaluated on the glazing of the targeted buildings. This amount of hours can be compared from the baseline model to the proposed model to see if there is a loss of over 20% of daylight which is the Criterion 1 (CR01) used.

This is measured over a full annual year using the SunCast calculation methods in IES VE. A range of 0 to 3000 hours was chosen for both the baseline and proposed sites to get a fixed colour range across the two sets of results.

An average hours of exposure is used from all the windows on the façade to assimilate the results.

10.2.2 Daylight

The BRE Report recommends that loss of daylight and sunlight should be checked for main living rooms of dwellings, where they have a window facing within 90° of due south.

The Sunlight will be quantified in terms of the Annual Probable Sunlight Hours (APSH) for any given location. Annual Probable Sunlight Hours is the total number of hours in the year that the sun is expected to shine on unobstructed ground while allowing for average monthly levels of cloud cover for the specific location.

The APSH for any given location depends on its latitude and longitude which determines the number of daylight hours for any particular location, but also on statistical records for that location which indicates the number of daylight hours that are likely to experience sunshine.

Access to sunlight on a window can be quantified in terms of the Annual Probable Sunlight Hours (APSH) for any given location. Annual Probable Sunlight Hours is the total number of hours in the year that the sun is expected to shine on unobstructed ground while allowing for average monthly levels of cloud cover for the specific location.

The number of daylight hours in Dublin ranges from 7hrs 30mins on 21st December to 17hrs 00mins on 21st June. Over the whole year, there are a total of 4,409 daylight hours. In order to determine sunlight hours, statistical data is available from Met Eireann that identifies the mean daily duration of sunshine for each month of the year averaged over the 30 year period from 1960 to 1990, recorded at Dublin Airport.

While the average percentage of daylight hours likely to experience sunshine is 31%, this varies substantially from just below 23% in December to just over 39% in May. The BRE Report recommends that the centre of the window; a point 1.6m above floor level, should receive at least 25% of the APSH. If the available sunlight hours become less than this, and less than 0.8 times their former value then a noticeable loss of sunlight can occur.

For Dublin, 25% of the APSH, totalling 1,438 hours as seen in table above, equates to 25% of 1,438 hours, or 359.5 hours.

Therefore for Criterion 2 (CR02) the annual recommended target is **359.5** probable sunlight hours.

A Sunpath Diagram is used to calculate the Annual Probable Sunlight Hours for any given reference point. Sunpath Diagrams are generated for different longitudinal locations using solar data for different days of the year at times of day. The Sunpath Diagram comprises a 'plot' of the path of the sun as 'seen' from a particular location on different days of the year and at different times of the day. Generally, sunlight in the lowest six degrees of elevation is discounted to take account of existing built or planted obstructions at or near the horizon.

The BRE Report recommends that the centre of the window in a dwelling living space; a point 1.6m above floor level, should receive at least 25% of the APSH, including at least 5% of the APSH from 21st September to 21st March. If the available sunlight hours become less than this, and less than 0.8 times their former value, either over the whole year or just in the winter months, then a noticeable loss of sunlight can occur.

The analysis investigates the impact that the Proposed Development has on the surrounding buildings as well as the public realm within the ACA. Whilst there are no dwellings impacted by the Site 2 developments the guidance methodology is used to target existing buildings in the study as listed below: -

- Nos. 70 to 74 Parnell Street.
- Nos. 37 & 38 O'Connell Street.
- O'Connell Hall and No.42 O'Connell Street.
- No. 59 to 61 O'Connell Street.
- Nos.14 to 17 Moore Street.
- Nos. 6 to 8 Moore Lane.

IES VE Simulation software uses an application called SunCast (based on Sunpath diagram) which calculates the position of the sun in the sky, tracks solar penetration through the building interior and calculates shadows. The software was therefore used to plot the direction and altitude of the sun for every two minutes and every day of the year and checks whether any elements of the 3D model obstruct the line of sight from the sun to particular reference points. It then calculates the total number of hours of daylight during which sun obstruction will occur.

10.2.3 Sunlight & Overshadowing Impact

The BRE Report acknowledges the value of sunlight in external spaces in enhancing their overall appearance, ambience and amenity. Relevant spaces noted in the report include private gardens of dwellings, amenity spaces such as parks, playing fields and playgrounds, and also public spaces between non-domestic buildings and in streetscapes.

The BRE report recommends that at least half of the area of relevant spaces should receive at least two hours of sunlight on 21st March. The 21st March (Spring Equinox) is used for overshadowing analysis as this date illustrates an average level of shadowing for the year.

In the context of the Proposed Development, the areas of interest are as follows: -

- New Public Square within the Dublin Central Masterplan.
- Existing pedestrian areas of streetscapes directly adjacent to the Proposed Development (i.e. Moore Lane, Henry Place and O'Connell Street).

Sunlight Exposure Plans and Shadow Plans are provided to show the effect of overshadowing of the Proposed Development on the adjoining public spaces and properties, using 3D digital models of existing buildings and structures in and around the site and of the Proposed Development.

Shadow plans are prepared for 09:00am, 12:00 noon, and 03:00pm on the 21st March (equinox).

10.3 RECEIVING ENVIRONMENT

A Sunlight and Overshadowing assessment is normally carried out with particular regard to potential impacts on the living spaces and private open spaces of residential properties. In the case of the Proposed Development, there are no existing residential properties impacted by overshadowing due to the site location and orientation to other existing buildings. This is illustrated in the shadow plans appended to this report.

Whilst it should be noted there are apartments on the North of Moore Street that face the existing Jurys Inn, Parnell Street; Sunlight analysis completed shows the roof top amenity space is not affected by the Proposed Development due to the orientation and height relative to the building. The apartment windows are facing North East and therefore are overshadowed by the existing Jurys Inn and as the elevation angle is more than 90 degrees from due south the impact on sunlight is not significant or considered relevant under BRE 209 guidance.

10.4 CHARACTERISTICS OF PROPOSED DEVELOPMENT

10.4.1 Dublin Central Masterplan

The Dublin Central Masterplan is divided into six sites. The overall development site is bounded by Henry Street to the south, O'Connell Street Upper to the east, Parnell Street and O'Rahilly Parade to the north-east and north-west respectively, and Moore Street to the west. The development is a mixed use development, and includes office, hotel, residential, café / restaurant and retail spaces. There is also provision made in Site 2 for a structure box beneath ground floor that has been designed to accommodate the independent construction and operation of the planned MetroLink Station, to be implemented separately by Transport Infrastructure Ireland (TII).

Site 2 for which this EIAR chapter assesses is one of the six sites associated with the Dublin Central Masterplan. For this reason the cumulative impact of the new Dublin Central Masterplan massing is added to each individual Daylight, Sunlight and Overshadowing Assessment. This ensures worst case analysis and ensures that the Dublin Central Masterplan itself does not reduce the access to Daylight and Sunlight for other individual Sites.

Figure 10.2: Masterplan & Site Identification.

The analysis notes the low density of the site at present and therefore it should be noted that this will exaggerate the impact of the Proposed Development on the surrounding area.

10.4.2 Proposed Development – Site 2 & No. 61 O'Connell Street Upper

The Proposed Development is indicated in white on Figure 10.3 below. The proposed development comprises a mixed-use scheme accommodating office, retail and café / restaurant uses over a new single storey localised basement and the MEW to facilitate the future MetroLink Station.

It is proposed to carry out refurbishment work to 61 O'Connell Street Upper. The proposed refurbishment comprises residential accommodation over 4-storeys, all over the existing single-storey basement. A new pedestrian through-route is proposed at ground floor, linking between O'Connell Street Upper and Henry Place / Moore Lane. There are no changes proposed to the existing massing of No. 61 O'Connell Street Upper with the exception of the rear where a single storey extension will be replaced.

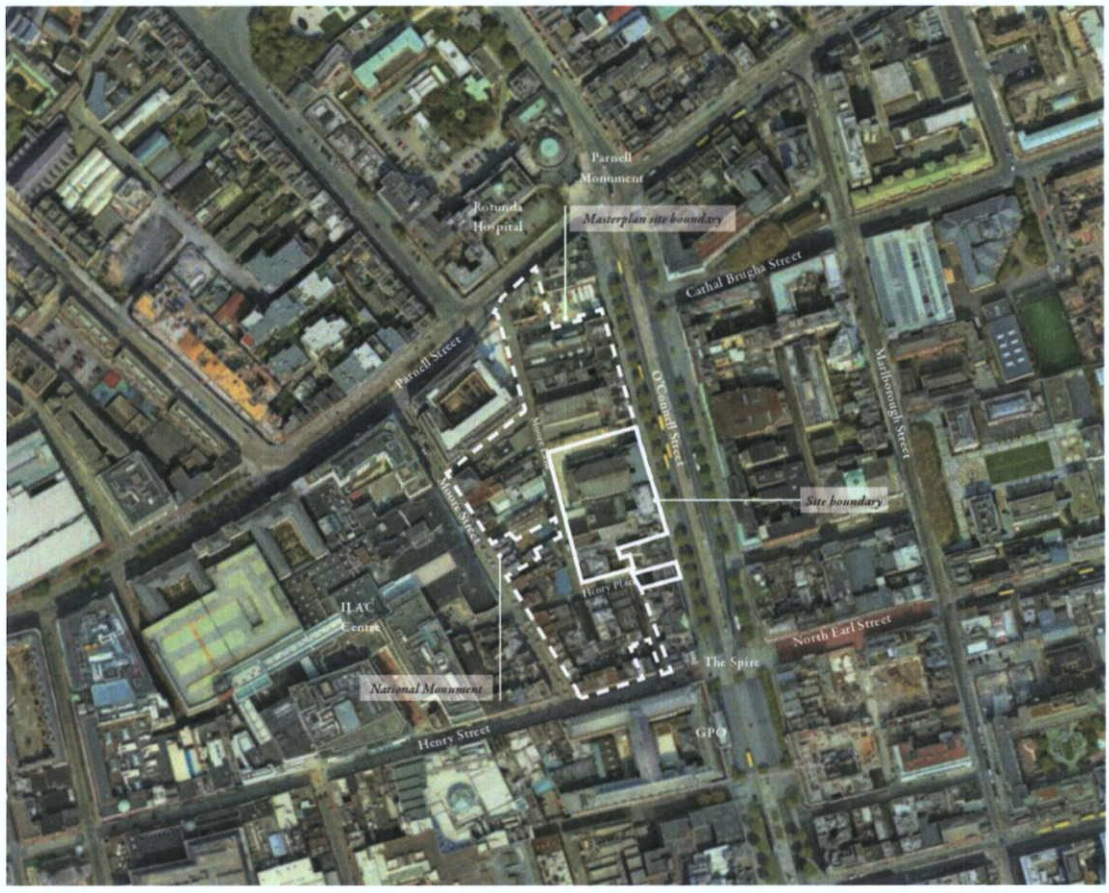


Figure 10.3: Location of Proposed Development (within solid white line).

10.5 POTENTIAL IMPACTS

10.5.1 Dublin Central Masterplan

Following a site survey and shadow assessment it was determined that there are no existing residential properties impacted by the Dublin Central Masterplan. The extent of the impact of a development is usually proportional to the extent to which that development is large in scale and / or height and its proximity to the location. This proportionality may be modified by the extent to which the development is seen as culturally or socially acceptable, and on the interaction between the Dublin Central Masterplan, the character of the existing shadow environment and the land use pattern of the receiving environment.

The impact of the Dublin Central Masterplan on sunlight access to the adjacent properties is therefore defined as **Not Significant:** *An effect which causes noticeable changes in the character of the environment but without significant consequences.* This is the second lowest definition of impact taken from the *Guidelines on the Information to be contained in Environmental Impact Assessment Reports* prepared by the Environmental Protection Agency (2022).

