| | | | | | | |
|---|---|---|---|---|---|---|
| **SW Runoff** | On/off site pollution, due to washing down areas | High | Short term | Moderate | Large | Construction |
| **SW Runoff** | On site flooding, due to poor temporary drainage | High | Short term | Slight | Slight | Construction |
| **Site Management** | Pollution issues due to site operations | High | Short term | Moderate | Moderate | Construction |
| **SW Discharges** | On/off site issues due to Uncontrolled spillages | High | Short term | Moderate | Moderate | Construction |
| **Flood Risk** | Site flooding | Low | Short term | Moderate | Slight (in Flood zone C) | Operational |
| **SW Drainage** | Site flooding, due to sewer blockage | High | Short term | Moderate | Moderate | Operational |
| **SW Drainage** | Off site flooding due to storm water release | High | Long term | Moderate | Moderate | Operational |
| **River Liffey/ Camac** | Surface water contamination | Very high | Short term | Moderate | Slight | Operational |
| **Groundwater** | Contamination & site flooding | Low | Long term | Imperceptible | Imperceptible | Operational |

## 8.6 Do Nothing Scenario

The "Do Nothing Impact" assesses the environmental impact of not redeveloping the proposed development site in respect of the existing impacts to water, hydrology and existing drainage and water supply systems at the proposed site.

Under the "Do Nothing Scenario" there would be no change in the current site arrangement and therefore the hydrology environment and drainage system would remain as is. This scenario would have a moderate impact on the hydrological environment. This is due to the fact that at present, surface water generated on site does not pass through any water quality treatment stage before discharging into the public sewer.

## 8.7 Mitigation Measures

**Table 8.7.1 Table of Mitigation Measures**

| Character of potential impact | Mitigation measure |
|---|---|
| **Construction Phase** | |
| Environmental Management | Prior to construction the Contractor will be required to develop an Environmental Management Plan which will incorporate mitigation measures such as containment procedures, audit and review schedules and an Emergency Response Plan in the event of spills, flooding or other incidents that may contribute to pollution to water during construction. |
| Surface Water Run off | All batching and mixing activities will be located in areas away from watercourses and drains. |
| Surface Water Run off | Protection measures will be put in place to ensure that all potentially hazardous materials used during the construction & demolition phase are appropriately handled, stored and disposed of in accordance with recognized standards and manufacturer's guidance. These measures will include:<br>- Refuelling of machinery at a designated bunded refuelling area.<br>- Treatment and disposal of wastewater from general clean-up of tools and equipment.<br>- The provision of spills control and cleanup kits.<br>- Silt trapping and oil interception. |
| Surface Water Run off | The batching and mixing plant will be isolated from the surrounding surface water drainage, and washout from the plant will be collected in a designated, contained impermeable area from which it shall be removed offsite for treatment. |
| Surface Water Run off | Spills of concrete, cement, grout or similar materials will not be hosed into drains. |
| Surface Water Run off | Rainwater that accumulates on site will be discharged to the DCC sewer system, under an appropriate discharge licence. |
| Site Management | The Contractor will comply with the following guidance documents:<br>- CIRIA – Guideline Document C532 Control of Water Pollution from Construction Sites (CIRIA, 2001)<br>- CIRIA – Guideline Document C624 Development and Flood Risk - guidance for the construction industry (CIRIA, 2004). |
| Surface Water Discharges | Dewatering and surface water discharges on the site, during construction and prior to completion will be controlled. The lead construction contractor will ensure that all necessary facilities are incorporated, such as settlement ponds/tanks, oil/grit interceptors with shut down valves, bunded oil storage tanks adjacent to a petrol interceptor for storage of any recovered oil. A monitoring programme including sampling for water quality before discharge to the Council sewer during construction will be carried out to ensure that only clean surface water is discharged to the receiving systems. |

| Operational Phase | |
|---|---|
| Surface Water run off (site flooding) | The provision of flow control with storm-water attenuation will ensure the rate of discharge of surface water is limited to greenfield run-off rates of 2 litres/second/hectare with a total allowable surface water discharge of 5.0 litres/second in line with the recommendations of the Greater Dublin Regional Code of Practice for Drainage Works and the Greater Dublin Strategic Drainage Study. |
| Surface Water run off (unattenuated flow) | The provision of flow control with storm-water attenuation will ensure the rate of discharge of surface water is limited to greenfield run-off rates of 5.05 litres/second/hectare with a total allowable surface water discharge of 2.27 litres/second in line with the recommendations of the Greater Dublin Regional Code of Practice for Drainage Works and the Greater Dublin Strategic Drainage Study. |
| Surface Water (River Liffey & Camac) | Incidental surface run-off from underground basement car parks, compactor units and waste / service yard areas will be discharged into the foul drainage system. |

## 8.8 Residual Impacts

### 8.8.1 Construction Phase

#### *8.8.1.2 Surface Water*

The implementation of the mitigation measures outlined in Section 8.6 will prevent the potential for impact on the Liffey and Camac rivers and other surface water features during the construction phase of the project. The risk of impact to the River Liffey during the construction phase to considered to be low and temporary in nature. The overall residual risk to water features is negative in character, slight in magnitude, and short-term in duration.

#### *8.8.1.3 Ground Water*

As noted, as the basement for the proposed scheme has already been constructed and there are no plans to alter same, the residual risk is considered to be negative in character, imperceptible in magnitude, and short-term in duration.

#### *8.8.1.5 Flood Risk*

The implementation of all mitigation measures will prevent significant impacts on flooding risk. Residual risks are considered to be negative in character, slight in magnitude, and short-term in duration.

### 8.8.2 Operational Phase

#### *8.8.2.2 Surface Water*

The implementation of the proposed surface water infrastructure, as designed, and all mitigation measures will ensure a reduced quantity of surface water discharging to the existing surface water drainage system,

therefore reducing the impact on the receiving system.

In addition, it is likely that the long-term impact of the proposed development will be positive for the River Liffey, due to the removal of impacted made ground which is a source of contamination.

Overall, the operational phase of the development will have a long-term slight negative impact on surface water quality.

#### *8.8.2.3 Ground Water*

As noted, as the basement for the proposed scheme has already been constructed and there are no plans to alter same, the residual risks are considered to be negative in character, imperceptible in magnitude, and long-term in duration.

#### *8.8.2.5 Flood Risk*

The implementation of all mitigation measures will prevent significant impacts on flooding risk. Residual risk is considered to be negative in character, slight in magnitude, and long-term in duration.

### 8.9 Interactions Arising

An assessment of potential interactions between this chapter and the other chapters of this EIAR was carried out, and the potential for interactions with Land & Soils, and biodiversity was identified.

As the basement is already constructed the traditional interaction with the Land & Soils chapter is less significant. The potential for groundwater flooding or for groundwater to be an issue when the basement is being constructed is not relevant in this situation. In addition, as the proposed development will not require deep excavations or new deep sewers to be constructed, the interaction with the Land & Soils chapter did not highlight any significant potential risks. This interaction is considered to be insignificant.

In respect of potential interactions with Biodiversity, the proposed development will cause storm water to be discharged at a reduced rate and will direct storm waters into a dedicated stormwater system post sustainable urban drainage measures. Therefore, the overall storm water quality from the current site will improve once the proposed development in operation, which will have a positive impact on the receiving system. Therefore, the interaction between water and biodiversity is considered to be minor in nature but positive in character.

### 8.9.1 Human Health

During the construction phase the proposed development, including proposed water infrastructure, will have implications for the current residents in the vicinity, as is typical for any development adjacent to a residential scheme. Should planning permission be granted the construction of the proposed development will be required to adhere to the planning conditions set upon it by Dublin City Council regarding noise levels, working hours and disturbance. These conditions are enforced by Dublin City Council to ensure that the potential for disturbance to the existing population is reduced to a minimum while the development is completed.

In its operational phase, the development will not result in any significant effect on human health. As described in Chapter 12 of this EIAR, Irish Water has confirmed the capacity of its surrounding infrastructure to accommodate the proposed development; the development shall therefore not result in any detrimental effects on local potable water supply or on the operation of the surrounding foul drainage network. As previously described in this chapter, the development has the potential to only slightly increase the risk of flooding at the subject site.

## 8.10 Potential Cumulative Impacts

The subject site forms the northern part of the applicant's landholding in the existing Heuston South Quarter (HSQ) complex. In the southern part of this landholding,

A full list of existing and permitted developments located in the environs of the proposed development is provided in Appendix 1A with this report. However, only the adjoining SHD (ABP SHD Ref. TA29S.311591) is of relevance with respect to impacts on water. On the 31 March 2022, ABP decided to grant planning permission for 359 no. residential units on the site outlined in blue in Figure 8.10.1.

**Figure 8.10.1 Associated Development Site**


### 8.10.1 Construction Phase

As is the case for the subject development, the adjacent SHD would be constructed within an area that has already been excavated and is enclosed by an existing secant pile wall. Its potential impacts on surface water, ground water, and flood risk during the construction phase are therefore analogous to those of the

subject development.

Were this adjacent SHD to be constructed concurrently with the subject development, the two developments would have the following cumulative impacts during their construction phase:

- a short-term slight negative impact on surface water;
- a short-term imperceptible negative impact on ground water; and
- a short-term slight negative impact on flood risk.



### 8.10.2 Operational phase

The potential cumulative impacts may occur due to the reduction available storm water capacity in the local storm water drainage system. However, as noted the provision of an attenuated system which will reduce the storm water discharge rate from the development during extreme storm events will mitigate against the loss of hydraulic capacity within the overall system. Should other sites in the general environs of the subject lands be submitted for planning they will also have to comply with the general requirements of Dublin City Council with regard to storm water management. This would entail appropriate attenuation and storm water flow restrictions being installed limiting storm water discharges during extreme storm water events. The potential cumulative risks during the operational phase have been deemed to be negative in character, slight in magnitude, and long-term in duration.

Specifically, the subject development, in conjunction with the adjacent SHD, would have the following cumulative impacts during the operational phase:

- a long-term slight negative impact on surface water;
- a long-term imperceptible negative impact on ground water; and
- a long-term slight negative impact on flood risk.

## 8.11 Major Accidents & Disasters

In terms of major accidents and disasters, flooding is the only event associated with hydrology. The sites elevation and surrounding topography would prevent the subject lands from being affected by tidal or pluvial flooding in all but exceptional events. The location of the culverted River Camac to the east of the site and as noted the topography around the subject lands would indicate that should the Camac flood, the flood waters would not be directed towards the site. The site's elevation of 7.40mAOD is higher than the 1-in-1000-year flood level for the River Liffey, predicted by the Office of Public Works to be at 3.487mAOD. The 1-in-1000-year flood level for the River Camac is predicted to be at 6.09mAOD. A full analysis of potential flooding affecting the subject lands has been undertaken as part of the Site-Specific Flood Risk Assessment report. This analysed the site with reference to various potential flooding mechanisms. Potential flooding sources such as tidal, pluvial, fluvial, ground water and infrastructure sources were reviewed. In the unlikely event that there is an internal system failure or fault with the onsite storm water attenuation system and the storm water cannot drain not the public network, emergency storage can be provided in the basement area until the storm water can be disposed of offsite. This would take the form of allowing a section of the basement to retain the storm water while the maintenance issue was resolved. In this way, the risk of major accidents or disasters at the site as a result of flooding are removed.

## 8.12 Monitoring

### 8.12.1 Construction Phase

All on site monitor works connected to the proposed project will be under the prepared (and approved by Dublin City Council) construction plans. These plans will clearly outline the safety measures required to ensure that the proposed development is constructed in accordance with current best practice & legislative requirements.

### 8.12.2 Operational Phase

When the proposed development is complete, elements of the scheme will be under the maintenance control of different entities.

- Public roads and limited landscaping elements of the proposed development will be taken in charge by Dublin City Council.
- All remaining elements will be under the control of one or more private management companies.

The various bodies noted above will take responsibility for the maintenance and operation of the facilities when complete.

The completed stormwater system will remain under the control of the development's management companies and will not be offered to be taken in charge by the Local Authority. Operational and maintenance requirements will be addressed by the companies' maintenance contractor(s). Issues that may interfere with the stormwater network include blockages and the lack of appropriate jetting and cleaning of gullies, drains and main sewers. The proposed stormwater system will be monitored and maintained by the development's management companies post construction.

## 8.13 References

In addition to the sources noted above, the documents listed below were also consulted.

- Dublin City Development Plan 2016–2022;
- Dublin City Strategic Flood Risk Assessment, 2016 – 2022;
- Regional Code of Practice For development works, Version 6;
- Irish Waters Code of Practice for Water Infrastructure;
- Irish Waters Code of Practice for Wastewater Infrastructure;
- Greater Dublin Strategic Drainage Study;
- Office of Public Works Flood Maps;
- Department of the Environment Flooding Guidelines;

- Geological Survey of Ireland Maps;
- Local Authority/Irish Water Drainage Records.