The definition is chosen because the scale of the implemented Dublin Central Masterplan 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.

10.5.1.1 Construction Stage

The potential impact of the construction phase of the Dublin Central Masterplan on daylight and sunlight is likely to be, initially, lesser than the potential impact of the completed development. As the Dublin Central Masterplan nears completion, the potential impact of the emerging development is likely to be similar in all material respects to that of the completed development. It is noted that temporary structures and machinery (e.g. hoarding, scaffolding, cranes, etc.) have the potential to result in changes in daylight access in buildings, although any additional impacts arising from temporary structures or machinery are likely to be **temporary** and **minor**.

10.5.1.2 Operational Stage

A Sunlight and Overshadowing assessment is normally carried out with particular regard to potential impacts on the living spaces and private open spaces of residential properties. In the case of the Dublin Central Masterplan, there are no existing residential properties impacted by overshadowing due to the site location and orientation to other existing buildings. This is illustrated in the shadow plans appended to this chapter.

10.5.1.3 Do-Nothing Impact

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

10.5.2 Proposed Development – Site 2 & No. 61 O'Connell Street Upper

10.5.2.1 Construction Stage

The potential impact of the construction phase of the Proposed Development on daylight and sunlight is likely to be, initially, lesser than the potential impact of the completed development. As the Proposed Development nears completion, the potential impact of the emerging development is likely to be similar in all material respects to that of the completed development. It is noted that temporary structures and machinery (e.g. hoarding, scaffolding, cranes, etc.) have the potential to result in changes in daylight access in buildings, although any additional impacts arising from temporary structures or machinery are likely to be **temporary** and **minor**.

10.5.2.2 Operational Stage

10.5.2.2.1 Impact on Sunlight from Proposed Development

Following a site survey and shadow assessment it was determined that there are no existing residential properties impacted by the Proposed Development. The extent of the impact of a development is usually proportional to the extent to which that development is large in scale and / or height and its proximity to the location. This proportionality may be modified by the extent to which the development is seen as culturally or socially acceptable, and on the interaction between the Proposed Development, the character of the existing shadow environment and the land use pattern of the receiving environment.

The impact of the Proposed Development on sunlight access to adjacent properties is therefore defined as ***Moderate Effects**: An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends*. This definition of impact is taken from the *Guidelines on the Information to be contained in Environmental Impact Assessment Reports* prepared by the Environmental Protection Agency.

The definition is chosen because the scale of the Proposed Development will have an impact on the shadow environment directly adjacent the site; but this change is consistent with a pattern of change that would be reasonable in an urban city centre environment and no neighbouring residential amenity or living space access to daylight and sunlight is materially impacted.

A Sunlight and Overshadowing assessment is normally carried out with particular regard to potential impacts on the living spaces and private open spaces of residential properties. In the case of the Proposed Development, there are no existing residential properties impacted by overshadowing due to the site location and orientation to other existing buildings. This is illustrated in the shadow plans appended to this chapter.

10.5.2.2.2 Impact on Existing Buildings of Historical Significance from Proposed Development

The following table summarises the sunlight analysis results. The hours listed for each building are an average across all the windows on the specific façade.

- **Criterion 01 (CR01)** – A pass (in green) is achieved if the percentage loss of sunlight is less than 20%. This percentage is used because BRE 209 suggests that a loss of 20% would represent a noticeable loss of sunlight.
- **Criterion 02 (CR02)** – A pass (in green) is achieved if the number of sunlight exposure hours for a specific façade exceed 25% (359.5 hours) of the annual probable sunlight hours (APSH) as recommended by BRE.

Building	Window Orientation	Exposure Hours (01/Jan – 31/Dec) Baseline Site (hrs)	Exposure Hours (01/Jan – 31/Dec) Proposed Site (hrs)	CR01 Percentage Difference (%)	CR02 Complying with APSH Target ?
No. 70 Parnell St.	South	3000	2700	-10.00%	Yes
No. 72 Parnell St.	South	No impact as no windows facing Dublin Central			
No. 73 Parnell St.	South	2200	1800	-18.18%	Yes
No. 74 Parnell St.	South	No impact as no windows facing Dublin Central			
No.37 O'Connell St	NA	No impact as no windows facing Dublin Central			
No.38 O'Connell St.	West	2100	1900	-9.52%	Yes
O'Connell Hall	Roof Light	2700	1600	-40.74%	Yes
No. 42 O'Connell St.	West	1600	900	-43.75%	Yes
No. 59 O'Connell St.	West	1950	1800	-7.69%	Yes
No. 60 O'Connell St.	West	2075	1800	-13.25%	Yes
No. 61 O'Connell St.	West	1550	1300	-16.13%	Yes
No. 6-8 Moore Lane	East	900	600	-33.33%	Yes
No. 14 Moore St.	East	550	450	-18.18%	Yes
No. 15 Moore St.	East	950	800	-15.79%	Yes
No. 16 Moore St.	East	950	800	-15.79%	Yes
No. 17 Moore St.	East	900	750	-16.67%	Yes

Table 10.1: Sunlight analysis results for existing buildings of Historical Significance.

O'Connell Hall, No. 42 O'Connell Street and Nos. 6 – 8 Moore Lane have not past Criterion 1 as the impact of Proposed Development will create a "noticeable loss" of sunlight as defined by BRE. It is however important to recognise that these elevations have an atypical access to sunlight given their city centre environment and orientation and so development of any significant scale in this location will necessarily have an impact. All three pass Criterion 2 demonstrating that they still receive access to daylight that would be accepted by BRE.

All other assessed façades comply with Criterion 1 & 2.

10.5.2.2.3 Overshadowing Impact on Sunlight from Proposed Development

The BRE 209 guide recommends that in all relevant amenity spaces; at least half of the area should receive at least **two hours** of sunlight on 21st March. The new public square created in Dublin Central Masterplan (see Figure 10.4 below) receives high levels of sunlight throughout the year with over 90% of the space achieving 2 hours of direct sunlight on the 21st March (see Figure 10.5 below).

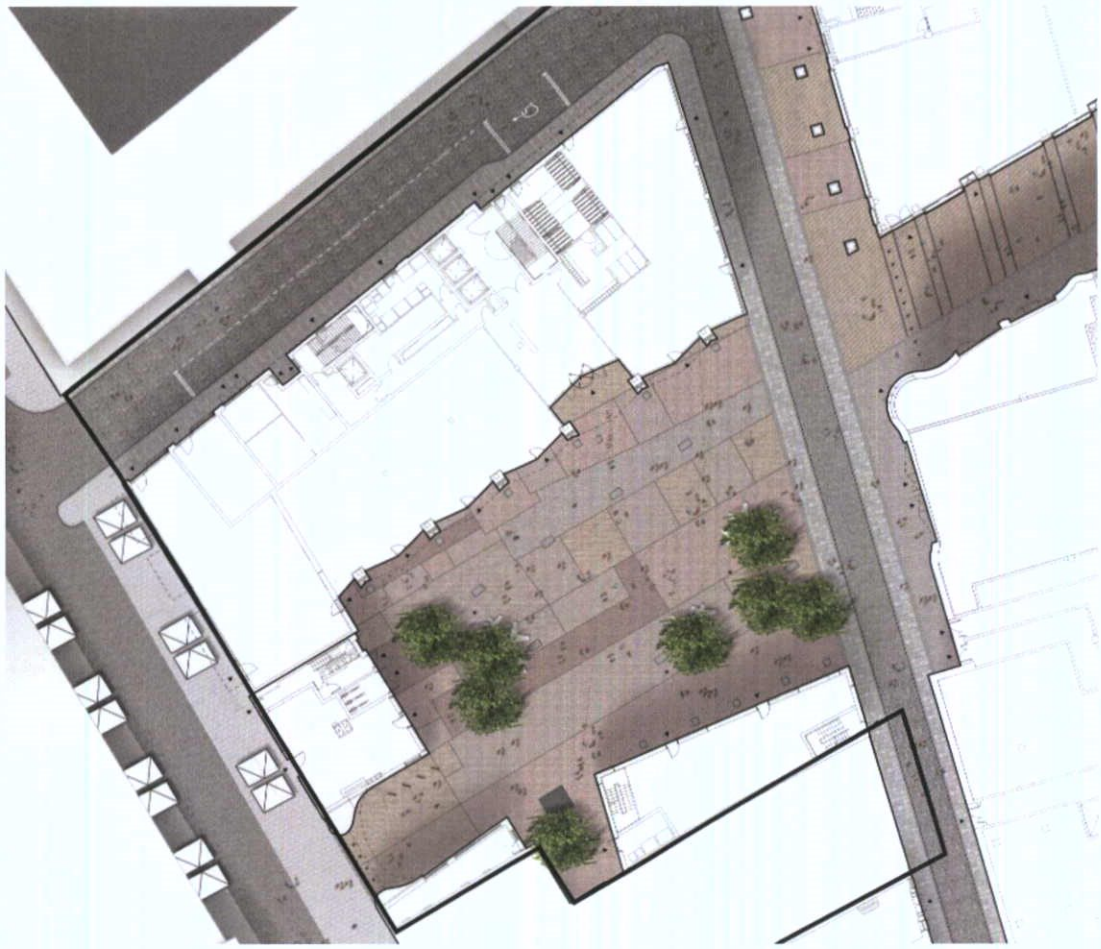


Figure 10.4: Amenity Space – New Public Square for Dublin Central located in Site 4 & 5.

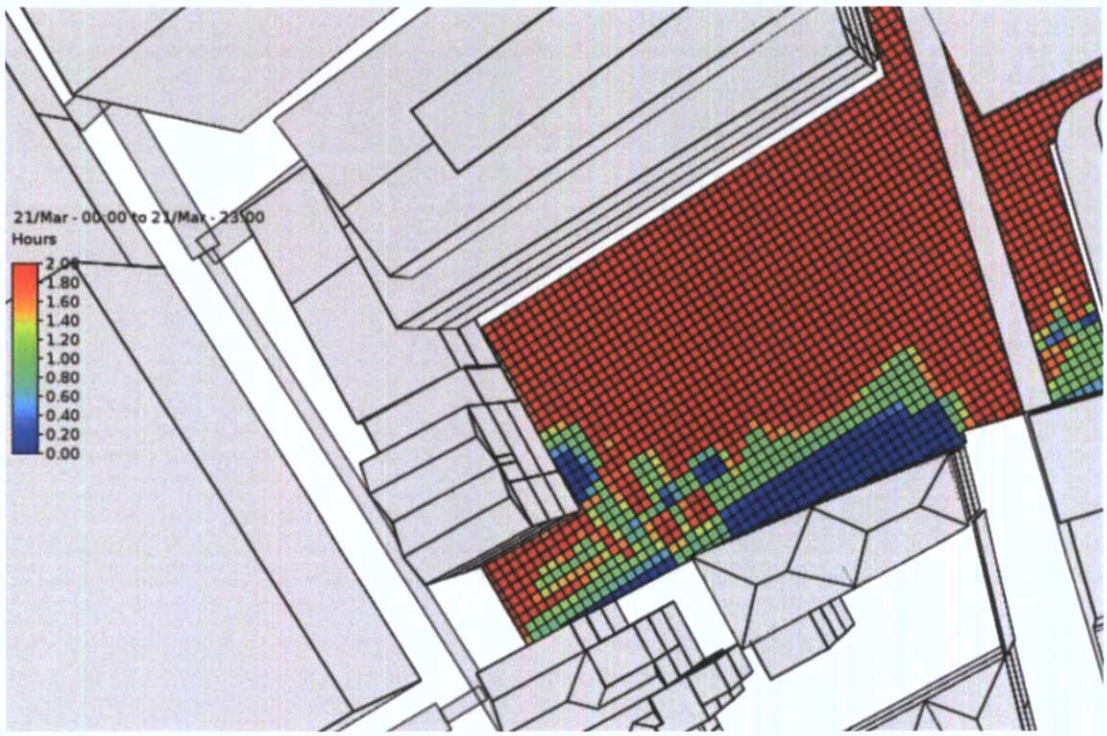


Figure 10.5: Amenity Space – New Public Square Sunlight Exposure located in Site 4 & 5.

The existing public realm within the ACA which includes O'Connell Street Upper, Moore Lane and Henry Place. Detailed sunlight analysis demonstrate that high levels of direct sunlight throughout the year is still achieved post development with approximately 55% of the space achieving 2 hours of direct sunlight on the 21st March (see Figure 10.6 below) complying with BRE 209 recommendations. The areas in green and orange illustrate spaces which receives over 2 hours of direct sunlight on the 21st March. The areas in blue fall below the 2 hour threshold.

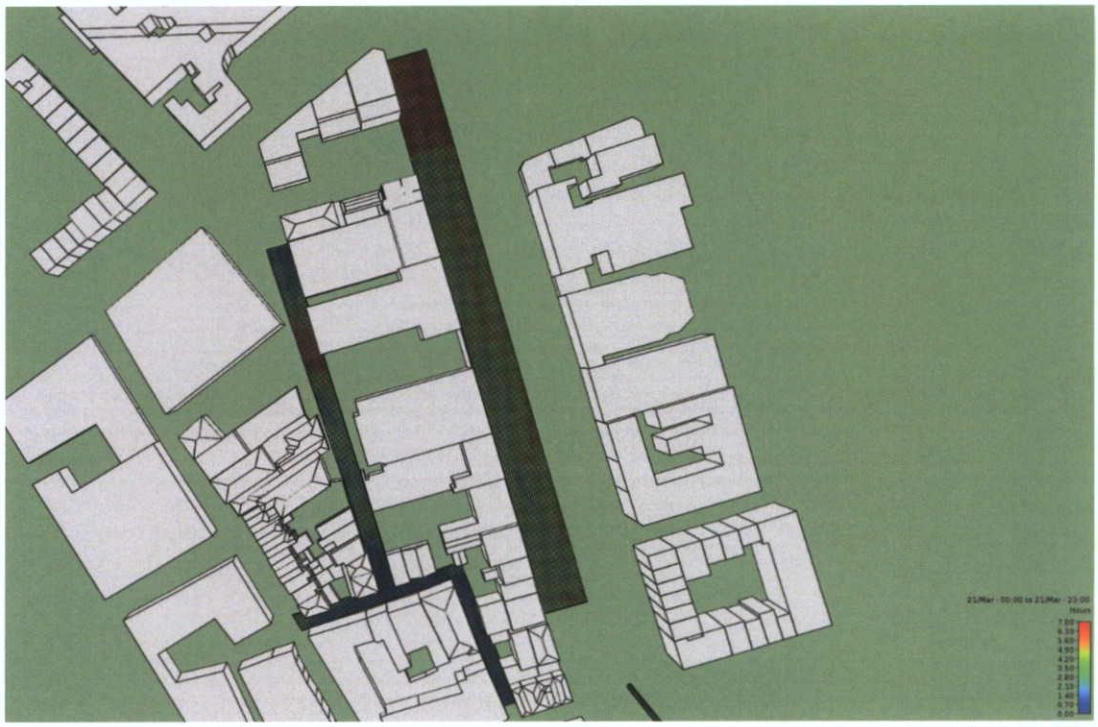


Figure 10.6: Sunlight Exposure on O'Connell Street, Henry Place & Moore Lane, March 21st (Baseline Site).

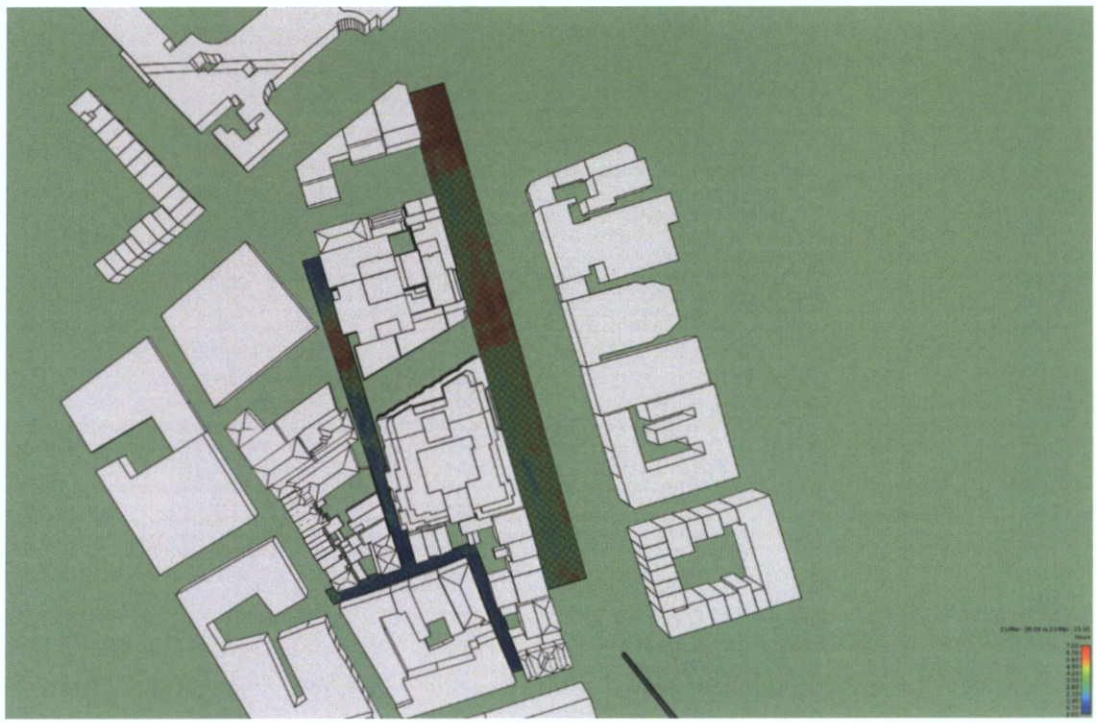


Figure 10.7: Sunlight Exposure on O'Connell Street, Henry Place & Moore Lane, March 21st (Post Development).

The analysis demonstrates that the design of Dublin Central Masterplan maximises access to sunlight in amenity spaces for both residents and the public and so the BRE 209 guidelines are comfortably achieved.

10.5.2.2.4 Summary of Development Impact

To conclude this study a 'Definition of Impacts on Sunlight Access' is given below. The list of definitions given below is taken from the *Guidelines on the Information to be Contained in Environmental Impact Statements prepared* by the Environmental Protection Agency (2022).

- **Imperceptible Impact:** An effect capable of measurement but without significant consequences.
- **Not Significant:** An effect which causes noticeable changes in the character of the environment but without significant consequences.
- **Slight Effects**: An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
- **Moderate Effects:** An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends
- **Significant Effects:** An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
- **Very Significant:** An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment.
- **Profound Impact:** An impact which obliterates sensitive characteristics.

The extent of the impact of a development is usually proportional to the extent to which that development is large in scale and/or height and its proximity to the location. This proportionality may be modified by the extent to which the development is seen as culturally or socially acceptable, and on the interaction between the Proposed Development, the character of the existing shadow environment and the land use pattern of the receiving environment.

The impact of the proposed Site 2 development on sunlight access to adjacent properties is therefore defined as **Moderate Effects**: *An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.* This definition of impact is taken from the *Guidelines on the information to be contained in Environmental Impact Assessment Reports* prepared by the Environmental Protection Agency.

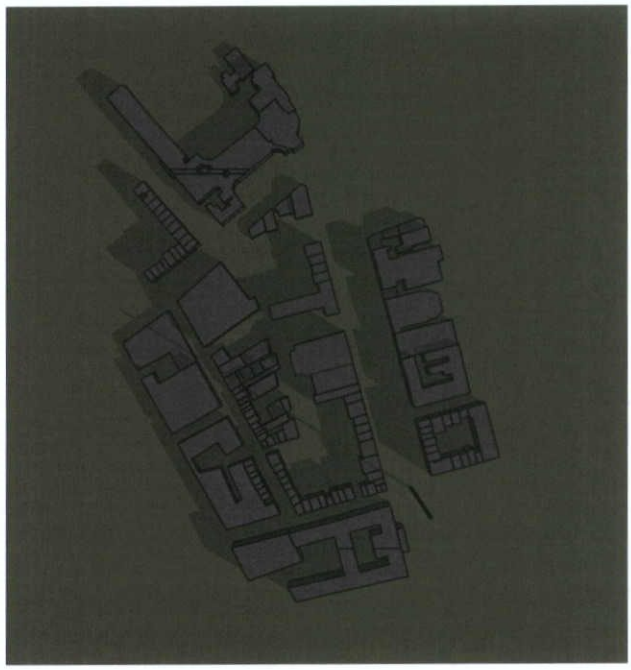
The definition is chosen because the scale of the development at Site 2 will have an impact on the shadow environment directly adjacent the site; but this change is consistent with a pattern of change that would be reasonable in an urban city centre environment and no neighbouring residential amenity or living space access to daylight and sunlight is materially impacted.

10.5.2.3 Overshadowing Impact on Sunlight from Proposed Site 2 Development

The shadow plans are prepared for 09:00am, 12:00 noon, 3:00pm and 5:00pm on the 21st March (equinox), 21st June (summer solstice) and 21st December (winter solstice) for reference. The dark grey massing is the existing context. The light grey massing is the proposed Site 2 massing within the Dublin Central masterplan. The brown massing are the proposed developments for Site 3, 4 & 5 of the Dublin Central Masterplan which currently have planning grant from DCC (subject to appeal). Following interrogation of the shadow plans for all periods of the year it was determined that Masterplan shall not have any impact on other amenity spaces such as residential gardens, parks, playing fields and playgrounds.