# 9. AIR, DUST AND CLIMATIC FACTORS

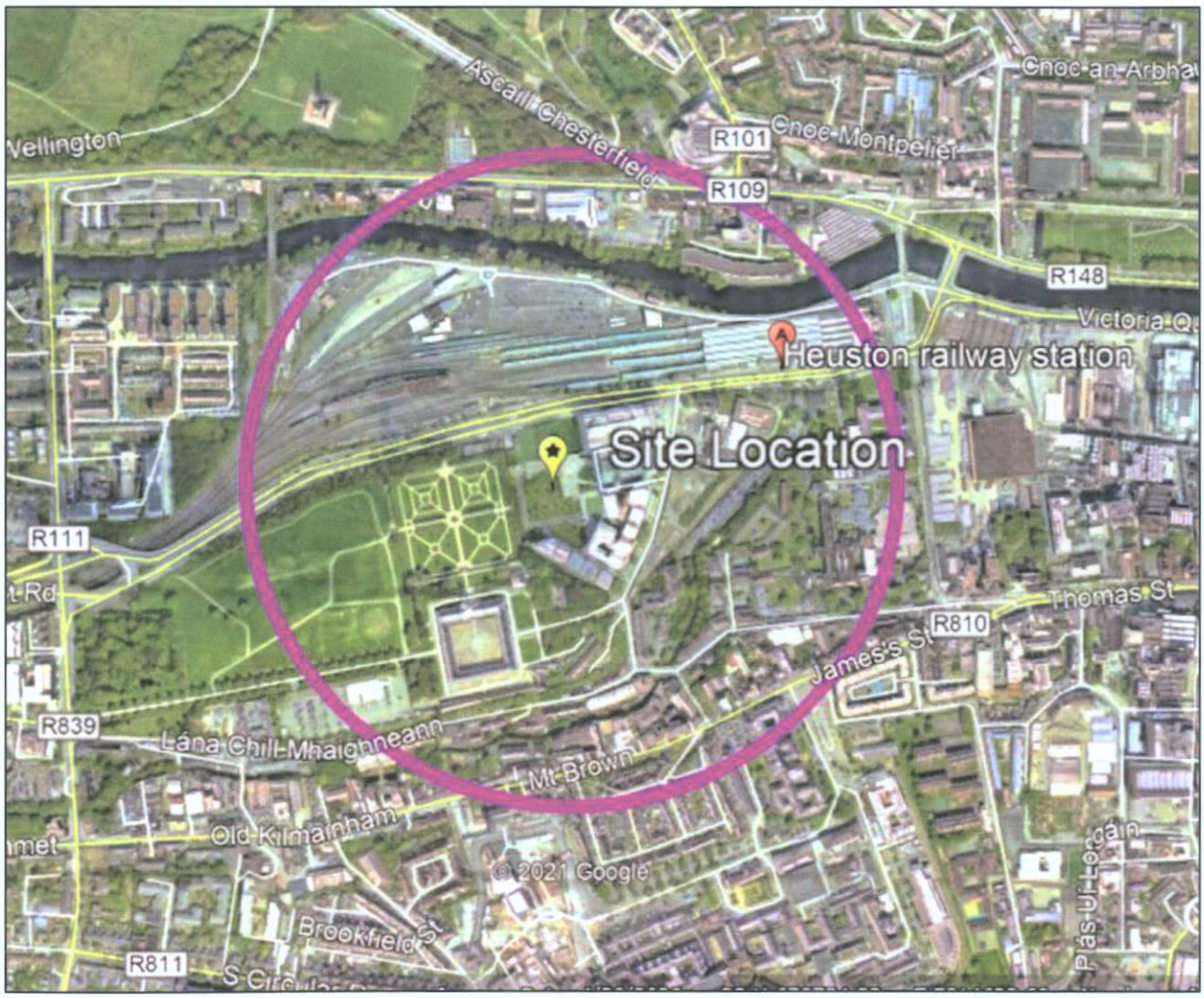
## 9.1 Introduction

This Chapter of the Environmental Impact Assessment Report was prepared by Imelda Shanahan TMS Environment Ltd who has over 30 years professional experience in preparing assessments of this type for various different types of development. Imelda has a BSc (Hons) in Chemistry from University College Dublin and a PhD in Physical Chemistry, she is a Chartered Chemist and a Fellow of the Institute of Chemistry of Ireland and a Fellow of the Royal Society of Chemistry.

The Energy Analysis and Microclimate assessments were prepared by IN2 Engineering. The IN2 reports are attached at Appendix 9A and 9B and relevant sections are summarised in this section of the EIAR.

This Chapter of the EIAR considers the potential air quality and climate impacts associated with the proposed development. Impacts of site operations are considered by taking account of the existing baseline, the projected impacts and compliance with relevant standards. The extent of the Study Area is shown in Figure 9.1.1 with a radius of detailed assessment up to 350m from the site boundaries.

**Figure 9.1.1 Study Area**



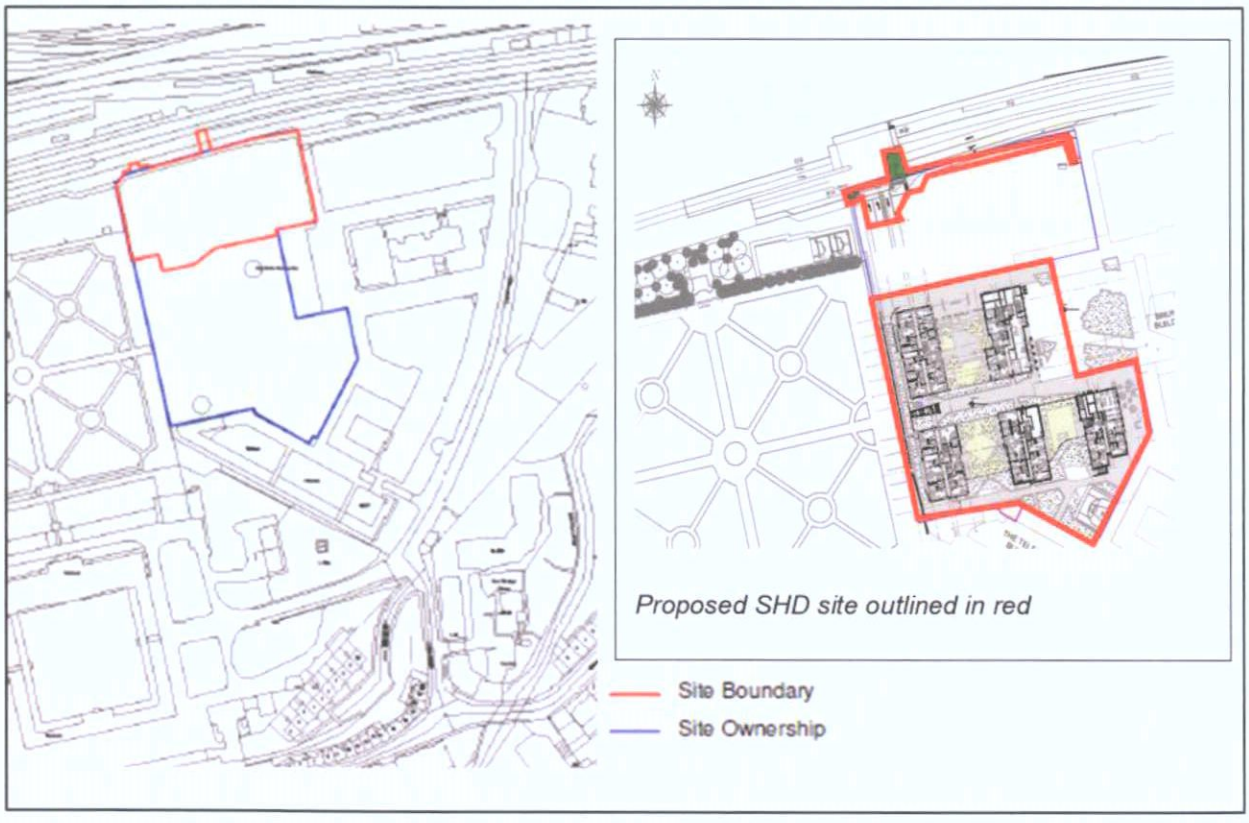
## 9.2 Characteristics of the Proposed Development

The proposed development will consist of a mixed use commercial development comprising of a hotel (238 no. bedrooms) and an office block providing a cumulative Gross Floor Area (GFA) of 32,602, inclusive of basement area.

The application site forms part of a larger development site known as Heuston South Quarter (HSQ). The site location and context are shown in Figure 9.2.1. The HSQ site is bounded principally by St. John's Road West (to the north) and Military Road (to the east) and by the formal gardens of the Royal Hospital Kilmainham (RHK) to the west and south. The site is bound to the south by the adjoining SHD - ABP Ref. TA29S.311591. The HSQ lands are in close proximity to Heuston Rail Station and the LUAS Red Line service and enjoy excellent connectivity to the City Centre.

The St. John's Road West frontage is characterised as an urban road and together with the approach to Heuston station on the opposite side of the road, this transportation corridor is the main road and rail artery to the west of the country.

**Figure 9.2.1 Site location and context**




## 9.3 Site specific Conditions for Impact identification

### 9.3.1 Existing Activities

The subject site is currently a landscaped site adjoining a busy transport corridor. The only potential for emissions to air from the site itself is associated with the occasional use of landscaping machinery on the site. Existing activities in the immediate vicinity of the site of the proposed development have the potential to exert an influence on air quality by release of emissions associated with the following:

- emissions of particulate matter ($PM_{10}$ and $PM_{2.5}$), Sulfur dioxide ($SO_2$), nitrogen oxides ($NO_x$) and carbon monoxide CO from heating sources in the area from existing residential and commercial activities;

- emissions of particulate matter ($PM_{10}$ and $PM_{2.5}$), $SO_2$, $NO_x$, CO from road and rail traffic in the area.

The magnitude of the emissions from the existing site itself is very small relative to the dominant influence on air quality in the surrounding area which is traffic from the adjoining road and rail network and heating sources in the area.

### 9.3.2 Impact Identification of Proposed Activities

#### *9.3.2.1 Construction Impacts*

The proposed development for which planning permission is sought in this application comprises a mixed use commercial development comprising of a hotel (238 no. bedrooms) and an office block and associated and ancillary infrastructure and open space provision.

The subject site forms the northern part of the applicant's landholding in the existing HSQ complex. In the southern part of this landholding, permission has been granted for a Strategic Housing Development (SHD) comprising residential apartment units. This associated planned development has been permitted and its construction shall proceed concurrently with that of the subject proposed development, which has a construction phase period of 36 to 48 months. The construction phase for the commercial and SHD developments is expected to be completed within 48 months.

The potential air quality and climate impacts on the surrounding environment that requires consideration for a proposed development of this type includes two distinct stages, the short-term construction phase and the long-term operational phase.

The potential air quality impacts during Construction of the proposed commercial development are summarised as follows:

***a) Dust emissions associated with excavations and demolition works***

There are some demolition works proposed for the proposed development over a 3 – 4 month programme of works. This excavation will extend to a maximum depth of approximately 1.4m below the existing ground level, across a maximum area of approximately 2,400$m^2$. It is therefore estimated that approx. 3,400$m^3$ of spoil will be generated. Given an assumed average density of 1,800kg/$m^3$ (corresponding to a clay soil with some rocks), this equates to a mass of 6,120 tonnes.

It will not be necessary to construct any further perimeter piled walls due to the works carried out in 2004/2005 and in 2013/2014. It is likely that a combination of Continuous Flight Auger (CFA) piling and traditional strips will be required for the substructure of the proposed buildings. The excavation and preparation of the foundation works will generate spoil that must be disposed of at an appropriate licensed land fill site.

The most significant of the potential air quality impacts associated with the construction site is dust. Dust

can be generated as a result of disturbance of materials, as a result of wind blowing across exposed surfaces and as a result of construction vehicle movements across exposed surfaces.

There are three potential impacts on air quality of the dust / particulate matter emissions. Dust deposition on surfaces is the main potential impact associated with the larger particles, nuisance effects such as reduced visibility could be associated with excessively high levels of suspended particulate matter, and respiratory effects could occur as a result of excessive levels of fine particles such as $PM_{10}$ and $PM_{2.5}$.

Dust emissions associated with the Construction Phase of the proposed development are expected to be predominantly in the 10 – 75µm particle size range so these particles, because of their size, will generally be deposited within 100m of the emission source. Only under exceptional meteorological conditions would the dusts be carried further downwind.

Suspended particulate matter (SPM) may also be released and this matter may remain suspended in the air. The main effect would be on visibility but this type of material could also be a respiratory nuisance if present at excessive levels. Emissions of dust in the form of fine particulate matter, $PM_{10}$ and $PM_{2.5}$, may also occur, primarily as a result of materials handling and storage since the dominant particle size of the main construction materials is in the lower size ranges. There may also be some emissions of particles in these size ranges from the general site activities.

***b) Construction transport emissions***

Emissions of dust raised by vehicle movement on the roads near the site and also on site are considered under the general construction phase emissions in section (a) above. Emissions from the construction vehicles as a result of fuel combustion are considered here. The emissions include $PM_{10}$ and $PM_{2.5}$, $NO_2$ and $NO_x$ and CO and benzene.

***c) Aspergillus emissions from excavation and earthmoving activity***

There is concern about a fungal disease, "invasive Aspergillosis" which may be contracted as result of disturbance of materials that release fungal spores into the atmosphere. Fungal spores (the Aspergillus moulds) are found everywhere but are of particular concern when large scale demolition, excavation and earth-moving activity takes place.

#### *9.3.2.2 Operational Impacts*

The most significant potential impacts remain the same as those associated with existing activities at and in the vicinity of the site - emissions of particulate matter and combustion gases such as CO, $SO_2$ $PM_{10}$ and $NO_2$ from traffic. The net proposed heating and air conditioning strategy ensures there will be no on-site combustion of fuels and therefore no on-site sources of emissions as discussed in section 9.6.3.

#### *9.3.2.3 Traffic Impacts*

The assessment of traffic and transport impacts in Chapter 11 shows that the proposed development shall not generate excessive vehicular traffic flows in its operational phase with a maximum projected trip generation rate of just 57 trips in the morning peak hour. The actual traffic volume numbers are not significant in terms of potential air quality impact and such a change in traffic volume will not result in a quantifiable change in emissions and therefore traffic emissions will remain similar to the current situation.

The principal substances that are associated with transport activity are particulate matter, nitrogen oxides and carbon monoxide. Dust emissions associated with construction traffic are also possible. Potential emissions from traffic are considered in further detail in section 9.6.3.

#### *9.3.2.4 Microclimate Impacts*

Adverse wind effects can reduce the quality and usability of outdoor areas, and could lead to safety concerns in extreme cases. It is therefore important that wind micro-climate assessments are carried out where required in order to ensure that the relevant factors have been considered in the general design and layout of the development. Accordingly, a wind microclimate analysis study was undertaken by IN2 Engineering to evaluate the risk of elevated wind speeds / microclimate impacts arising as a result of the proposed development. Appropriate wind conditions for the area were selected and a Computational Fluid Dynamics (CFD) Modelling study was completed to evaluate the impacts. The IN2 microclimate assessment report is included at Appendix 9B.