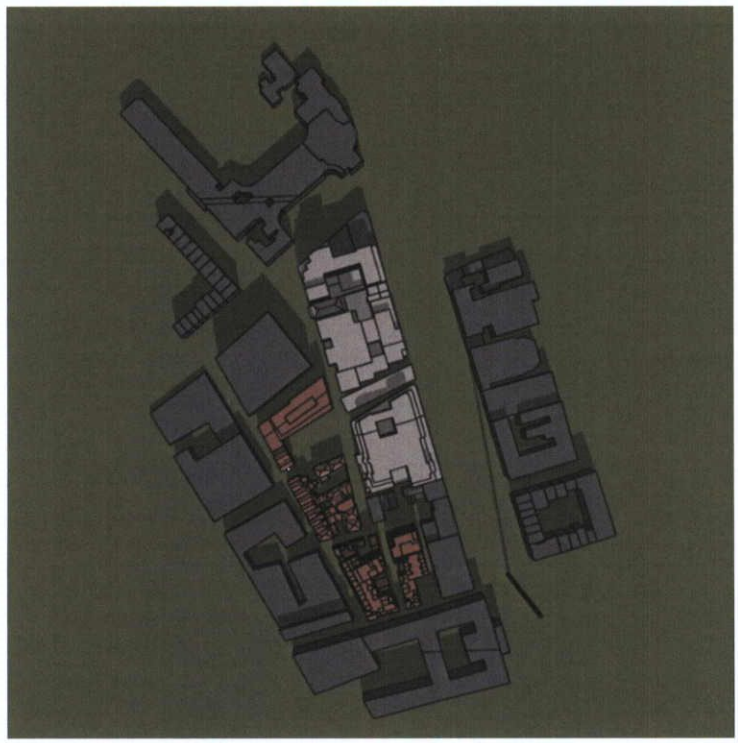
9am – 21st March

Proposed

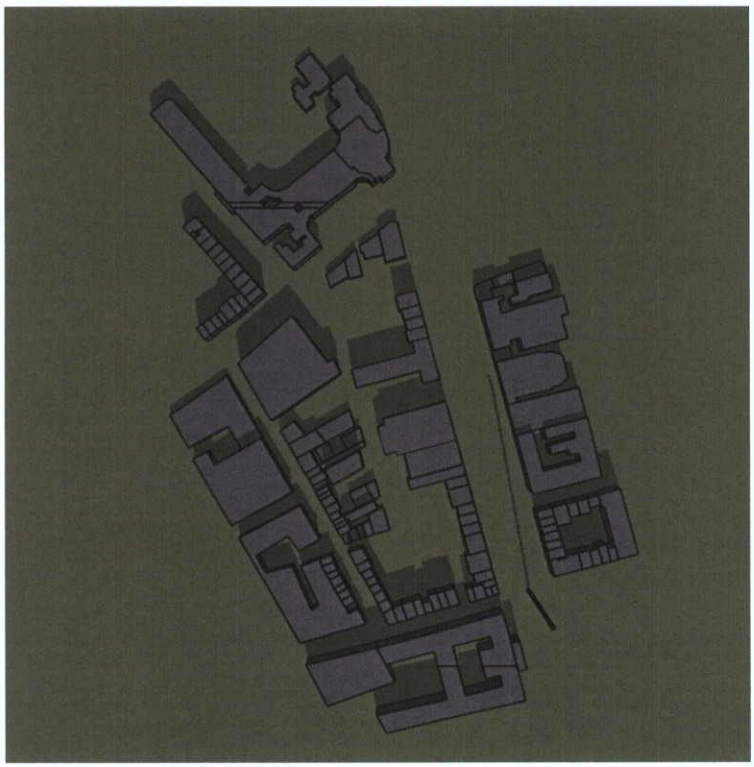


Existing

12pm – 21st March

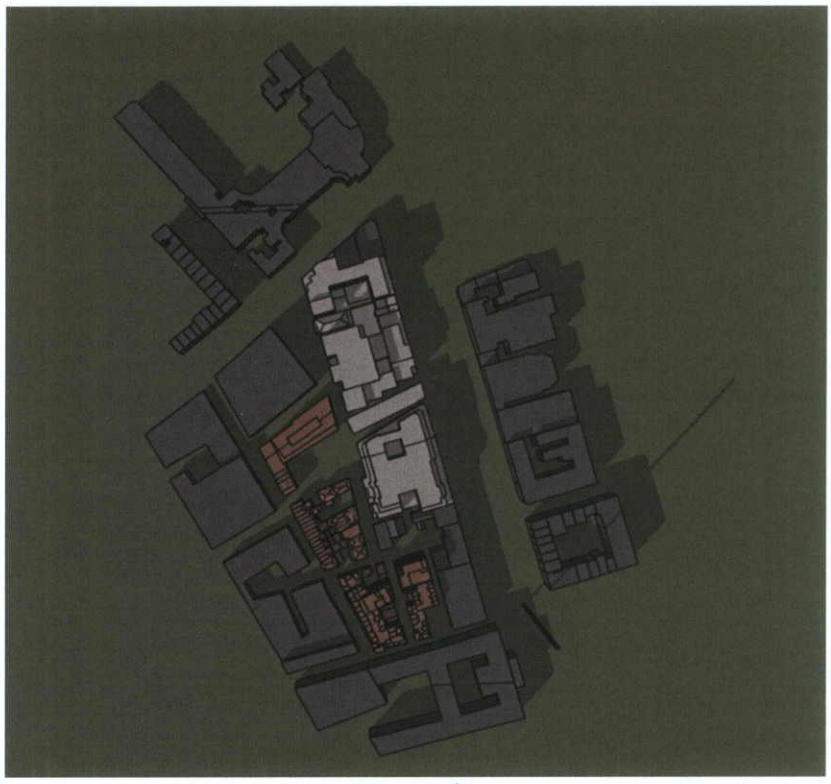


Proposed

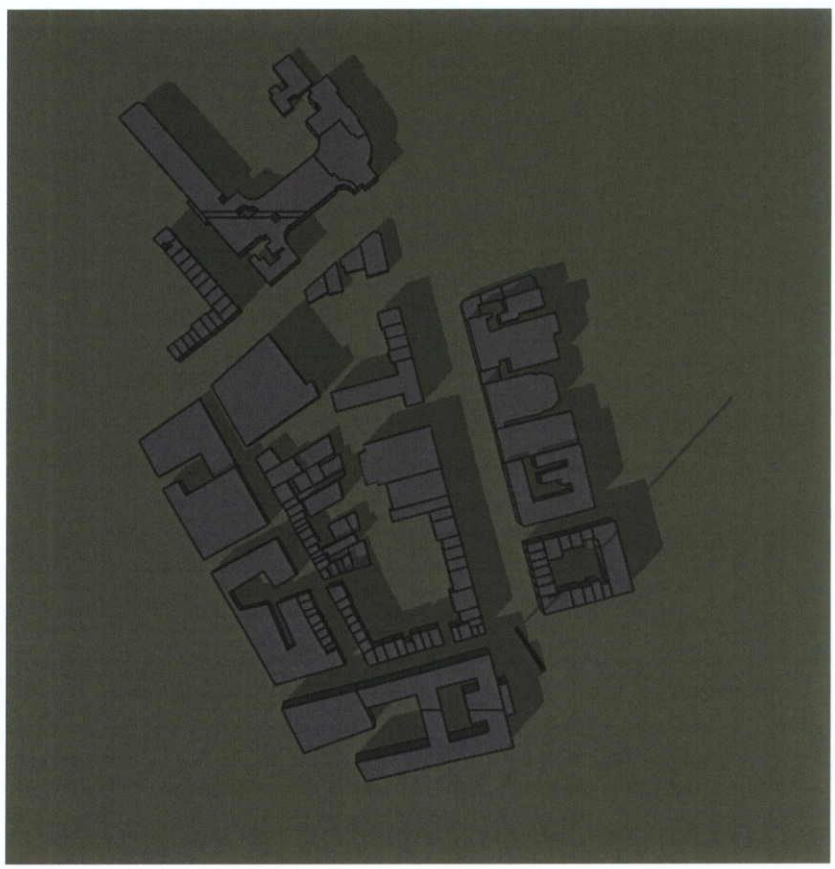


Existing

3pm – 21st March



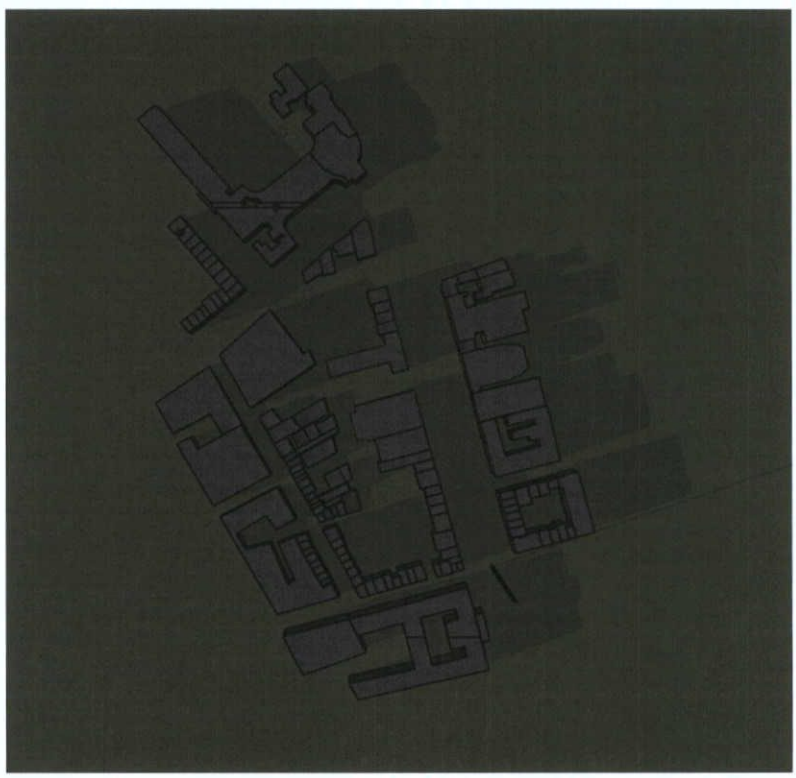
Proposed



Existing

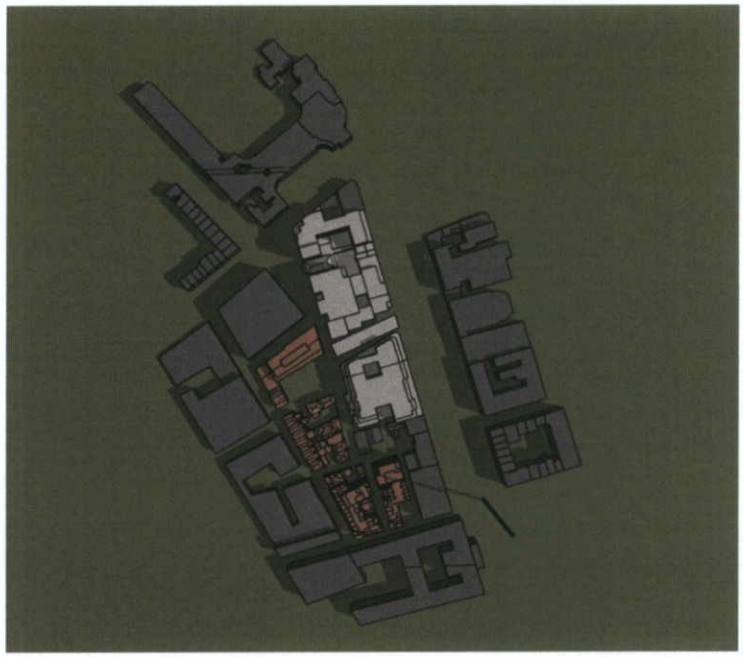
5pm – 21st March

Proposed

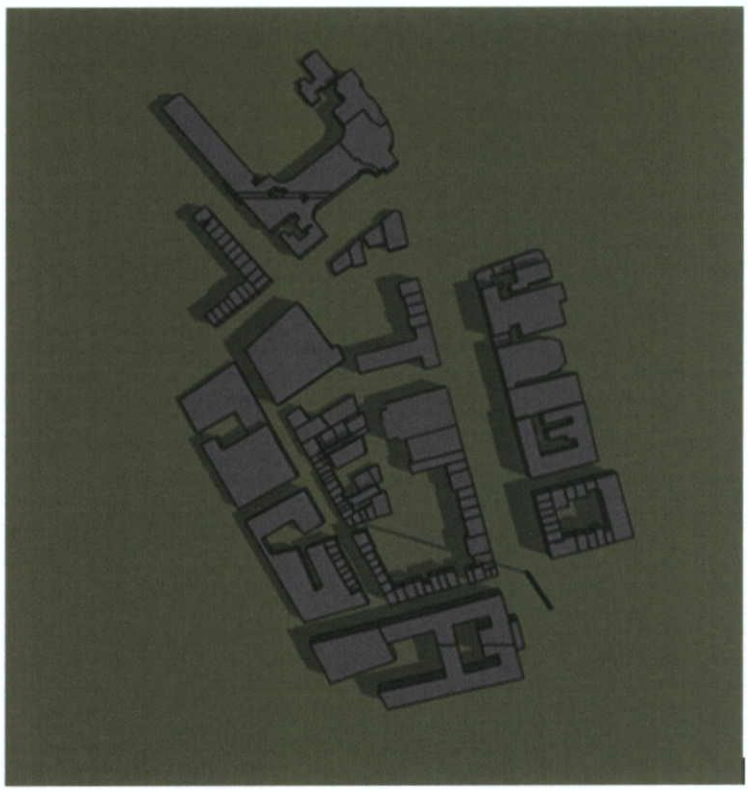


Existing

9am – 21st June

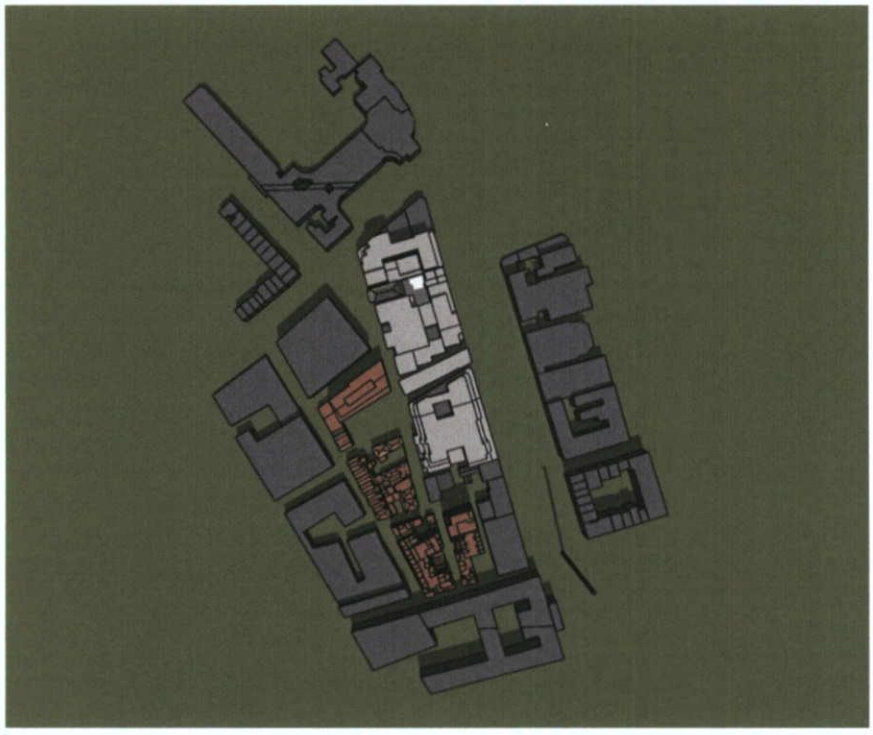


Proposed Site

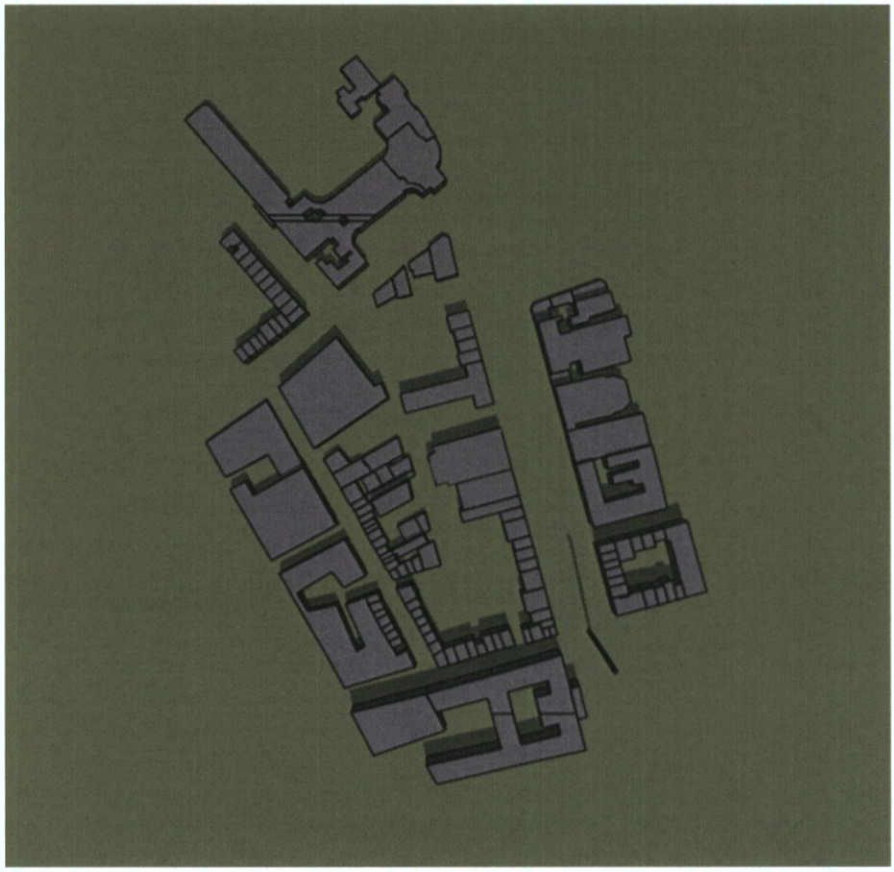


Existing Site

12pm – 21st June

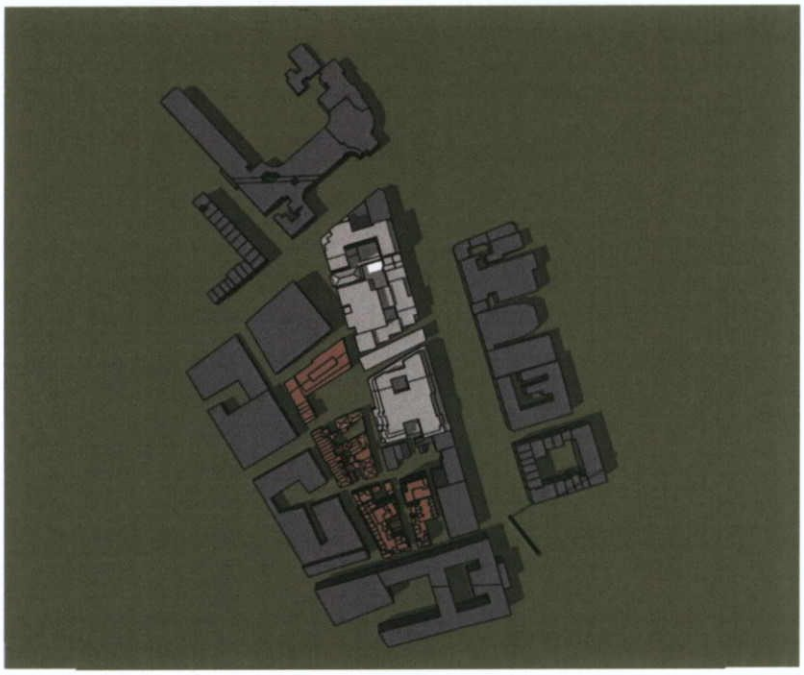


Proposed Site

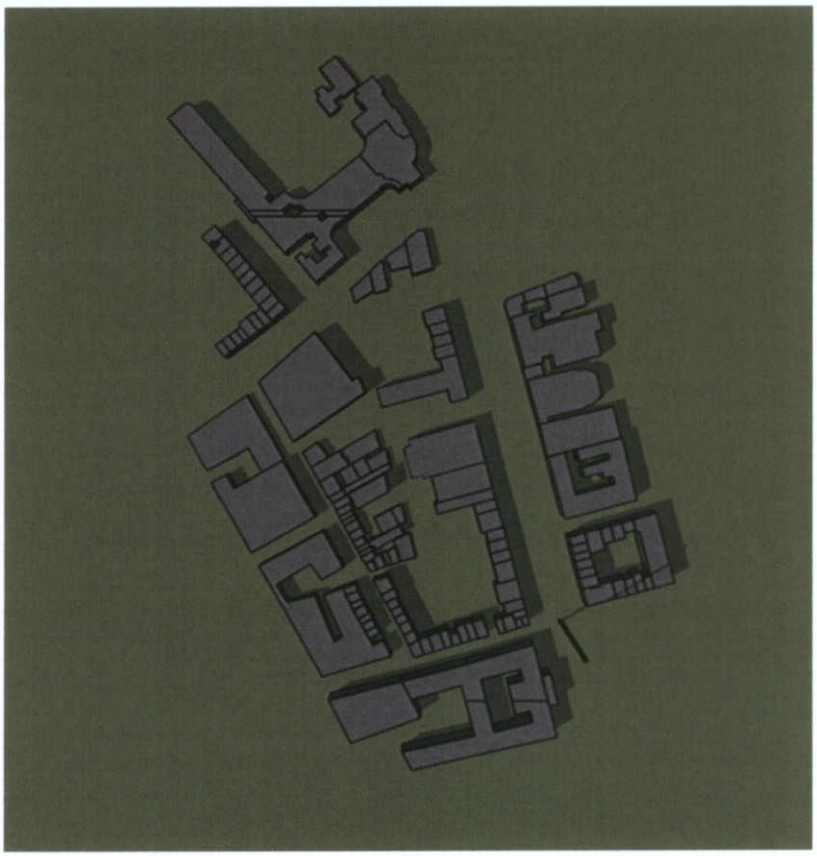


Existing Site

3pm – 21st June



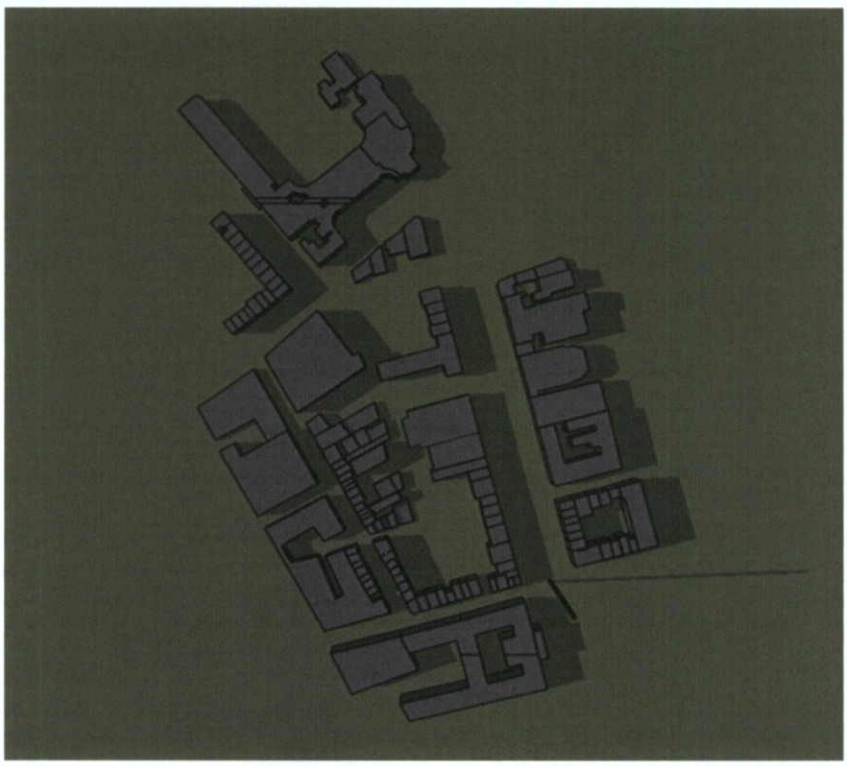
Proposed Site



Existing Site

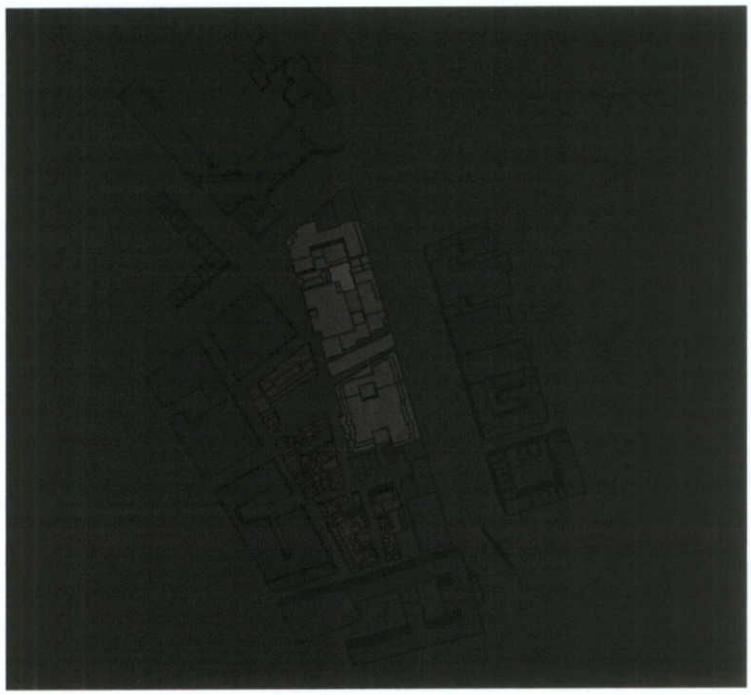
5pm – 21st June

Proposed Site

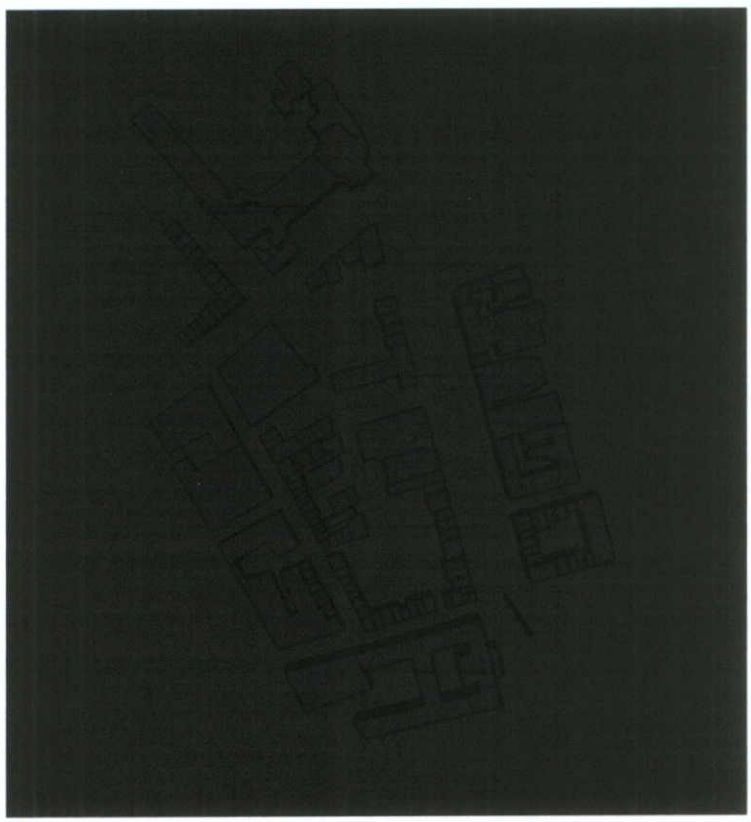


Existing Site

9am – 21st December



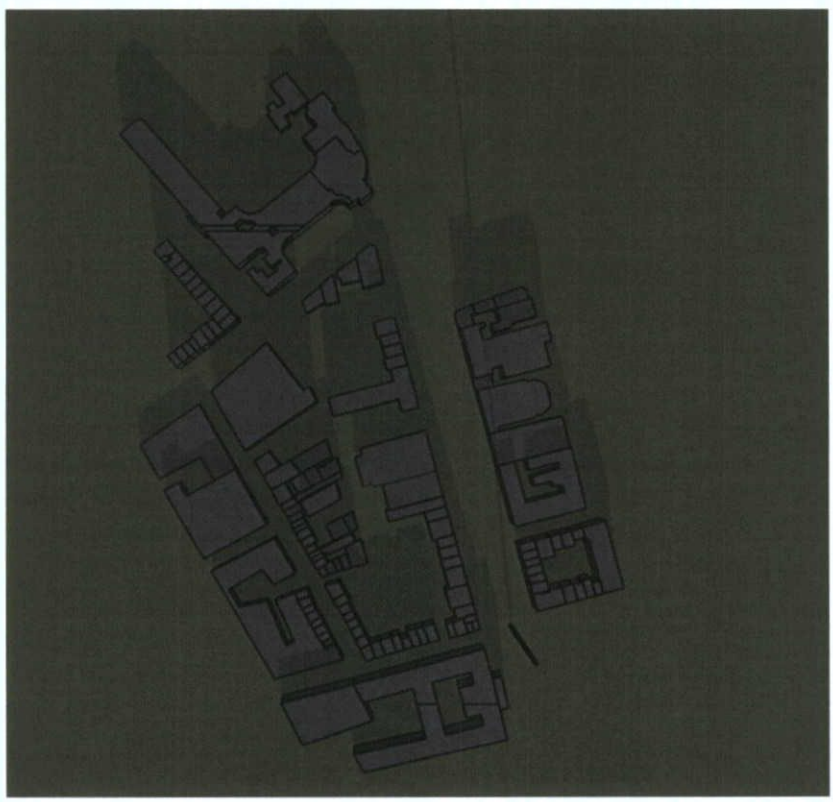
Proposed Site



Existing Site

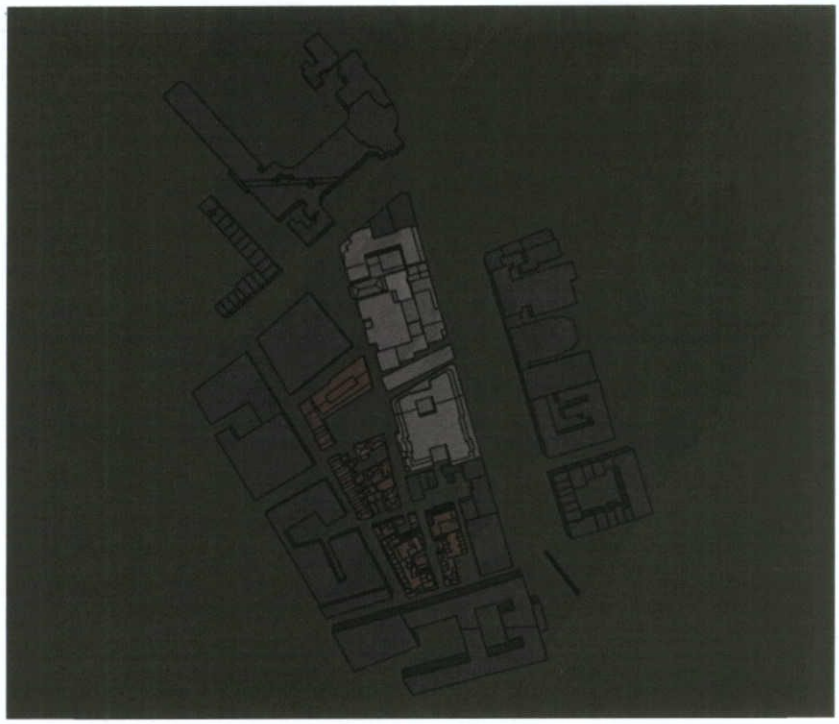
12pm – 21st December

Proposed Site

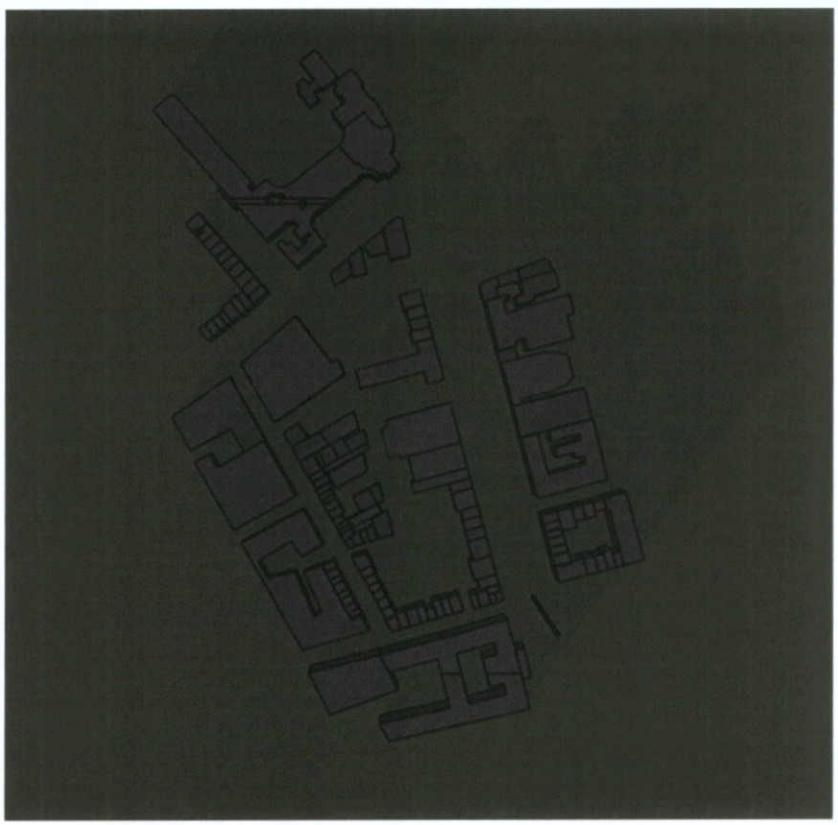


Existing Site

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 Site 2 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 Leo Williams (Senior 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.

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.

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 May 2022 (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, including the MetroLink Enabling