## 9.4 Receiving Environment

### 9.4.1 Meteorological conditions

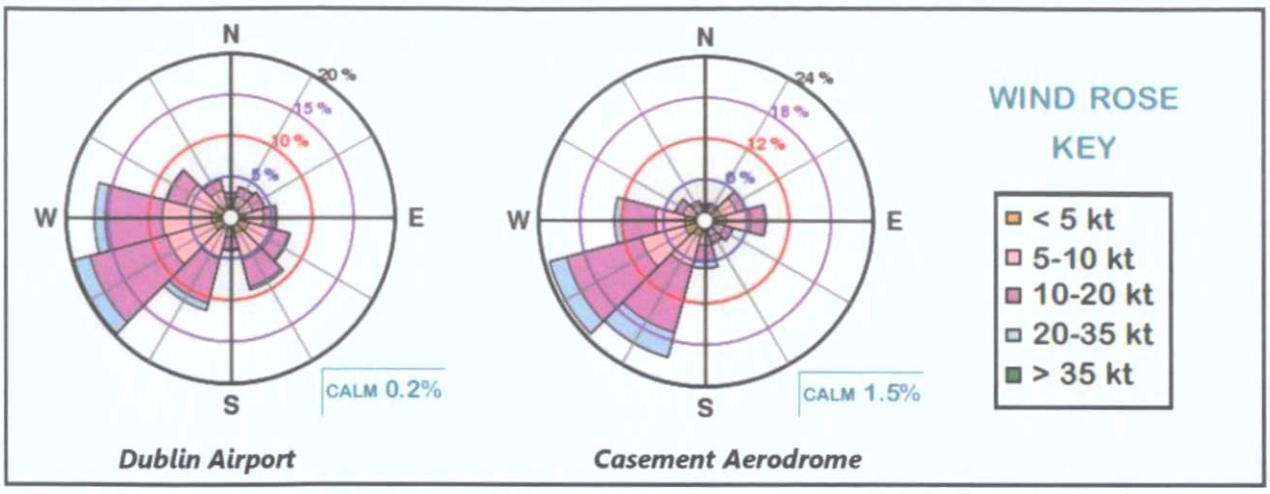
The magnitude of potential impacts of the proposed development on air and climate will largely be influenced by the local meteorological conditions, in particular by wind speed and direction and by precipitation rates. An evaluation of the climatic conditions at the site is therefore useful for an assessment of the type required for this study.

Met Éireann operate a Synoptic Network of weather stations at Belmullet, Malin Head, Johnstown Castle, Birr, Clones, Kilkenny and Mullingar while the Aviation Division of Met Éireann maintains observing stations at Shannon Airport, Knock Airport, Casement Aerodrome, Dublin Airport and Cork Airport. There is no continuous meteorological monitoring on the subject site but the general guidance on selection of meteorological data for air quality impact assessments is to choose representative data, recently acquired, which best represents conditions at the site. At least three years of recently acquired data is preferred.

Comprehensive monitoring data is available for Dublin Airport (approximately 9km northeast of the site) and for Casement Aerodrome (approximately 10km southwest of the subject site) which would be indicative of the meteorological conditions that are experienced at the site. Data from either station would likely be a reliable indicator of conditions at the site. Wind speed and direction in particular is important in determining how emissions associated with the activity are dispersed. The prevailing wind direction determines which areas are most significantly affected by the emissions from the activity and wind speed determines in part the effectiveness of the dispersion of the emissions.

The long term average windroses for Dublin Airport and for Casement Aerodrome are presented in Figure 9.4.1 sourced from Met Eireann. The windroses show a very similar pattern in the distribution and frequency of wind direction and wind speeds. The dominant wind direction is from the southwest quadrant. The wind speed is below 5m/s for approximately 50% of the time and the average long-term wind speed over the period is less than 5.5 m/s for the two stations.

**Figure 9.4.1 Long-term (1981 – 2010) for Dublin Airport and Casement Aerodrome**




### 9.4.2 Influences on Ambient Air Quality

The existing activities at and in the vicinity of the site have the potential to exert an influence on ambient air quality by release of emissions to atmosphere as follows:

- emissions of fine particulate matter ($PM_{10}$ and $PM_{2.5}$), sulfur dioxide ($SO_2$), nitrogen oxides ($NO_x$), carbon monoxide (CO) from domestic, commercial and industrial heating;
- emissions of particulate matter ($PM_{10}$ and $PM_{2.5}$), $SO_2$, $NO_x$, CO and benzene from traffic on adjoining roads and the rail line;

Overall, the contribution of traffic travelling on the surrounding road network, rail transport activity and heating sources in the area are considered to be the dominating influence on air quality in the immediate vicinity of the site, as detailed in section 9.4.3 below.

The main substances of interest in terms of existing air quality are sulfur dioxide, nitrogen oxides, particulate dusts including $PM_{10}$ and $PM_{2.5}$ which could originate from combustion sources and traffic. There are no new substances expected to be present in emissions released from the proposed development. A description of existing levels of the various substances in ambient air is required to allow completion of the evaluation of air quality impacts associated with the development and is presented in the following section.

### 9.4.3 Existing Ambient Air Quality

#### *9.4.3.1 Influences on Existing Air Quality*

The site is located in an urban area adjoining a major transport corridor. The dominant influences on air quality in the area are emissions from road traffic and to a much lesser extent from rail transport. Emissions from heating sources are expected to be minor contributors to ambient air quality in the vicinity of the site relative to those from transport.

The main substances which are of interest in terms of existing air quality are sulfur dioxide, nitrogen oxides (nitric oxide, NO and nitrogen dioxide $NO_2$, collectively referred to as $NO_x$), fine particulate matter

including $PM_{10}$ and $PM_{2.5}$ which could originate from combustion sources, traffic and the existing commercial activities in the area. Carbon monoxide is also potentially of interest, and benzene may also be of interest from traffic sources. There are no significant new substances expected to be present in emissions released from the proposed development relative to the existing situation.

Particulate matter is made up of tiny particles in the atmosphere that can be solid or liquid and is produced by a wide variety of natural and manmade sources. Particulate matter includes dust, dirt, soot, smoke and tiny particles of pollutants. Particulate matter of 10 micrometers in aerodynamic diameter or less are also referred to as $PM_{10}$ or more strictly, particles which pass through a size selective inlet with a 50% efficiency cut-off at 10 um aerodynamic diameter. Similarly, $PM_{2.5}$ refers to particulate matter of 2.5 micrometers or less in aerodynamic diameter. In the past domestic coal burning was a major source of particulate matter in Irish cities during winter months. Levels of particles have decreased significantly following the introduction of abatement strategies including Special Control Areas and other Regulations regarding the use, marketing, sale and distribution of certain fuels. The significance of particulate matter is predominantly related to human health and respiratory effects.

Nitrogen oxides ($NO_x$, which is the sum of NO and $NO_2$), are generated primarily by combustion processes. The main anthropogenic sources are mobile combustion sources (road, air and traffic) and stationary combustion sources (including industrial combustion). The main source of nitrogen oxides in the vicinity of the site is traffic. The significance is health-related for nitrogen dioxide ($NO_2$) and ecological for nitrogen oxides ($NO_x$).

Sulfur dioxide also originates from combustion but predominantly from heating sources and not traffic. The trend in ambient $SO_2$ concentrations in Ireland is very clearly downward and this pollutant is not a matter for concern in Ireland. This reduction can be attributed to fuel switching from high-sulfur fuels, such as coal and oil, to natural gas and to decreases in the sulfur content of oil.

Carbon Monoxide (CO) is a colourless and odourless gas, formed when carbon in fuel is not burned completely. It is a component of motor-vehicle exhaust, which accounts for most of the CO emissions nationwide. Consequently, CO concentrations are generally higher in areas with heavy traffic congestion.

#### *9.4.3.2 Existing Air Quality Data*

A description of existing levels of the various substances in ambient air is required to allow completion of the evaluation of air quality impacts associated with the development. The available data from the National Ambient Air Quality Network is a reliable data set for consideration in this study as shown below.

The Environmental Protection Agency (EPA) and local authorities maintain and operate a number of ambient air quality monitoring stations throughout Ireland in order to implement EU Directives and to assess the country's compliance with national air quality standards. Ireland's small population and generally good air quality means that a relatively small number of monitoring stations are sufficient across the country for the purposes of implementing the EU Air Directives. For ambient air quality management and monitoring in Ireland, four zones, A, B, C and D are defined in the Air Quality Standards (AQS) Regulations (S.I. No. 180 of 2011) and are defined as follows:

- Zone A: Dublin Conurbation.
- Zone B: Cork Conurbation.

- Zone C: 24 cities and large towns. Includes Galway, Limerick, Waterford, Clonmel, Kilkenny, Sligo, Drogheda, Wexford, Athlone, Ennis, Bray, Naas, Carlow, Tralee, Dundalk, Navan, Newbridge, Mullingar, Letterkenny, Celbridge and Balbriggan, Portlaoise, Greystones and Leixlip.

- Zone D: Rural Ireland, i.e. the remainder of the State excluding Zones A, B &C.

The subject site is considered to be located in Zone A for assessment purposes. Air Quality Data from representative air monitoring stations in Zone A are therefore considered representative of air quality at the subject site. The EPA publishes Ambient Air Quality Reports every year which details the air quality in each of the four zones. The most recent report, published by the EPA in 2020, is the *Air Quality in Ireland 2020*, which contains monitoring data collected during 2020. Best practice requires that an average of at least three years of recent monitoring data is used for assessments of this type so data for 2018, 2019 and 2020 has been reviewed.

The EPA maintains monitoring stations in a number of locations in Dublin including St John's Road and Winetavern Street to monitor air quality. Other monitoring stations have operated at various times and some new stations have been added to the network, but long-term data is available for the above stations. Data from the Air Quality Monitoring Annual reports for 2018 - 2020 was reviewed and a summary of the data for representative stations for the three most recent years is presented for each parameter of interest in Table 9.4.3.1.

The approach taken is to take the average of the three most recent years for the most representative Zone A stations and the averages of the values for the stations are reported in Table 9.4.3.1. This is the data set which is used in the assessment of the potential impact of the proposed development on air quality.

It is noted from the data that existing ambient air quality is good for several of the pollutants with concentration levels well within the EU Standards for all parameters of interest. However, there was an exceedance of the EU Air Quality limit value for nitrogen dioxide at the St. John's Road West station in 2019. An annual average concentration of 43µg/m$^3$ was measured in 2019 which is above the EU annual limit value for NO2 of 40 µg/m$^3$. The EPA have determined that this exceedance is as a result of the heavy traffic passing this monitoring station.

The exceedance of the EU limit value for nitrogen dioxide in the Dublin region in 2019 necessitated the preparation of the Dublin Region Air Quality Plan 2021 -Air Quality Plan to improve Nitrogen Dioxide levels in Dublin Region. The final version of the Dublin Region Air Quality Plan 2021 -Air Quality Plan to improve Nitrogen Dioxide levels in Dublin Region has been submitted to the Minster for the Environment, Climate and Communications and EU Commission. This air quality plan sets out 14 broad measures and a number of associated actions to address the exceedance of the nitrogen dioxide annual limit value all of which are focused on measures to reduce air quality impacts of traffic and transportation.

The year 2020 was a very unusual one from the point of view of traffic levels and associated pollution from vehicles. Restrictions associated with COVID-19 significantly reduced transport across the country and reductions of up to 50% in $NO_2$ concentrations in comparison to previous years were observed at many traffic-oriented monitoring stations. The annual mean $NO_2$ levels recorded at St John's Road was 30 µg/m$^3$down from the high 43µg/m$^3$ measured in 2019. To allow for comparison of pre-Covid air quality with that which includes an anomalously low data set from 2020 the three-year averages for 2017 – 2019 are shown alongside the averages for 2018 – 2020 in Table 9.4.3.1. While the three year average is lower

for some pollutants, the differences are not significant and the overall picture of air quality dominated by traffic influences remains the same.

**Table 9.4.3.1 Summary baseline air quality data (2017 - 2020)**

| Data set | Parameter and averaging interval | | Concentration µg/m³ | |
|---|---|---|---|---|
| | | | 2017 - 2019 | 2018 - 2020 |
| Urban Zone A | Nitrogen dioxide $NO_2$ | *Annual Mean, µg/m³* | 38 | 34 |
| Urban Zone A | Nitrogen oxides, $NO_x$ | *Annual Mean, µg/m³* | 72 | 84 |
| Urban Zone A | Particulate Matter $PM_{10}$ | *Annual Mean, µg/m³* | 12 | 14 |
| Urban Zone A | Particulate Matter $PM_{2.5}$ | *Annual Mean, µg/m³* | 9 | 8 |
| Urban Zone A | Sulfur dioxide, $SO_2$ | *Annual Mean, µg/m³* | 0.5 | 2.2 |
| Urban Zone A | Carbon Monoxide CO | *Annual Mean 8-hour, mg/m³* | 0.21 | 0.27 |
| Urban Zone A | Benzene | *Annual Mean, µg/m³* | 0.5 | 0.36 |

**NOTE**

1. Data summarised from the EPA Annual Ambient Air Quality Monitoring Reports 2017 to 2020.

2. Data is from Wine Tavern Street (2017 and 2018, and 2019 and 2020 for some pollutants; data is from St Johns Road for $NO_2$, $NO_x$ and $PM_{10}$ / $PM_{2.5}$ in 2019 and 2020.

## 9.5 Assessment Methodology

### 9.5.1 Introduction

#### *9.5.1.1 Air Quality*

The assessment follows a well-established scheme involving identification and characterisation of the air quality impacts that must be addressed, characterisation of the receiving environment to benchmark the existing situation, quantitative prediction of air quality impacts and assessment of the impacts against recognised Air Quality Standards and Guidelines. From this assessment comes a definition of the Management Plans and environmental solutions that are required to ensure that all aspects of the impacts of the development proposal through Construction and Operation Phases are managed and controlled to protect human health, the environment and amenity.