Works (MEW) at the nearest noise and vibration sensitive receptors to the site, inclusive of the operational Luas Green Line for which TII sets vibration limits to avoid damage to the rail.
- 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 commercial buildings has also been assessed to determine the requirements for additional noise mitigation to ensure a suitable internal noise environment for the proposed uses.

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 Masterplan 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.

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 and rail lines 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.

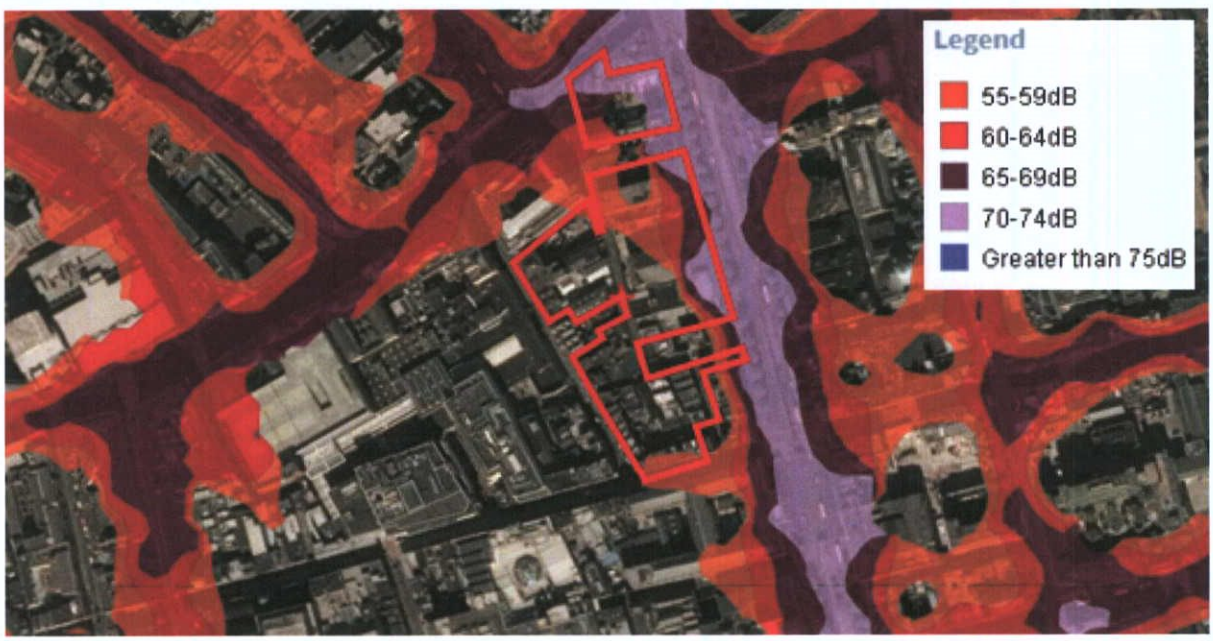


Figure 11:1: Road Traffic L_{den} Noise Contours (Source: epa.ie).

Reference to Figure 11:1 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 64 dB 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.

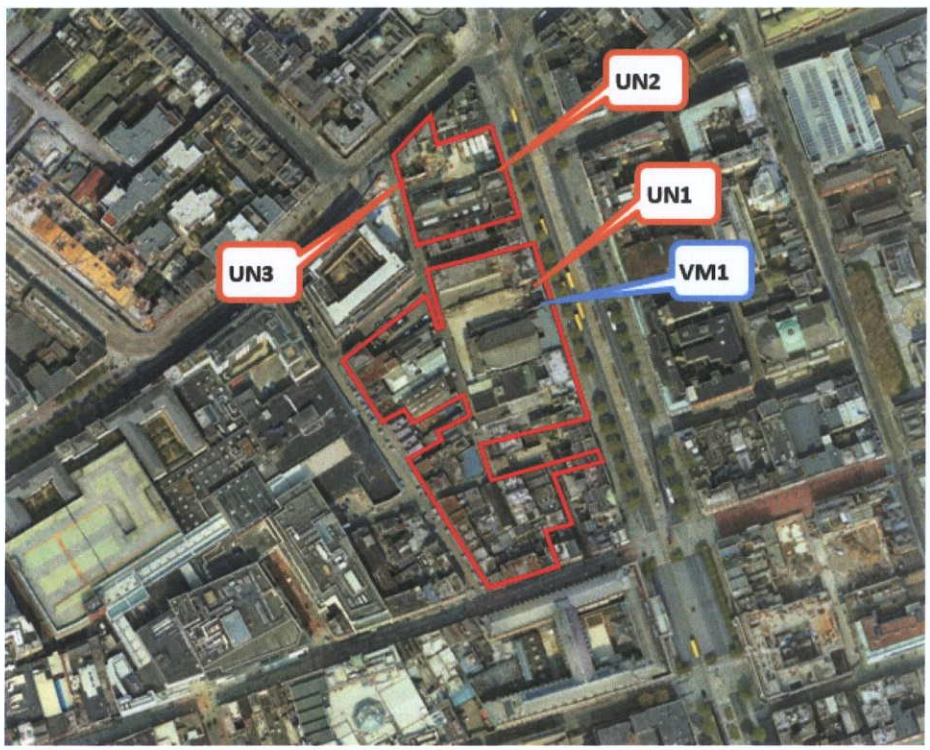


Figure 11:3: Noise and Vibration Monitoring Locations UN1 to UN3 (Source: Google Earth).

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					
UN3				586940	16 August 2018
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. $2x10^{-5}$ 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, 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
Average	*68*[1]	*62*[2]	*66*[3]	*61*[4]	*63*[3]	*54*[4]

Table 11.4: Summary of Measured Noise Levels at UN1 (dB re. 2x10-5 Pa)

1 Logarithmically averaged.
2 Arithmetically averaged.

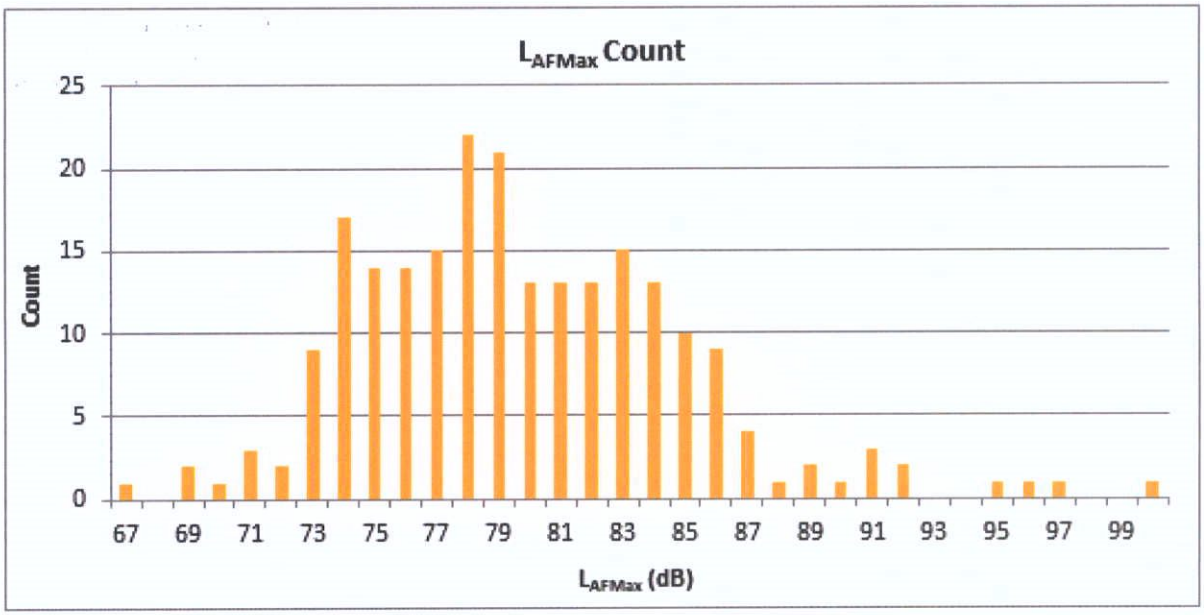


Figure 11:4: Number of L_{AFMax} events at each decibel level measured during the night period at location UN1.

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

Survey Position UN2

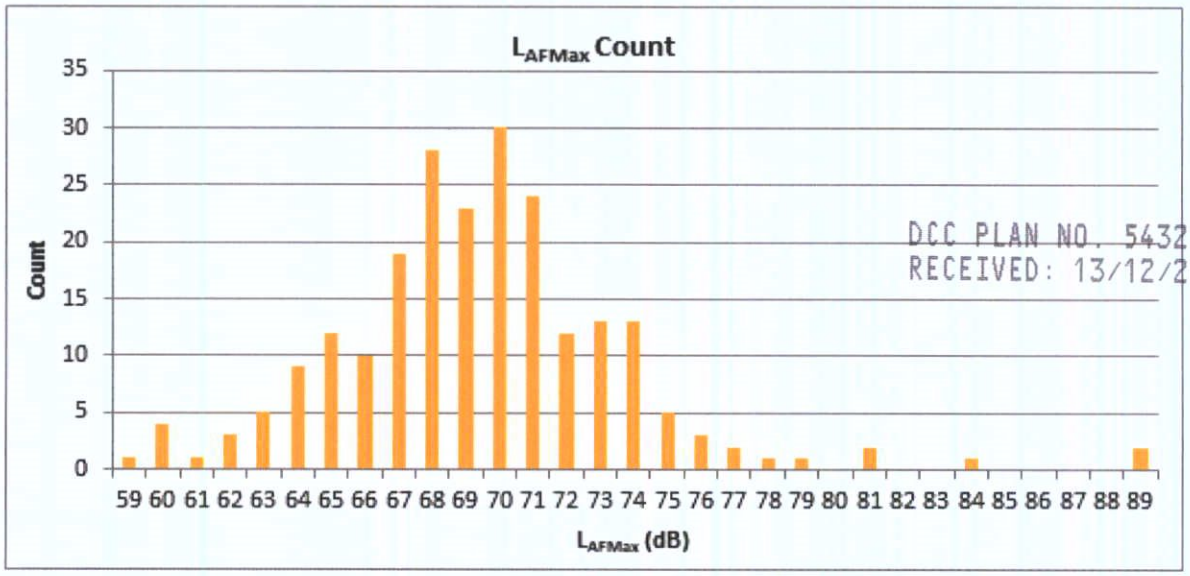
Table 11.5 summarises the measured day, evening and night-time noise levels for survey location UN2. Subjective observations during the setup and removal of the monitoring equipment noted that the primary contributors to noise build-up were road traffic along O'Connell Street, Parnell Street and the 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)	
	L_{Aeq}	L_{A90}	L_{Aeq}	L_{A90}	L_{Aeq}	L_{A90}
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.



DCC PLAN NO. 5432/22
RECEIVED: 13/12/2022

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. 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}
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. 2x10-5 Pa).

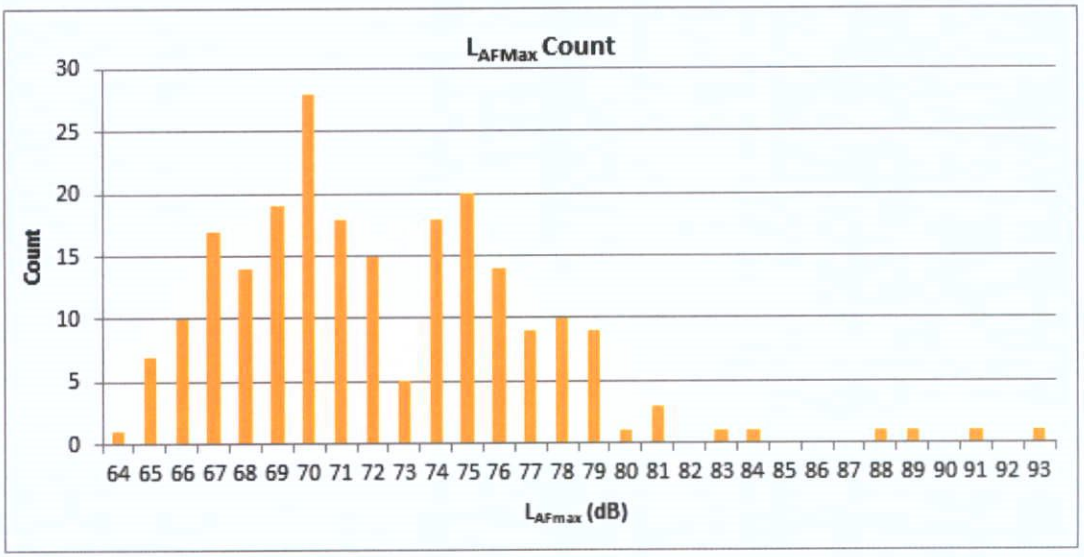


Figure 11:6: Number of L_{AFMax} events at each decibel level measured during the night period at location UN3.

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 bys are also included.

[5] Logarithmically averaged
[6] Arithmetically averaged

Axis	Daytime (07:00-23:00hrs)			Night-time (23:00 – 07:00hrs)			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)	
X	0.05 – 0.14	0.03	0.04	0.05 – 0.06	0.03	0.03	0.04 – 0.06
Y	0.07 – 0.2	0.03	0.04	0.05 – 0.13	0.03	0.03	0.05 – 0.1
Z	0.15 – 0.4	0.03	0.04	0.07 – 0.13	0.03	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.