The following Guidance was considered in carrying out the assessment:

1. Guidelines on the Information to be contained in Environmental Impact Statements (EPA, 2022);
2. Advice Notes for Preparing Environmental Impact Statements, (Environmental Protection Agency,

Draft September 2017);

3. Advice Notes on Current Practice in the Preparation of Environmental Impact Statements (EPA, 2003).
4. European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 – S.I. No. 296 of 2018

The EPA Revised Guidelines on the Information to be Contained in Environmental Impact Assessment Reports were published in 2022. These Guidelines take account of the EIA Directive (2011/92/EU) as revised by Directive 2014/52/EU and are considered in this assessment. Impacts are described in the Guidance in terms of quality, significance, magnitude, probability, duration and type. A description of the significance of effects is presented in Table 9.5.1.1, and Table 9.5.1.2 presents the description of the duration of effects as shown in the Guidelines.

In addition to considering the above guidance, the general approach adopted for the air quality impact assessment is summarised as follows.

(i) Describe the existing baseline air quality at the site and in the vicinity of receptors – addressed in Section 9.4;

(ii) Describe the potential impacts of the development on air quality – addressed in Section 9.6;

(iii) Identify appropriate criteria against which to assess the significance of the impacts associated with the proposed development – addressed in Section 9.5;

(iv) Propose mitigation and avoidance measures where required.

(v) Identify and assess all cumulative impacts with potential to impact upon the receiving environment.

**Table 9.5.1.1 Describing the Significance of Effects**

| **"Significance" is a concept that can have different meaning for different topics – in the absence of specific definitions for different topics the following definitions may be useful.** | |
|---|---|
| Imperceptible | 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 Effects | An effect which obliterates sensitive characteristics. |

**Table 9.5.1.2 Describing the Duration of Effects**

| 'Duration' is a concept that can have different meanings for different topics – in the absence of specific definitions for different topics the following definitions may be useful. | |
|---|---|
| Momentary Effects | Effects lasting from seconds to minutes. |
| Brief Effects | Effects lasting less than a day. |
| Temporary Effects | Effects lasting less than a year. |
| Short-term Effects | Effects lasting one to seven years. |
| Medium-term Effects | Effects lasting seven to fifteen years. |
| Long-term Effects | Effects lasting fifteen to sixty years. |
| Permanent Effects | Effects lasting over sixty years. |
| Reversible Effects | Effects that can be undone, for example through remediation or restoration. |

#### *9.5.1.2 Climate*

The potential climate impact of the proposed development is assessed by comparing the total emissions of Greenhouse Gases (GHG) with those that would occur if the site was left as it is. The Climate Action and Low-Carbon Development Act 2015, which provides for new arrangements aimed at achieving transition to a low-carbon, climate-resilient and environmentally sustainable economy by 2050, requires that the applicant considers and reduces its carbon footprint in all aspects of the proposed development. The Climate Action and Low Carbon Development (Amendment) Act 2021 is an amendment to the Act which will give a statutory basis to certain matters addressed in the Act and the proposed Amendment. This assessment provides information on how the proposed development considers national climate change objectives in the selection of the preferred approaches for the proposed development.

The principal GHG emissions associated with the proposed development are carbon dioxide ($CO_2$). For the purposes of this assessment the proposed development is compared with a *Do Nothing* scenario and evaluated. Therefore, 2 scenarios have been assessed as follows: Scenario 1 – Do Nothing, in this scenario, there will be no development at the site, and Scenario 2 – Do Something (proposed development), in this scenario the proposed development is assessed.

The assessment estimates the total GHG emissions from direct and indirect activities associated with the proposed development. Overall emissions over the lifetime of the project are considered. The assessment is presented in terms of relative GHG emissions from the various sources and while there are some uncertainties, the assessment allows a reliable comparison of the Climate Impact of the proposed development relative to the Do Nothing scenario.

#### *9.5.1.3 Aspergillosis*

As noted above, there is concern about a fungal disease, "invasive Aspergillosis" which may be contracted as result of disturbance of materials that release fungal spores into the atmosphere. This is a disease which is detrimental to persons with suppressed immune systems, such as hospital patients. The "*National Guidelines for the prevention of Nosocomial Invasive Aspergillosis during construction/renovation activities*" deals specifically with construction works occurring within or adjacent to hospitals. The report states that the fungal spores responsible for invasive Aspergillosis can originate from a number of sources such as construction, demolition, renovation, disturbance of soil, removal of fibrous insulation material, removal of suspended ceiling tiles and from poorly maintained air ventilation systems. The potential sources of the fungal spores associated with invasive Aspergillosis, as detailed above, are related to the occurrence of these operations either within or in very close proximity to the hospital buildings.

Fungal spores (the *Aspergillus* moulds) are found everywhere but are of particular concern when large scale demolition, excavation and earth-moving activity takes place and especially in close proximity to areas where vulnerable individuals are located. The dispersion of spores (or indeed dust or any other substance) which are released at a particular location depends on a significant number of factors which include the rate and temperature of the release, the release height, the wind speed, rainfall, wind direction, topography, local meteorological conditions, the nature of the substances released, the potential for physical or chemical interactions and the concentrations of the substances released and other factors. The dispersion of fungal spores will depend on all of the above factors and this dispersion is evaluated by considering the factors noted above and the distances from the source at which the predicted impacts are to be assessed. In the first instance, the key factors are the concentration of the spores released and

the distance to sensitive receptors. Dispersion of fungal spores released as a result of any activity is a function of time and distance and would be completely dispersed i.e. no measurable concentration at approximately 250m from the source of the release (UK HSE Research Report RR786 Bioaerosols from Composting, 2010). The National Guidelines report referred to above notes that the fundamental requirement in respect of eliminating *Aspergillus* infection from construction works is first to minimise the dust generated during construction and second to prevent dust infiltration into patient care areas.

### 9.5.2 Impact Assessment Criteria

The assessment of impact significance is based on a comparison of predicted impacts with air quality standards and guidelines, and consideration of the magnitude and duration of the potential impact.

Air Quality Standards in Ireland have been defined to ensure compliance with EC Directives; they are developed at different levels for different purposes. European legislation on air quality has been framed in terms of two categories - limit values and guide values. Limit values are concentrations that cannot be exceeded and are based on WHO guidelines for the protection of human health. Guide values are set as a long-term precautionary measure for the protection of human health and the environment. The WHO guidelines differ from EU air quality standards in that they are primarily set to protect public health from the effects of air pollution, whereas Air Quality Standards are recommended by governments, and other factors such as socio-economic factors, may be considered in setting the standards.

The air quality standards and guidelines referenced in this report are summarized in Table 9.5.2.1. The Clean Air for Europe (CAFE) Directive (Council Directive 2008/50/EC) was transposed into Irish legislation by the Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011). This Directive and the Irish Regulations set out the main standards against which the potential impact of the development on air quality are assessed.

In addition to the Air Quality Standards Regulations and the Directive Standards, it is also appropriate to consider the World Health Organisation (WHO) Guidelines. These guidelines were developed by the WHO to provide appropriate air quality targets worldwide, based on the latest health information available. The air quality guidelines for particulate matter ($PM_{10}$), nitrogen dioxide and sulfur dioxide, and $PM_{2.5}$ are considered in this report (WHO, 2005; updated in 2008; updated in 2021). While the WHO Guidelines are not mandatory, they represent current informed opinion on the levels to which we should be aspiring in order to minimise adverse health impacts of air pollution. The WHO guidelines referenced in this report are summarized in Table 9.5.2.2.

There are no national or European Union air quality standards with which dust deposition can be compared. However, a figure of 350 mg/m$^2$-day based on the German Standard TA Luft Regulations is commonly applied by Local Authorities and the EPA (Environmental Protection Agency) to ensure that no nuisance effects will result from specified industrial activities.

**Table 9.5.2.1 Air Quality Standards Regulations 2011 (based on EU Clean Air For Europe [CAFE] Directive 2008/50/EC)**

| Pollutant | EU Regulation | Limit Type | Margin of Tolerance | Value |
|---|---|---|---|---|
| Nitrogen Dioxide | 2008/50/EC | Hourly limit for protection of human health - not to be exceeded more than 18 times/year | None | 200 µg/m$^3$ $NO_2$ |
| | | Annual limit for protection of human health | None | 40 µg/m$^3$ $NO_2$ |
| | | Annual limit for protection of vegetation | None | 30 µg/m$^3$ NO +$NO_2$ |
| Sulfur Dioxide | 2008/50/EC | Hourly limit for protection of human health - not to be exceeded more than 24 times/year | 150 µg/m$^3$ | 350 µg/m$^3$ |
| | | Daily limit for protection of human health - not to be exceeded more than 3 times/year | None | 125 µg/m$^3$ |
| | | Annual & Winter limit for the protection of human health and ecosystems | None | 20 µg/m$^3$ |
| Particulate Matter (as $PM_{10}$) | 2008/50/EC | 24-hour limit for protection of human health - not to be exceeded more than 35 times/year | 50% | 50 µg/m$^3$ |
| | | Annual limit for protection of human health | 20% | 40 µg/m$^3$ |
| Particulate Matter (as $PM_{2.5}$) | 2008/50/EC | Annual limit for protection of human health (Stage 1) | 20% from June 2008. Decreasing linearly to 0% by 2015 | 25 µg/m$^3$ |
| | | Annual limit for protection of human health (Stage 2) | None To be achieved by 2020 | 20 µg/m$^3$ |
| Carbon Monoxide | 2008/50/EC | 8-hour limit (on a rolling basis) for protection of human health | 60% | 10 mg/m$^3$ (8.6 ppm) |
| Benzene | 2008/50/EC | Annual limit for protection of human health | 0% by 2010 | 5 µg/m$^3$ |

NOTE

The Air Quality Standards Regulations 2011 (SI 180 of 2011) transposed EU Directive 2008/50/EC (CAFE) into Irish law.

**Table 9.5.2.2 WHO Air Quality Standards**

| Pollutant | Limit Type | Interim Target, µg/m³ | | | | Air Quality Guideline |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | |
| Nitrogen Dioxide | Hourly limit for protection of human health | - | - | - | - | 200 |
| | Annual limit for protection of human health | 40 | 30 | 20 | - | 10 |
| | 24 hour limit for | 120 | 50 | - | - | 25 |
| Sulfur Dioxide | Daily limit for protection of human health | 125 | 50 | - | - | 40 |
| | 10-minute limit for protection of human health | - | - | - | - | 500 |
| Particulate matter (as $PM_{10}$) | 24-hour limit for protection of human health | 150 | 100 | 75 | 50 | 45 |
| | Annual limit for protection of human health | 70 | 50 | 30 | 20 | 15 |
| Particulate matter (as $PM_{2.5}$) | 24-hour limit for protection of human health | 75 | 50 | 37.5 | 25 | 15 |
| | Annual limit for protection of human health | 35 | 25 | 15 | 10 | 5 |
| Carbon monoxide | 24-hour limit for protection of human health | 7 | - | - | - | 4 |

**Note**

1. The 24-hour limits are expressed as the 99th percentile (i.e. 3–4 exceedance days per year).

## 9.6 Identification of Likely Significant Impacts

### 9.6.1 Existing Activities

Section 9.4 describes the existing air quality at and in the vicinity of the site. The available data supports the conclusion that heating and traffic emissions are the dominant influence on air quality in the area. The existing air quality complies with most of the Air Quality Standards but there was an exceedance in 2019 of the $NO_2$ air quality standard. The EPA determined that the exceedance is due to road traffic and an Air Quality Plan was published by the Local Authorities in 2021 with proposed measures to reduce the impact of road transport on air quality.

### 9.6.2 Construction Phase Impacts

Guidance on assessment of dust from demolition and construction was published in 2014 by the Institute of Air Quality Management (IAQM). This Guidance describes a five-step approach to the assessment which is summarised as follows.

(i) Screen the development to determine if there is a requirement for a more detailed assessment.

(ii) Assess the risk of dust impacts for each of the four activities (demolition, earthworks, construction and construction traffic) and take account of the scale and nature of the works, and the sensitivity of the area.

(iii) Determine the site-specific mitigation for each potential activity.

(iv) Examine the residual effects and determine whether or not these are significant.

(v) Prepare the dust assessment report.

This approach has been applied to the development at the proposed site and is summarised below. A detailed assessment is required (IAQM Guidance) when there are human receptors within 350m of the boundary of the site and since the closest human receptors to the site boundary are within this distance, a detailed assessment is required. The Guidance advises that most projects will require a detailed assessment as the approach adopted is conservative. There are no European or designated sites within 50m of the site boundary which is the threshold distance for ecological sensitivity as recommended in the IAQM Guidelines and which has also been assessed as the relevant distance of potential significant impact, The assessment concludes that there are no significant construction impacts predicted for ecological sites.

The risk of dust being emitted in sufficient quantities to cause a nuisance or health impacts is evaluated by considering the scale of the works programme. The IAQM Guidance Note gives advice on classifying the magnitude of the potential dust impacts and using the advice and information derived from the Construction Management Plan for the site, the magnitude of the dust emissions is estimated as shown in Table 9.6.2.1.

**Table 9.6.2.1 Assessment of Magnitude of dust emissions for Construction Programme**

| Activity | Magnitude of Dust Emission | Sensitivity of receptors and surrounding areas | | |
|---|---|---|---|---|
| | | Dust Soiling | Human Health | Ecological |
| Demolition | Medium | Medium | Low | Low |
| Excavations | Low | Low | Low | Low |
| Construction | Low | Medium | Low | Low |
| Construction | Low | Medium | Low | Low |

| | | | | |
|---|---|---|---|---|
| Traffic | | | | |

The proposed development consists of a relatively small-scale demolition programme and a construction programme. The construction phase is estimated to last for up to two years. Some minor excavation work is required, however the site is currently landscaped and the majority of excavated materials being soils (grassed topsoil, topsoil and subsoil) and clays have already been removed under the previous planning permissions. The Construction programme is moderately significant and therefore significant emissions could be expected.

The significance of the dust emissions and impacts is evaluated in terms of the sensitivity of the receptors in the area that could be affected by the emissions. In general, receptors located close to the construction site boundary are considered high sensitivity with sensitivity decreasing with increasing distance from the source reflecting the exponential decrease in dust levels as distance increases. The highest receptor sensitivity in the immediate vicinity of the proposed site is medium for existing residential receptors in the area and is low for the vast majority of the construction activity.



The potential air quality impact arises from emissions of particulate matter and may result in deposition of dust around the site, and trackout onto the roads in the vicinity of the site. The magnitude of the potential emissions associated with Construction is assessed as Low using the above criteria.

Using the alternative assessment approach outlined in the Guidelines on Environmental Impact Assessment as outlined in Section 9.5, the significance of potential dust emissions during construction is summarized in Table 9.6.2.2.

**Table 9.6.2.2 Assessment of Significance of Dust Emissions for Construction Programme**

| Activity | Significance of Dust Emission | Duration of Dust Emission |
|---|---|---|
| Demolition | Slight | Short-term |
| Excavations | Slight | Short-term |
| Construction | Not Significant | Short-term |
| Construction Traffic | Not significant | Short-term |

This assessment shows that the most significant potential impacts are those associated with the limited demolition and excavation work which is very dependent on weather conditions. Damp weather and low wind speeds will reduce the level of impact experienced at the receptor locations. There will be a short-term, slight impact on the closest receptors during the demolition and excavation programme and a short-term, not significant impact on the closest receptors during the construction works. Construction traffic impacts will be not significant and experienced in the short-term. In the absence of mitigation measures, the overall impact of dust arising during the construction phase is considered to be short term in duration and its significance will vary from not significant to slight.

Raw materials required for the construction will be delivered to the site using conventional Heavy Goods Vehicles (HGVs) and some Light Goods vehicles (LGVs), and any wastes requiring removal from the site

will be removed using HGVs. The principal substances that are emitted from the vehicles are fine particulate matter, nitrogen oxides and carbon monoxide. Dust and particulate matter impacts associated with the passage of vehicles on roads has already been assessed as part of the dust and particulate matter impacts. The level of traffic movements has been reviewed in the context of potential contributions to air quality in the area and found to be not significant as detailed below.

HGV construction traffic to and from the site shall be associated mostly with the breaking up and removal of existing hardstanding on the development site. Similar rates of HGV trip generation may also occur during concrete pouring, though at a later stage in construction. HGV trips for material delivery, heavy plant transfer, etc. will be sporadic in nature and generally will not occur at the same time as more HGV-intensive activities. As a 'worst-case' scenario, it is assumed that:

- At most 4 (No.) HGV trips will be made to the site each hour (one HGV arrival and one HGV departure every 15 minutes).
- 6 (No.) LGV arrivals and 6no. LGV departures will occur in each of the background peak hours.
- 25 (No.). construction staff car trips will be made to the site during the AM peak hour, and 25 (No.) such trips made from the site during the PM peak hour.

Potential emissions from construction traffic using the local road network have been assessed in this assessment based on projected traffic movements to contribute less than 5% change to the existing air quality emission levels. It can therefore be concluded that the additional construction transport will not generate significant emissions in terms of local air quality and no material change in air quality relative to the existing situation is predicted. This impact is considered to be short term and imperceptible.

The fundamental requirement in respect of eliminating *Aspergillus* infection from construction works is first to minimise the dust generated during construction and second to prevent dust infiltration into patient care areas. There are no patient care areas within 250m of a possible release source at the site. This is the distance at which fungal spores would be completely dispersed (UK HSE Research Report RR786 Bioaerosols from Composting, 2010) as set out in Section 9.5.1. It is therefore concluded that dust infiltration or exposure to fungal spores will not occur. It is considered that in the absence of mitigation measures the potential construction phase impact of Aspergillus is short term and imperceptible.

In the absence of mitigation measures the construction phase activities will range from an imperceptible to slight impact on local air quality depending on the activities occurring will be short-term in duration.

### 9.6.3 Operation Phase Impacts

The only predicted air quality impacts associated with operation of the development are emissions to atmosphere from heating sources and traffic associated with the development.

Information derived from the assessment of traffic and transport impacts in Chapter 11 has been used to assess the likely change in emissions to air as a result of changes in traffic numbers. Traffic volumes for the Opening Year and Design Year were considered for key junctions for two scenarios, namely; the With Development and Without Development scenarios. The change in traffic volume at the key junctions for the opening year was a less than 5% increase for am and peak hours for all but the am peak at the least trafficked Junction analysed at the eastern access to the HSQ Complex which projects a +10.1% change.

The potential impact on air quality associated with a traffic volume change of this magnitude is considered not significant in a local context and imperceptible in an overall context particularly considering the advanced developments made in cleaner and more efficient vehicle engines.

In the context of elevated ambient $NO_2$ levels at St Johns Road West as measured by the EPA in 2019, it is noted that the monitoring station was located at a location removed from the subject site and specifically in a location where significant volumes of two-way stationary traffic are observed especially at peak hours. The subject site is located in an open area where two-way stationary traffic is less prevalent than the location where monitoring is completed. It is also noted that the subject site is further removed from the edge of the roadway at the closest point than the air quality monitoring station; traffic-derived pollutants are at their highest within 10m of the edge of the carriageway and therefore at the subject site the traffic-derived pollutants would be significantly lower than roadside measurements. The four Dublin Local Authorities have prepared an Air Quality Management Plan aimed at reducing nitrogen dioxide levels which was published and submitted to the Minister in 2021. In the context of an overall objective to reduce nitrogen dioxide levels, there are specific proposals in this Scheme which specifically support the objectives of the Air Quality Plan as set out below.

The proposed development is located in an urban area with intentionally limited provision for parking spaces and very generous provision supporting bicycle use with significant capacity for bicycles and visitor cycle parking spaces. This approach, and the location which is served by excellent public transport choices, minimises traffic associated with the proposed development thereby minimising emissions to atmosphere.

The design and construction of all buildings in the proposed development shall be in accordance with National Building Regulations (The Irish Building Regulations Technical Guidance Document L – Conservation of Fuel & Energy) and shall ensure that modern building materials are used and that they are designed to be thermally efficient resulting in a reduction in the energy required to heat the buildings.

IN2 engineering have prepared an Energy Statement for the proposed development which is attached in Appendix 9A. The report confirms full compliance with the energy reduction, carbon emissions reduction and renewable energy contributions requirements to TDG Part L 2021 of the Building Regulations for both the Hotel and Office buildings and therefore the Dublin Climate Action Plan 2019-2024. In each case compliance has been achieved through a combination of Passive design features, Low-energy systems, supplemented by renewable technologies.

The Hotel is proposed to utilise Air Source Heat Pumps (ASHP's) for both hot water consumption and perimeter/ ventilation heating, which, in conjunction with Variable Refrigerant Flow (VRF) air conditioning to Bedrooms will ensure a high degree of renewable energy provision to the building equating to 43% well in excess of the 20% required by the Dublin City Council Climate Action Plan 2019 -2024 and 10% required by TGD Part L 2021.

Similarly, the Office building is proposed to avail of renewable-based heating by ASHP's throughout, supplemented also by an extensive Photovoltaic (PV) solar panel array (600m$^2$ area) located at roof level, which also provides screening to Heating Ventilation and Air Conditioning (HVAC) plant. This renewable energy contribution of 28% exceeds that required by both the Climate Action Plan and the Building Regulations.

Overall, the proposed Commercial development has been determined to be fully compliant with the

Dublin Climate Action Plan 2019-2024 and TGD Part L 2021. The proposed building designs utilise a fully electrical HVAC and services strategy, free from onsite fossil fuel usage and therefore minimising local anthropogenic gas emissions. The operational phase activities are assessed to have an imperceptible impact on local air quality.

### 9.6.4 Climate Impact

The principal GHG emissions associated with construction are carbon dioxide from transport and machinery utilised in construction. For the *Do Nothing* Scenario, if the proposed development does not proceed then the emissions of GHGs in the area are projected to remain the same with some relatively minor increases as activity in the area develops. However, GHG emissions will still occur somewhere because the commercial facilities must be provided to cater for existing and future needs.

Although the overall impact of each of the potential scenarios assessed would be the same, opportunities for minimisation of GHG emissions during construction will arise and will be required to ensure that the overall objectives of enhanced energy efficiency and minimisation of GHG emission are achieved.

The operation of the proposed development will result in indirect emissions of GHGs including carbon dioxide ($CO_2$) resulting from off-site energy generation required for heating and road traffic. The $CO_2$ released due to energy usage is directly reduced by enhancing the energy efficiency of the proposed development. The detailed energy statement prepared by IN2 Engineering is attached at Appendix 9A, where the energy analysis undertaken for the proposed development is described. The proposed design considers these factors and contributes to the overall objective of minimising GHG emissions. For new dwellings in Ireland, Near Zero Energy Building (NZEB) performance has been defined as being (primarily) associated with demonstrating that a 70% reduction in carbon emissions has been achieved relative to the 2005 Part L and that 20% of the primary energy comes from renewable sources. Since this development meets, and exceeds, these minimum requirements the reduction in carbon emissions relative to the regime that applied in 2005 has been demonstrated.

The scheme has been designed to provide thermally efficient buildings and utilises zero on-site fossil fuels. This will reduce the impact the operational phase of the development will have on the micro and macro climate.

Due to the size, nature and design of the development, greenhouse gas emissions resulting from the development will be imperceptible in the local and national context. There will therefore be no adverse impacts on climate and no significant contribution to Irelands greenhouse gas budget.

The size and nature of the development and the nature and volume of emissions will lead to an imperceptible change in atmospheric conditions. There will be no change to the heat balance in the immediate area.

The construction phase activities will have a not significant impact on climate and will be short-term in duration while the operational phase activities will have an imperceptible impact on climate and will be long-term in duration.

## 9.7 Microclimate

The Microclimate Wind Analysis undertaken by IN2 Engineering for the proposed commercial development at Heuston South Quarter, St John's Road West, Dublin 8 is presented in Appendix 9B.

The analysis utilises Computational Fluid Dynamics (CFD) modelling software to simulate the wind profiles for each of the twelve cardinal wind directions for the proposed development. The results of the modelling are evaluated using the Lawson Criteria, a best practice methodology for assessing acceptable wind velocities and microclimate effects.

The results of the Heuston South Quarter commercial development analysis indicate no undesirable wind effects. At ground level, the conditions have been determined to be predominantly suitable for "Outdoor Dining" and "Pedestrian Sitting" in accordance with the Lawson Criteria methodology utilised.

Hotel roof terrace at level 4 and office roof terraces at levels 5 and 11 were analysed. The addition of landscaping effects to the West Side of the roof terraces is predicted to be effective in mitigating against wind effects. Both the hotel and office roof terraces are determined to be predominantly suited to "Outdoor Dining/ Pedestrian Sitting" and are therefore suitable for use as amenity spaces in accordance with the Lawson Criteria methodology utilised.

The analysis undertaken identified that the proposed development was determined to not unduly impact on the local wind micro-climate, with no adverse wind effects predicted to be introduced to the receiving environment.

## 9.8 Mitigation Measures

A Dust Management Plan will be formulated for the construction phase of the project, as construction activities are likely to generate some dust emissions. The principal objective of the Plan is to ensure that dust emissions do not cause significant nuisance at receptors in the vicinity of the site. The most important features of the Dust Management Plan are summarised in Table 9.8.1 Table of Mitigation Measures.

The design of the construction programme and the location and layout of the construction compound and the storage of materials will be carefully planned to ensure that air quality impacts are minimised. Table 9.8.1 presents a summary of the main mitigation features of the project and the specific mitigation measures which will be employed in order to minimise emissions from the activity and the associated impacts of such emissions.

**Table 9.8.1 Table of Mitigation Measures**

| Character of potential impact | Mitigation measure |
|---|---|
| | **Construction Phase** |
| Dust | A designated Site Agent will be assigned overall responsibility for Dust Management; |
| Dust | Implementation of the Construction Management Plan. |
| Dust | The design of the site and Construction programme considers dust impact management and chooses design approaches to minimise dust emissions; |
| Dust, general air quality | An effective training programme for site personnel will be implemented for the duration of the Construction Programme; |
| Dust, general air quality | A strategy for ensuring effective communication with the local community will be developed and implemented; |
| Dust | A programme of dust minimisation and control measures will be implemented and regularly reviewed; |
| Dust | A monitoring programme will be implemented. |
| Dust | Activities with potential for significant emissions will wherever possible be located at a position as far as possible removed from the nearest residential and commercial receptors; |
| Dust | The areas on site which vehicles will be travelling on will generally be hard-surfaced or compressed ground thus significantly reducing the potential for dust emissions from the vehicles; |
| Dust | The construction compound area will have hard standing areas to minimize dust generation from windblow. |
| Dust | In order to minimise the potential for wind-generated emissions from material storage bays, these bays will be oriented away from the dominant wind direction to minimise the effects of wind on release of dust and particulate. |
| Dust | Fixed and mobile water sprays will be used to control dust emissions from material stockpiles and road and yard surfaces as necessary in dry and/or windy weather. |
| Dust | A daily inspection programme will be formulated and implemented in order to ensure that dust control measures are inspected to verify effective operation and management. |
| Dust | A dust deposition monitoring programme will be implemented at the site boundaries for the duration of the construction phase in order to verify the continued compliance with relevant standards and limits. |
| Aspergillus Risks | The National Guidelines will be followed with regard to the effective management of Aspergillus risks. |
| | **Operational Phase** |
| Climatic Factors | The scheme shall only contain thermally efficient buildings. All buildings shall contain thermally enhanced glazing and window and door frames. |

## 9.9 Cumulative Impacts

The cumulative impacts of the proposed commercial development in conjunction with current and future developments in the vicinity of the subject site are considered in this section. Guidance published by the European Commission (1999, Guidelines for the Assessment of Indirect and Cumulative Effects as well as Impact Interactions) was considered in carrying out this element of the assessment.