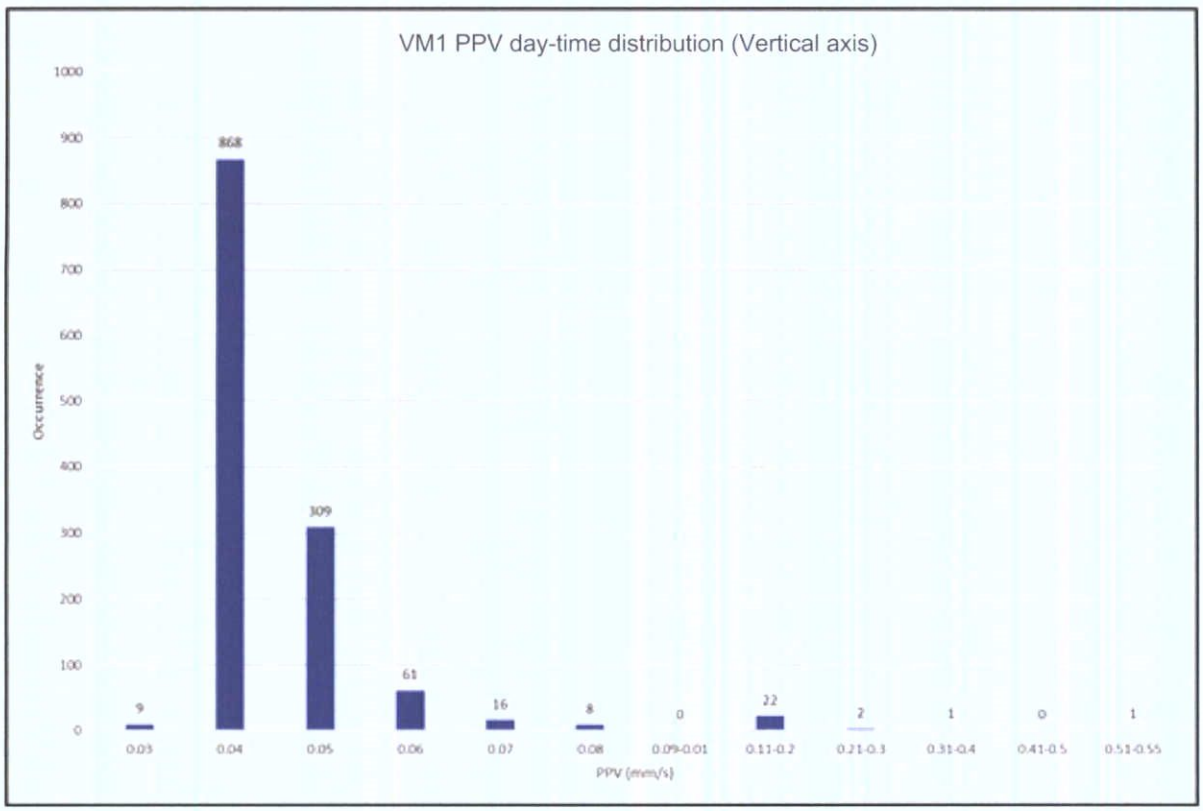


Figure 11:7: Daytime PPV Vertical Distribution at VM1

PPV values are in the range of 0.03 to 0.04 in the absence of passing trams. During a passing tram 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.

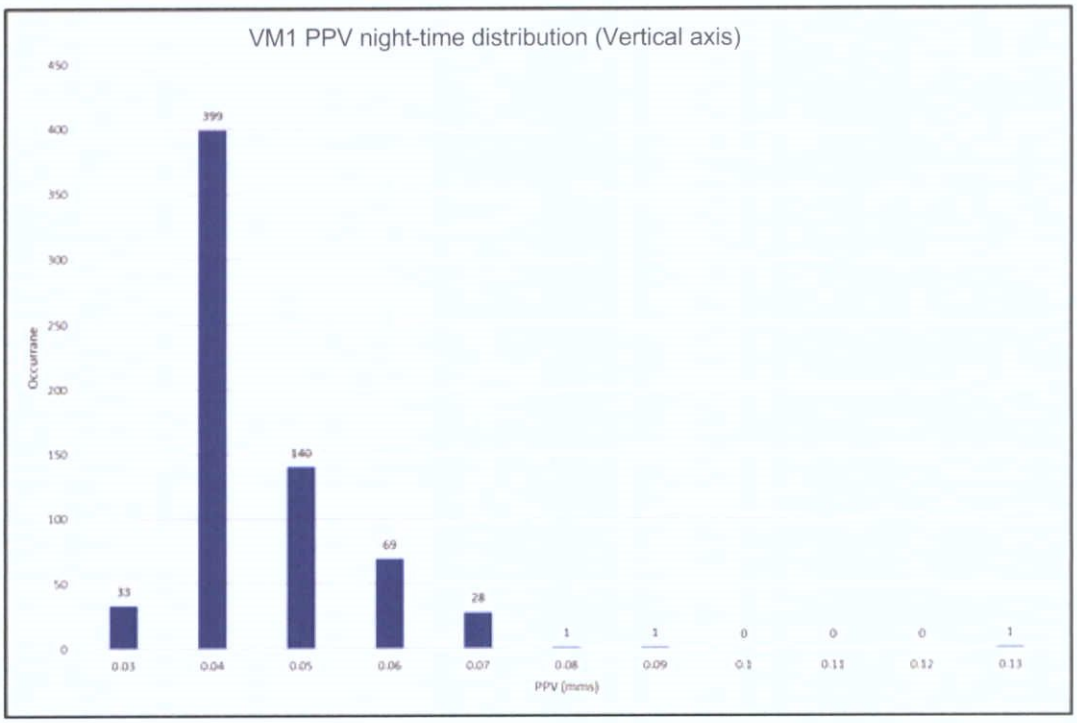


Figure 11:8: Night-time PPV Vertical Distribution at VM1

PPV values are in the range of 0.03 to 0.04mm/s in the absence of passing trams. During a passing tram event, measured PPV values are measured in the range of 0.05 to 0.07mm/s. The dominant frequency associated with a tram 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	ITM Co-ordinates	Description	Rationale
UN4	715741, 734924	Unattended noise monitor. Externally positioned 1m outside first storey window to north-eastern boundary of the proposed site, overlooking O'Connell Street.	The data collected at this location has been cross referenced with UN1 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.

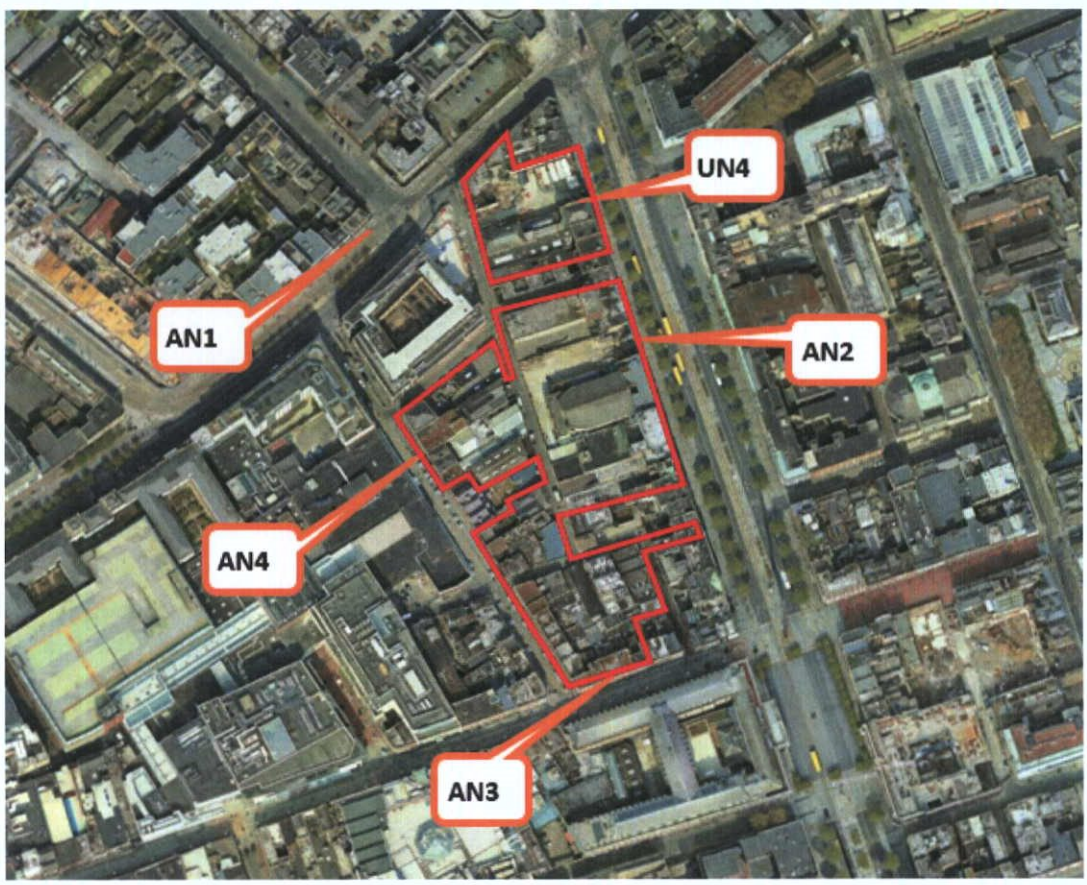


Figure 11:9: Noise Monitoring Locations UN4, AN1 to AN4 (Source : Google Earth).

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. $2x10^{-5}$ 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
Average	*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.

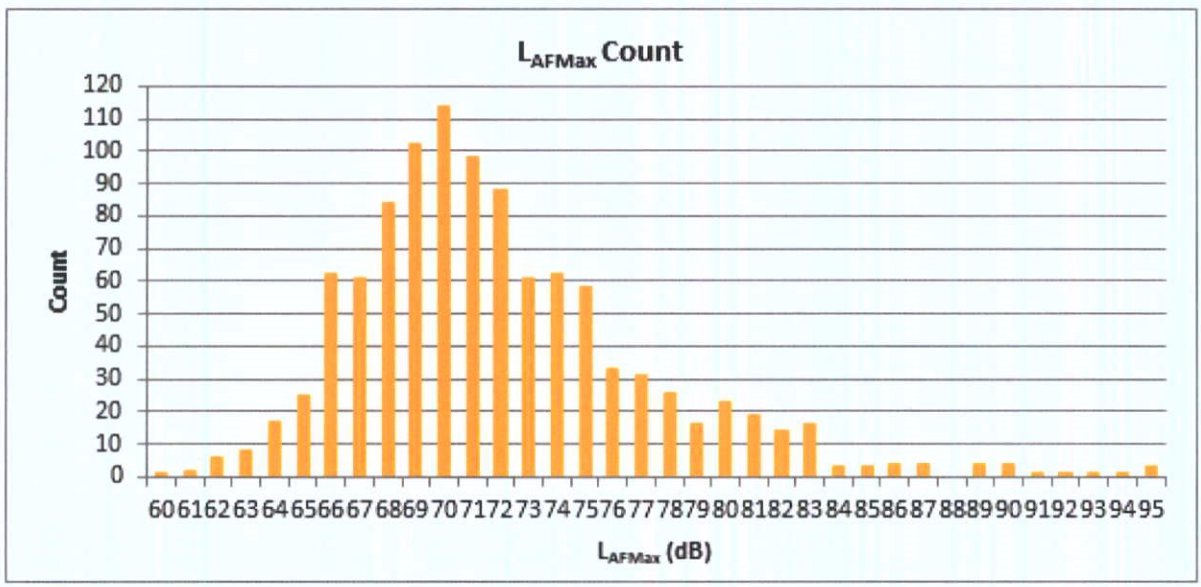


Figure 11:10: Number of L_{AFMax} events at each decibel level measured during the night period at location UN4.

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 accordingly[9] from the frequency content collated at UN4.

[7] Logarithmically averaged.
[8] Arithmetically averaged.
[9] The LAFMax 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.