A review of other existing and / or approved projects in the vicinity of the site was carried out as reported in Appendix 1A of the EIAR and these projects were considered to determine whether any of these existing / approved projects will likely have significant cumulative effects in combination with the proposed project. The assessment also considers whether all of the existing / approved projects if they all occurred simultaneously will likely have significant cumulative effects in combination with the proposed development.

The potential for cumulative impacts to arise is greatest for those developments closest to the proposed development site, which in this instance is the adjoining residential development immediately to the south (ABP SHD Planning Ref. TA29S.311591). This associated permitted residential development is likely to be constructed simultaneously with the subject development as a single construction project and thereby extending the estimated construction period from 2 years to circa 4 years. Given the close proximity and potential scale of the development, this proposed development presents the greatest potential for cumulative impacts to arise. For a development of the type considered for the adjoining site, the type of activities that would be required, the general types of construction activities that would be undertaken and the magnitude of potential air emissions associated with such a proposed development are predicted to be very similar to those predicted for the subject site. Since the assessment for the subject site has concluded that the predicted impacts will be either imperceptible, not significant or slight and short term, there is deemed to be no risk of a significant adverse cumulative impact if both developments proceed simultaneously.

In the event that the construction phase of the proposed development coincides with the construction of any other permitted developments within the zone of influence of the subject site (<350m) there is the potential for cumulative dust impacts to the nearby sensitive receptors. While the zone of potential influence extends to 350m for the purpose of the overall assessment, the magnitude and significance of any impacts decreases with distance from the site with the maximum impacts observed within 50m of the site boundaries. The dust mitigation measures outlined above should be applied throughout the construction phase of the proposed development, and with similar mitigation measures applied for other permitted developments in accordance with both best practice guidance and Dublin City Council requirements then this will prevent any significant cumulative impacts on air quality. With appropriate mitigation measures in place, the predicted cumulative impacts on air quality and climate associated with the construction phase of the proposed development are deemed slight and short-term.

Once the development is completed and operational, there will be no residual adverse air quality or climate impact on the receiving environment as a result of the proposed development or in conjunction with other local residential developments that are planned for the area.

## 9.10 Do Nothing Scenario

There will be no change in air quality impacts if no change takes place. In the absence of the development proposal, the air quality is unlikely to change.

## 9.11 Human Health Impacts

Air Quality Standards (AQS) are set to protect vulnerable people, such as those with respiratory illnesses, the old and infirm. Hence, the human health impact assessment has relied on compliance with the AQS to determine whether significant impacts will arise on human health or not.

The air quality impact assessment notes that dust and particulate matter are the primary sources of construction related impacts for all of the proposed development elements. A short-term Slight adverse impact is predicted for the closest receptors during the Construction Phase with potential short-term impacts from traffic on the surrounding roads within approximately 50m of the proposed development site. There will be no lasting impact, and the short-term impact will be managed by means of an effective Construction Management Plan (CMP) incorporating the mitigation measures outlined in Section 9.7 of this EIAR. The CMP will include a specific Dust Minimisation Plan which will ensure that dust impacts are prevented or minimised during the Construction Phase of the proposed development.

The predicted impact on air quality is short term and not significant hence the potential human health impact during construction is imperceptible.

There will be no significant emissions to atmosphere during the Operation Phase and the impact has been assessed as imperceptible. Therefore, the potential human health impact during Operation is imperceptible.

## 9.12 Residual Impacts

During the construction phase of the proposed development there will be some dust impacts experienced at the nearest receptors to the subject site. It is predicted that the mitigation measures proposed will ensure that the air quality impacts are kept to a minimum. The predicted air quality impacts on the receiving environment during the construction phase are considered to be not significant and short-term and only affecting a small number of properties.

The only predicted air quality impacts associated with operation of the development are emissions to atmosphere from traffic associated with the development. The change in traffic movements will have no quantifiable impact on air quality. The predicted air quality and climate impacts on the receiving environment during the operational phase are considered to be imperceptible and long-term.

Due to the size and nature of the development and the nature and volume of the potential emissions, the construction phase activities will have a not significant impact on climate and will be short-term in duration while the operational phase activities will have an imperceptible impact on climate and will be long-term in duration.

## 9.13 Interactions Arising

The main interactions with air quality are in relation to human beings, biodiversity, Land, Soil & Geology, and Material Assets: Traffic & Transportation.

The impact of air quality on human beings living in the area of the proposed development has been addressed above for both the construction and operational phase of the proposed development. The impact assessment shows that the air quality impacts that will be experienced by human beings in the vicinity of the proposed development are all within the prescribed criteria. This interaction is described as negative for the construction phase and neutral for the operational phase and is quantified as Not Significant for both phases.

In relation to the interaction of emissions to atmosphere from the proposed development with flora and fauna, Table 9.5.2.1 sets out Air Quality Standards for the protection of vegetation and ecosystems. This assessment has shown that the emissions generated from the development are very limited and do not have potential to generate a significant adverse impact on the local ecosystems including birdlife and wildlife. Air Quality in the area is good as shown in Section 9.5 and the Air Quality Standards will not be exceeded as a result of the development thereby ensuring that no significant adverse impact on ecosystems arises. This interaction is described as neutral and quantified as Not Significant.

Chapter 7 of this EIAR found that there is a potential interaction between Land, Soil & Geology, and Air Quality during the construction phase due to the emission of dust. Implementation of mitigation measures will ensure that this interaction is not significant.

Chapter 11 of the EIAR found that there is a potential interaction between Material Assets: Traffic & Transport and Air quality. Is considered that construction traffic and vehicular traffic flows that shall be generated by the proposed development may contribute to changes in air quality. The assessment described in Section 9.6 of this EIAR found that potential impact on air quality associated with a traffic during the construction and operational phases is considered not significant in a local context and imperceptible in an overall context. This interaction is therefore not significant.

## 9.14 Monitoring

In order to mitigate against air quality effects at receptors during the Construction Phase, Best Practice Measures will be adopted. These measures will include techniques such as those outlined in the IAQM's (2014a) *Guidance on the Assessment of Dust from Demolition and Construction*.

The Contractor will be required to produce an Air Quality and Dust Management Plan including Best Practice Measures to control dust and, in particular, measures to prevent dust nuisance. The principal objective of the Air Quality and Dust Management Plan will be to ensure that dust emissions do not cause significant nuisance at receptors near the Proposed development. The Air Quality and Dust Management Plan will include a daily inspection programme which will be formulated and implemented in order to ensure that dust control measures are being operated and managed effectively. A dust deposition monitoring programme will be implemented during the Construction Phase in order to verify the continued compliance with relevant standards and limits.

## 9.15 Accidents or Unplanned Events

There are no accidents or unplanned events as a result of the proposed development that could occur that will have an adverse or significant impact on air quality or climate that have not already been considered in this chapter.

## 9.16 References

Dublin City Council Air Quality Monitoring and Noise Control Unit's Good Practice Guide for Construction and Demolition

Environmental Protection Agency (2022). Guidelines on the Information to be Contained in Environmental Impact Assessment Reports.

Environmental Protection Agency. Air Quality in Ireland 2016, 2007 and 2018: Indicators of Air Quality.

Health Protection Surveillance Centre (2018). National Guidelines for the Prevention of Nosocomial Invasive Aspergillosis During Construction/Renovation Activities.

Institute of Air Quality Management (2014). Guidance on the Assessment of Dust from Demolition and Construction.

Institute of Air Quality Management (2014). Guidance on the Assessment of Odour for Planning.

Institute of Air Quality Management (2017). Land-Use Planning and Development Control: Planning for Air Quality.

European Union (1996). Council Directive 96/62/EC of 27 September 1996 on ambient air quality assessment and management [1996].

European Union (2004). Directive 2004/107/EC of the European Parliament and of the Council of 15 December 2004 relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air [2004].

European Union (2008). Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe [2008].

Climate Action and Low Carbon Development Act 2015

Climate Change and Low Carbon Development Act (Amendment) Act 2021

Air Quality Standards Regulations 2011 – S.I. No. 180 of 2011

Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations 2009 – S.I. No. 58 of 2009

World Health Organisation Global Air quality Guidelines 2021

# 10. NOISE AND VIBRATION

## 10.1 Introduction

This Chapter of the Environmental Impact Assessment Report was prepared by Imelda Shanahan TMS Environment Ltd who has over 30 years professional experience in preparing assessments of this type for various different types of development. Imelda has a BSc (Hons) in Chemistry from University College Dublin and a PhD in Physical Chemistry, she is a Chartered Chemist and a Fellow of the Institute of Chemistry of Ireland and a Fellow of the Royal Society of Chemistry.

This Chapter of the EIAR considers the potential noise and vibration impacts associated with the proposed development. Impacts of the construction and operational phases are considered in the context of appropriate standards and guidelines, together with requirements for noise and vibration monitoring and control.

## 10.2 Characteristics of the Proposed Development

The proposed development will consist of a mixed use commercial development comprising of a hotel (238 no. bedrooms) and an office block providing a cumulative Gross Floor Area (GFA) of 32,602, inclusive of basement area.

The application site forms part of a larger development site known as Heuston South Quarter (HSQ). The site location and context are shown in Figure 9.2.1. The HSQ site is bounded principally by St. John's Road West (to the north) and Military Road (to the east), by the formal gardens of the Royal Hospital Kilmainham (RHK) to the west , and to the south by the adjoining permitted SHD application site (ref TA29S.311591). The HSQ lands are in close proximity to Heuston Rail Station and the LUAS Red Line service and enjoy excellent connectivity to the City Centre.

The St. John's Road West frontage is characterised as an urban road and together with the approach to Heuston station on the opposite side of the road, this transportation corridor is the main road and rail artery to the west of the country.

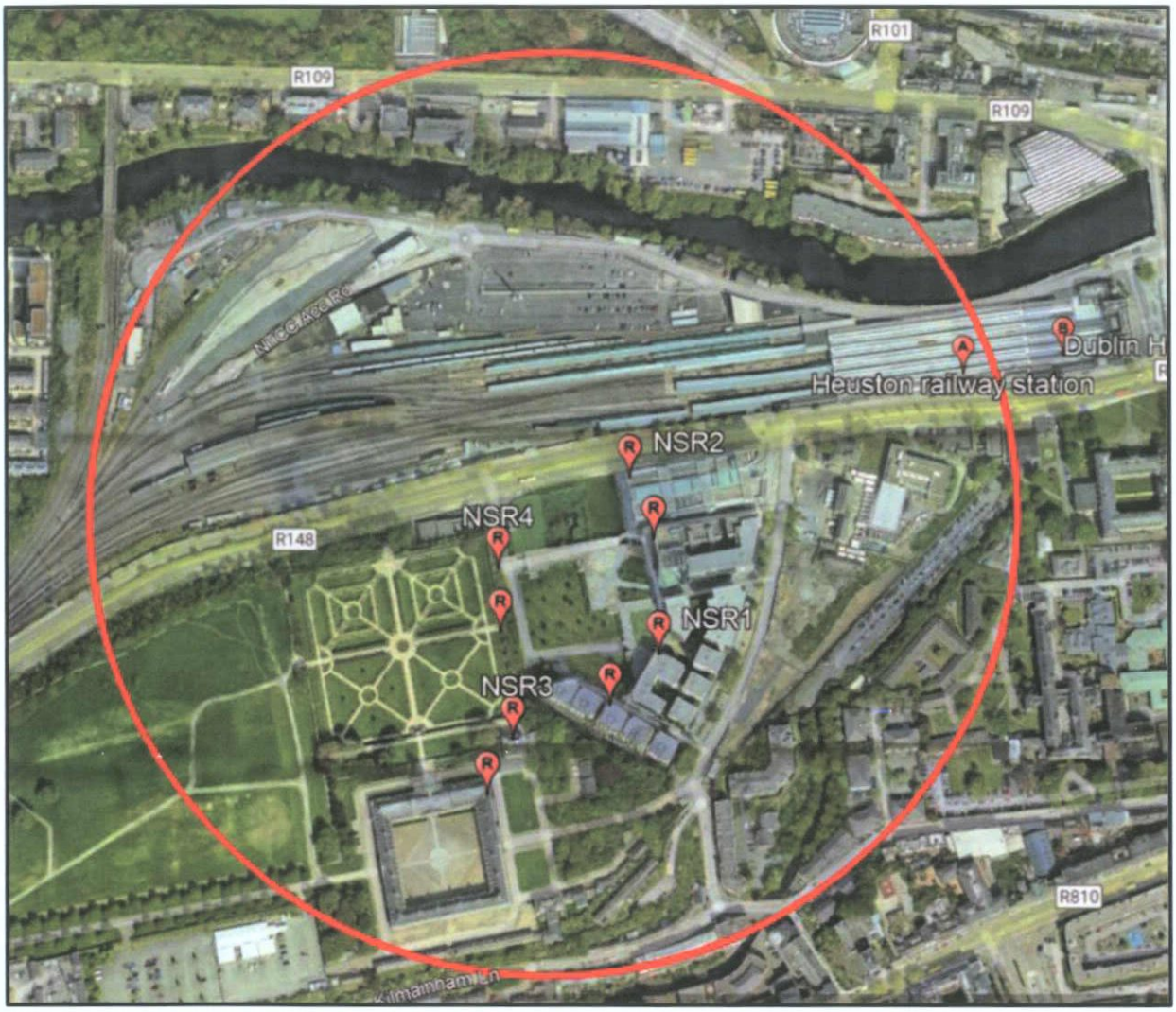
The potential noise and vibration impacts on the surrounding environment that requires consideration for a proposed development of this type includes two distinct stages, the short-term construction phase and the long-term operational phase. During the construction phase the main site activities will include demolition and site clearance, building construction, and landscaping. This phase has the greatest potential for noise and vibration impacts on the surrounding environment but this phase will be of short-term duration and impact.

During the operational phase of the proposed development, no significant sources of noise or vibration are expected from within the development. The primary source of noise in the operational context relates to any changes in traffic flows along the local road network and any operational plant noise.

The extent of the Study Area is shown in Figure 10.2.1 with a radius of detailed assessment up to 350m

from the site boundaries[1]. Potential noise and vibration impacts associated with the proposed development are predicted to be at their most significant close to the construction works boundaries. The general area surrounding the site was assessed in order to identify the receptors that have the potential to be impacted by noise emissions associated with the proposed development works. Representative noise sensitive receptors were identified close to the site boundaries to ensure that the maximum potential impacts were considered in the assessment and are shown on Figure 10.2.1.

**Figure 10.2.1 Study Area and representative Noise Sensitive Receptors (NSRs)**




## 10.3 Receiving Environment

### 10.3.1 Introduction

The existing noise environment was characterised by conducting measurements at the site of the proposed development. The baseline noise monitoring survey consisted of carrying out attended and

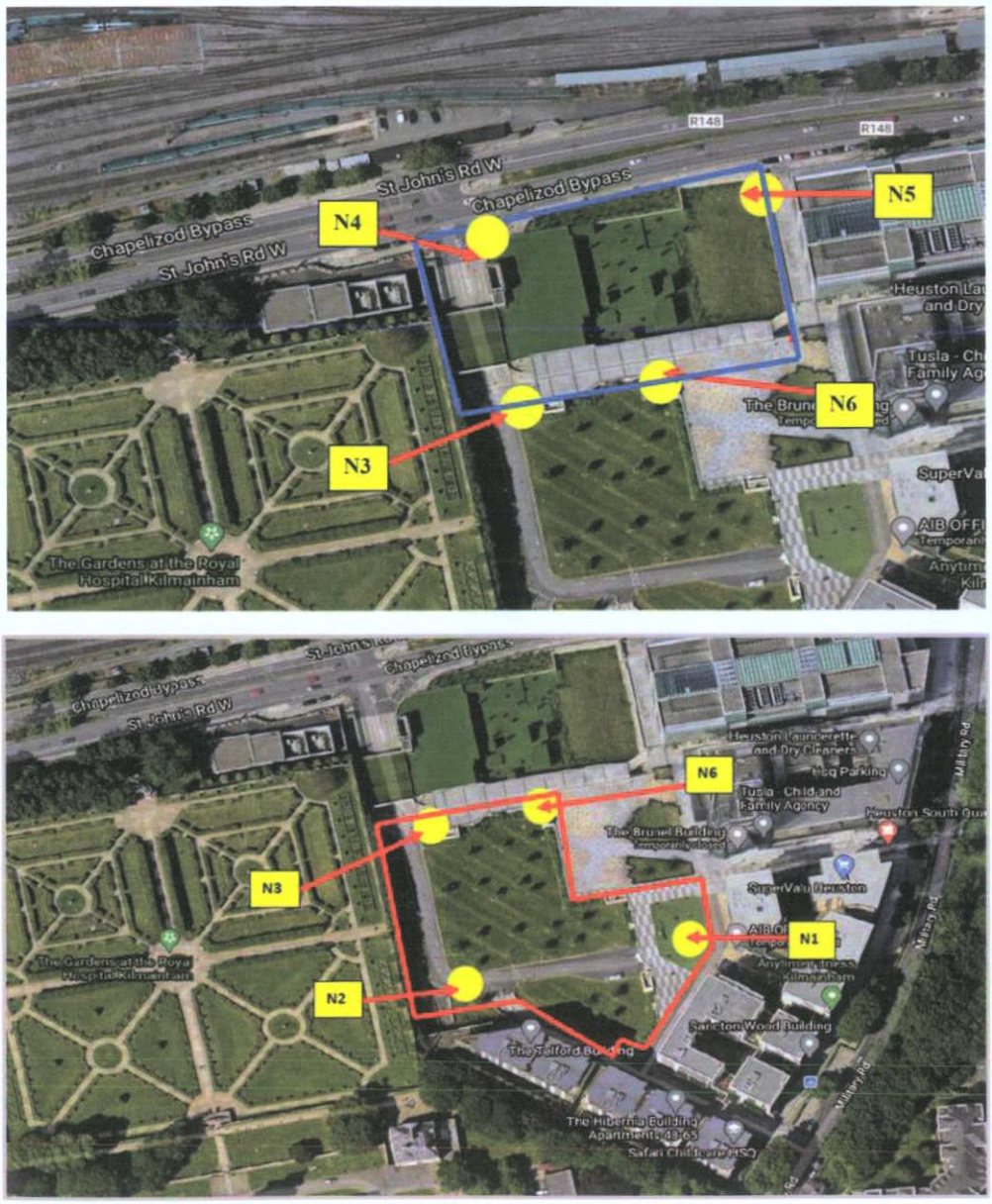
[1] This distance is prescribed for the assessment of air quality impacts in the principal Guidance followed for the assessment and for consistency the same radius was selected for the noise impact assessment even though potential impacts would not be expected beyond a distance of 100m from site boundaries.

unattended continuous noise monitoring at a number of locations in the vicinity of and on the subject site. The detailed noise monitoring survey reports are presented in Appendix 10A, Appendix 10B and Appendix 10C and include a map of the survey locations.

### 10.3.2 Existing Noise Climate

The baseline noise monitoring locations were chosen in order to best represent the current noise climate at the nearest Noise Sensitive Receptor (NSR) locations in the vicinity of the subject site. In total seven noise monitoring locations were chosen to complete the baseline survey and measurements were carried out during the daytime period (07.00 to 19.00), the evening time period (19.00 to 23.00) and the night-time period (23.00 to 07.00) on 26th January 2021 and on 03 – 09 February 2021. The monitoring locations are shown on Figure 10.3.2.1 where the SHD and Commercial site boundaries are outlined in red.

**Figure 10.3.2.1 Noise monitoring locations for Commercial and SHD sites**



The measurement parameters included meteorological observations of prevailing conditions at the time of the survey. The main measurement parameter was the equivalent continuous A-weighted sound pressure level, $L_{Aeq, T}$. A statistical analysis of the measurement results was also completed so that the percentile levels, $L_{AN, T}$, for N = 90% and 10% over the measurement intervals were also recorded.

The results of the baseline noise monitoring survey are summarised in Table 10.3.2.1, 10.3.2.2 and 10.3.2.3 below. These results are an accurate representation of the existing baseline noise climate in the vicinity of the site.

The noise climate is described in terms of the following measurement parameters.

- $L_{Aeq}$ : The equivalent steady sound level in dB containing the same acoustic energy as the actual fluctuating sound level over a given period.
- $L_{A90}$: the sound pressure level in dB(A) which is exceeded for 90% of the time.
- $L_{A10}$: the sound pressure level in dB(A) which is exceeded for 10% of the time.

The measurements were carried out over 30 minute intervals in accordance with Standard Methods. Noise levels at all locations were dominated by road traffic noise as expected for this location.

The measurement results are consistent with expectations for this location. As expected, noise levels at the boundary adjacent to St John's Road are the highest levels recorded and lowest at locations removed from St John's Road. Noise levels on the adjacent SHD site are lower than those on the commercial site which is consistent with expectations as the SHD site is further away from the road.

**Table 10.3.2.1 Baseline noise monitoring results: SHD Site**

| Date | Period | $L_{AEq}$ | $L_{A90}$ | $L_{A10}$ |
|---|---|---|---|---|
| **Location N3, northern boundary removed from St John's Road** | | | | |
| 26 Jan 2021 | Day | 55 | 50 | 58 |
| **Location N6, southern boundary removed from St John's Road** | | | | |
| 26 Jan 2021 | Day | 52 | 48 | 54 |
| **Location N1, south eastern boundary of the SHD site** | | | | |
| 26 Jan 2021 | Day | 53 | 48 | 54 |
| **Location N2, southwestern boundary of the SHD site** | | | | |
| 26 Jan 2021 | Day | 53 | 48 | 54 |

Note: Day is 07:00 to 19:00, evening is 19:00 to 23:00 and night is 23:00 to 07:00

**Table 10.3.2.2 Baseline noise monitoring results: Commercial Site**

| Date | Period | $L_{AEq}$ | $L_{A90}$ | $L_{A10}$ |
|---|---|---|---|---|
| **Location N3, southern boundary removed from St John's Road** | | | | |
| 26 Jan 2021 | Day | 55 | 50 | 58 |
| **Location N4, northwestern boundary fronting St John's Road** | | | | |
| 26 Jan 2021 | Day | 72 | 55 | 77 |
| **Location N5, northeastern boundary fronting St John's Road** | | | | |
| 26 Jan 2021 | Day | 65 | 58 | 68 |
| **Location N6, southern boundary removed from St John's Road** | | | | |
| 26 Jan 2021 | Day | 52 | 48 | 54 |

Note: Day is 07:00 to 19:00, evening is 19:00 to 23:00 and night is 23:00 to 07:00

**Table 10.3.2.3 Indicative Daytime (16-hour) and Night-time (8-hour) Noise Levels (N7)**

| Time | Average Noise levels / dB | |
|---|---|---|
| | Daytime $L_{Aeq,16hr}$ | Night-time $L_{Aeq,8hr}$ |
| 03 February 2021 | 54 | 52 |
| 04 February 2021 | 56 | 52 |
| 05 February 2021 | 57 | 51 |
| 06 February 2021 | 54 | 49 |
| 07 February 2021 | 53 | 50 |
| 08 February 2021 | 55 | 51 |
| 09 February 2021 | 56 | 53 |

It was observed that the dominant source of noise at all noise monitoring locations was passing traffic on the surrounding road network including the adjacent St John's Road West. The baseline noise environment within the general vicinity of the proposed development site was observed to be typical of an urban environment where road traffic activities were the main contributors to the prevailing noise environment.

### 10.3.3 Existing Vibration Climate

There are no significant sources of vibration in the vicinity of the subject site. The main vibrations experienced at the nearest sensitive receptor locations relates to the passing traffic along the surrounding road network. Low-level, short-term vibrations could be experienced when fully loaded HGVs travelling at speeds in excess of 50km/hr pass in close proximity to private residences. However, traffic does not

generally pass the site at these speeds and therefore vibration levels are imperceptible at the site.

## 10.4 Assessment Methodology

### 10.4.1 Impact Assessment Methodology

The EPA published the document *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports* in 2022. These Guidelines take account of the revised EIA Directive (2014/52/EU) and are considered in this assessment. Impacts or effects are described in the Guidance in terms of quality, significance, magnitude, probability, duration and type. Table 10.4.1.1 below presents the description of the significance of effects and Table 10.4.1.2 presents the description of the duration of effects as shown in the Guidelines.

**Table 10.4.1.1 Describing the Significance of Environmental Effects (EPA 2022)**

| Significance of Effects | Description |
|---|---|
| Imperceptible | An effect capable of measurement but without noticeable consequences |
| Not Significant | An effect which causes noticeable changes in the character of the environment but without noticeable consequences. |
| Slight | An effect which causes noticeable changes in the character of the environment without affecting its sensitivities |
| Moderate | An effect that alters the character of the environment in a manner that is consistent with existing and emerging trends. |
| Significant | An effect which, by its character, magnitude, duration or intensity, alters most of 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 | An effect which obliterates sensitive characteristics |

**Table 10.4.1.2 Describing the Duration of Environmental Effects (EPA 2022)**

| Duration of Effects | Description |
|---|---|
| Momentary Effects | Effects lasting from seconds to minutes. |
| Brief Effects | Effects lasting less than a day. |
| Temporary Effects | Effects lasting less than a year. |
| Short-term Effects | Effects lasting one to seven years. |
| Medium-term Effects | Effects lasting seven to fifteen years. |
| Long-term Effects | Effects lasting fifteen to sixty years. |
| Permanent Effects | Effects lasting over sixty years. |

In addition to the above, the methodologies presented below were used to inform the noise and vibration impact assessment and to identify and assess all cumulative impacts with the potential to impact upon the receiving environment and to propose mitigation and avoidance measures where required.

1. Carry out a series of baseline noise measurements to provide information on existing background and specific site noise levels at the nearest sensitive receptors.

   A baseline noise survey was completed in Jan – Feb 2021 in the vicinity of the subject site according to the requirements of *ISO 1996: Acoustics - Description and Measurement of Environmental Noise* and in addition, with reference to the EPA publication; *Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4), 2016.* Noise monitoring was carried out at a total of seven representative noise monitoring locations in order to determine the existing noise environment at the proposed site locations. The detailed baseline noise monitoring survey reports are presented in Appendix 10A, Appendix 10B and Appendix 10C.

2. Identify appropriate criteria against which to assess the significance of the noise and vibration impacts associated with the proposed development. Criteria for noise assessment are discussed in Section 10.4.2 and the criteria for vibration assessment are discussed in Section 10.4.3 below.

3. Provide predictions of resultant noise and vibration levels at the nearest sensitive receptors and assess these against the selected assessment criteria.

   Noise prediction modelling was carried out in order to predict the noise emissions that would be experienced at sensitive receptor locations as a result of the various activities associated with the proposed development. Prediction calculations for the noise generating activities including plant and equipment operation, construction activities and vehicle movements on site have been conducted generally in accordance with ISO 9613: *Acoustics – Attenuation of sound during propagation outdoors, Part 2: General method of calculation*, 1996.

4. Propose mitigation and avoidance measures where required.

5. Identify and assess all cumulative impacts with potential to impact upon the receiving environment.

### 10.4.2 Noise Assessment Criteria

There is no specific Irish legislation which sets out environmental noise limits that must be achieved and therefore the assessment criteria that are presented in this report are based on the guidelines set out by regulatory bodies such as the Environmental Protection Agency (EPA), the World Health Organisation (WHO), the Department of Housing, Planning, Community and Local Government (DHPCLG) whose guidance and standards are based on international best practice.

***Construction Noise Criteria***

Construction noise is temporary in nature and is usually experienced over a short to medium-term period and this characteristic requires it to be considered differently to other longer term noises. Construction activities on larger-scale construction projects such as the subject development will inevitably result in noise being generated.

British Standard *5228-1:2009+A1:2014 –Code of Practice for Noise and Vibration Control on Construction and Open Sites Part 1: Noise* (BS 5228-1) is a commonly used Standard to assess the potential noise impacts associated with the construction phase of a project. This Standard states that noise complaints related to new industrial/commercial noise sources are more likely to arise as the difference between the industrial noise source and the existing background noise increases. Practical noise reduction measures are detailed in BS 5228-1 and these measures can be implemented in order to reduce the overall noise emissions from a construction site.

There is no Irish Guidance specifically published for the short to medium-term construction work such as that proposed for the subject site. Construction noise impacts are assessed in terms of the requirements of BS 5228-1. Annex E of this Standard details acceptable construction noise limits for differing scenarios. Annex E.2 looks at the significant of noise impacts based on fixed noise limits and states:

> *"noise levels, between say 07.00 and 19.00 hours, outside the nearest window of the occupied room closest to the site boundary should not exceed:*
>
> - *70 decibels (dBA) in rural, suburban and urban areas away from main road traffic and industrial noise;*
> - *75 decibels (dBA) in urban areas near main roads in heavy industrial areas.*
>
> *These limits are for daytime working outside living rooms and offices. In noise-sensitive situations, for example, near hospitals and educational establishments – and when working outside the normal hours say between 19.00 and 22.00 hours – the allowable noise levels from building sites will be less: such as the reduced values given in the contract specification or as advised by the Environmental Health Officer (a reduction of 10 dB(A) may often be appropriate). Noisy work likely to cause annoyance locally should not be permitted between 22.00 hours and 07.00 hours."*

International best practice dictates that noise limits in the range 65dB $L_{Aeq,1hr}$ to 75dB $L_{Aeq,1hr}$ are generally

acceptable in the community during daytime construction activities.

Transport Infrastructure Ireland (TII) (formerly the National Roads Authority (NRA)) is the only government body in Ireland to publish construction noise limits which are presented in their document *'Guidance for the Treatment of Noise and Vibration in National Road Schemes (2004)'*.

The guidelines are not mandatory but are recommended to achieve appropriate consistency with respect to the treatment of noise and vibration. The Guidance points out that there is no published Irish guidance relating to the maximum permissible noise level that may be generated during the construction phase of a project. However, it states that Local Authorities, where appropriate, should control construction activities by imposing limits on the hours of operation and consider noise limits at their discretion. The NRA Guidance presents indicative noise levels that are typically deemed acceptable during construction phase of road developments. These are presented below in Table 10.4.2.1.

**Table 10.4.2.1 NRA Maximum Permissible Construction Phase Noise Levels at the façade of dwellings**

| Days & Times | $L_{Aeq, (1hr)}$ dB | $L_{pA(max) slow}$ dB |
|---|---|---|
| Monday to Friday - 07:00 to 19:00hrs | 70 | 80 |
| Monday to Friday - 19:00 to 22:00hrs | 60[2] | 65[2] |
| Saturday - 08:00 to 16:30hrs | 65 | 75 |
| Sundays and Bank Holidays - 08:00 to 16:30hrs | 60[2] | 65[2] |

Note 1: Noise levels measured at facade of dwellings.

Note 2: Construction activity at these times, other than that required in respect of emergency works, will normally require the explicit permission of the relevant local authority.

Dublin City Council has adopted a number of policies to help manage environmental noise exposure throughout the city and has co-operated with the three Dublin County Councils to produce a combined Noise Action Plan, which covers the period from 2018 to 2023 and sets out the measures for the management of environmental noise. There are no specific noise limit values currently in place within each Local Authority and in general, Local Authorities may only specify advisory levels.

The Dublin City Council *"Air Quality Monitoring and Noise Control Unit's Good Practice Guide for Construction and Demolition"* is a good practice Guide which sets out guidance on the measures which all developers should consider prior to commencement of work in the Dublin City Council Local Authority area to ensure that demolition and construction work does not have an adverse impact on those living and working nearby. The Guide sets out the Risk Assessment Approach to be followed whereby sites are classified as either Low, Medium or High Risk depending on the locality, the type of Work and Duration of work. When this risk assessment is carried out, the site is identified as a High Risk Site due to the close proximity of residential receptors.

The Dublin City Council (DCC) Guide sets out the approaches to be followed for setting appropriate noise limits as follows:

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

It is noted that the British Standard was revised in 2014 and the most up to date version of the Standard is quoted and applied in the current assessment.

The DCC Guide also sets vibration limits:

*"Vibration levels must be kept below 1.0 mm/sec (PPV) where possible. Where levels are expected to exceed this value residents must be warned and an explanation given".*

The BS5228 methodology referenced in the DCC Guide defines a set of threshold noise values which are applicable to construction sites and which apply only to residential receptors. The threshold values are selected based on the ambient noise level prior to commencement of the construction activity, and where a potentially significant effect is identified *"The assessor then needs to consider other project-specific factors such as the number of receptors affected and the duration and character of the impact to determine if there is a significant effect."* Taking account of the baseline noise level data and applying the BS5228 approach, the noise level should not increase by more than 5 decibels to ensure a tolerable environment unlikely to cause complaints. Applying this approach and taking account of the existing noise climate, the appropriate noise limits for the development are defined in the Dublin City Council Guide as derived directly from BS5228-1 the noise limits set out in Table 10.4.2.2 are derived.

**Table 10.4.2.2 Maximum Permissible Construction Phase Noise Levels at the façade of dwellings**

| Days & Times | $L_{Aeq, (1hr)}$ dB | $L_{pA(max) slow}$ dB |
|---|---|---|
| Daytime and Saturday (07:00 to 19:00hrs, 07:00 – 13:00 hours, respectively) | 70 | Not specified |
| Evening and weekends | 60 | Not specified |
| Night time (23:00 to 07:00hrs) | 50 | Not specified |

Note 1: Noise levels measured at facade of dwellings.

It is considered that the noise limits set out in Table 10.4.2.2 above represent a good compromise between the practical limitations in a construction project such as this one and the requirement to ensure acceptable noise levels at the nearest noise sensitive receptor locations.

***Operational Noise Criteria***

The WHO *Guidelines for Community Noise* states that, *"in dwellings, the critical effects of noise are on sleep, annoyance and speech interference"*. In order to avoid sleep disturbance it is recommended that indoor guideline values for bedrooms are 30dB $L_{Aeq}$ for continuous noise and 45dB $L_{AMax}$ for single sound events. However, it is noted that lower levels may be annoying, depending on the nature of the noise source. During the night-time, sound pressure levels at the outside facades of the living spaces should not exceed 45dB $L_{Aeq}$ and 60dB $L_{Amax}$, so that people may sleep with bedroom windows open. These values have been determined by the WHO by assuming that the noise reduction from outside to inside with a window partly

open is 15dB. Similarly, during the daytime the outdoor sound level from steady, continuous noise should not exceed 50dB $L_{Aeq}$ on balconies, terraces and in outdoor living areas to protect the majority of people from being moderately annoyed.

The *Design Manual for Roads and Bridges Volume 11, Section 3* (Highways Agency 2011) also offers guidance on 'long-term' noise impacts associated with changes in traffic noise level. For the Operational Phase, traffic impacts are assessed against the 'long-term' impact classification, presented in Table 10.4.2.2.

**Table 10.4.2.2 Classification of Magnitude of Traffic Noise Impacts in the Long-Term (Operational Phase)**

| Change in Sound Level (dB $L_{A10}$) | Magnitude of Impact |
|---|---|
| 0 | No change |
| 0.1 to 2.9 | Negligible |
| 3.0 to 4.9 | Minor |
| 5.0 to 9.9 | Moderate |
| 10+ | Major |

The criteria above reflect the key benchmarks that relate to human perception of noise. A change of 3dB is generally considered to be the smallest change in environmental noise that is perceptible to the human ear. A 10dB change in noise represents a doubling or halving of the noise level.

It is considered that the criteria specified in Table 10.4.2.2 above provide a good indication as to the likely significance of changes in noise levels in this case and have been used to assess the impact of the operational noise.

### 10.4.3 Vibration Assessment Criteria

Some activities during the construction phase of the proposed project have the potential to generate ground vibrations at sensitive receptor locations. Activities such as rock-breaking, movement of loaded HGVs and other construction traffic can all cause significant vibration to occur. The levels of vibration associated with these activities would not normally be expected to cause structural damage to buildings or to protected structures such as the boundary wall of the Royal Hospital Kilmainham but may have the potential to impact negatively on humans depending on environmental factors such as distance from source and mitigation measures employed.

The operational phase of the proposed development will not generate any observable vibration emissions and is consequently not required to be considered.

#### *Construction Vibration Criteria*

Vibration standards are concerned with those dealing with human comfort, and those dealing with

structural or cosmetic damage to buildings / structures. In both instances, it is appropriate to consider the magnitude of vibration in terms of Peak Particle Velocity (PPV).

Humans are particularly sensitive to vibration and can detect vibration levels as low as 0.3 mm/sec PPV and levels above this may cause annoyance. However, significantly higher levels than this are tolerated for single short-term events and do not cause annoyance or disturbance to humans. British Standard BS 5228-2:2009+A1:2014 *Code of Practice for Noise and Vibration Control on Construction and Open Sites* provides guidance on vibration and its control and management on various site types. The standard also presents details on the human response to vibration and Table 10.4.3.1 below outlines these effects.

**Table 10.4.3.1 Human Response to Vibration**

| Vibration Level PPV (mm/sec) | Effect |
|---|---|
| 0.14 | Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration. |
| 0.3 | Vibration might be just perceptible in residential environments. |
| 1.0 | It is likely that vibration of this level in residential environments will cause complaint but can be tolerated if prior warning and explanation has been given to residents. |
| 10 | Vibration is likely to be intolerable for any more than a very brief exposure to this level in most building environments. |

The response of a building / structure to groundborne vibration is affected by numerous factors including the type of foundation, underlying ground conditions, its construction and the state of repair of the building / structure.

British Standard 7385 *Evaluation and Measurement for Vibration in Buildings* provides guidance on vibration measurement, data analysis and reporting as well as building classification and guide values for building damage. The damage threshold criteria presented in BS 7385-2 are based upon systematic studies using a carefully controlled vibration source in the vicinity of buildings. The Standard states that there should be no cosmetic damage to buildings if transient vibration levels do not exceed 15 mm/sec in the low frequency range and this rises to 20 mm/sec at frequencies of 15 Hz and 50 mm/sec at 40 Hz and above. These guidelines should be reduced by up to 50% for listed structures[2] or similar. It is also noted that the probability of damage to buildings tends towards zero at 12.5 mm/sec at component PPV.

The NRA Guidance Document recommends vibration levels to ensure that there is no potential for vibration damage during road construction activities. These values have been derived through consideration of various European standards and compliance with their guidance should ensure that there

[2] The equivalent of Protected Structures in Ireland

is little to no risk of even cosmetic damage to buildings. The guide values are presented below in Table 10.4.3.2.

**Table 10.4.3.2 NRA Maximum Permissible Construction Phase Vibration Levels**

| Vibration Level – Peak Particle Velocity at the closest part of any sensitive property to the source of vibration at a frequency of | | |
|---|---|---|
| **Less than 10Hz** | **10 to 50Hz** | **50 to 100Hz (and above)** |
| 8 mm/s | 12.5 mm/s | 20 mm/s |

## 10.5 Identification of Likely Significant Impacts

### 10.5.1 Construction Phase

The construction works associated with the development proposed in this planning application is expected to take place over an extended period of time, up to 2 years, with the hours of construction typically from 07.00 to 19.00 Monday to Friday and 08.00 to 14.00 Saturdays. Although there may occasionally be the need to work outside the normal hours of construction, heavy or noisy construction activities will be minimised during these periods. Construction is expected to be constructed sequentially from east to west: the proposed office building to proceed first followed by the hotel in the western part of the site.

A variety of items of plant will be in use for the purposes of demolition, site clearance, foundations, and construction activities. There will be no blasting techniques or rock breaking used during construction. Some of the most significant activities in terms of potential noise and vibration impacts include sawing and breaking of concrete, piling and the general construction activities associated with a scheme of this magnitude. There will be no perimeter secant or contiguous piling required, as this is already in place. The buildings will have piled foundations.

The general sequence of works is as follows:

- Site establishment and erection of hoarding;
- Demolition of the existing basement and podium structure where required.
- Construction of the foundations and substructure.
- Construction of superstructures.

Each of these activities would be expected to generate noise as a result of the activity and the various plant and machinery required for completion. Some of the activities would also generate vibration.

Plant and equipment to be used during the construction works will include the following:

- articulated and rigid trucks;
- Pilling-rigs (Continuous Flight Auger (CFA) rigs);
- bulldozers, excavators, backhoes, with ancillary equipment (rock hammers or saws);
- Tower cranes / mobile cranes;

- concrete delivery trucks;
- concrete pumps;
- man, and material hoists;
- scissor, boom and fork lifts.

### 10.5.2 Operational Phase

The proposed development will consist primarily of a hotel and office buildings and will also include car parking spaces, pedestrian/cycle and vehicular access together with all ancillary, infrastructure, landscaping and boundary treatments. The only predicted contributions to the noise environment during the operation phase in the vicinity of the site will result from increased traffic movements as a result of the increased activity in the area. There are no significant vibration sources associated with the operation phase.

## 10.6 Predicted impacts

### 10.6.1 Predicted Construction Noise Impact

The actual noise level produced by construction work will vary at the nearest sensitive receptor boundary at any time depending upon a number of factors including the type of plant in use, plant location, duration of operation, hours of operation and intervening topography. It is therefore difficult to accurately determine the likely noise levels without knowing greater detail, therefore the impact assessment carried out for the proposed development presents the highest likely noise levels at the nearest receptors based on the demolition, piling, infrastructure work, general site activities and building construction work in the vicinity of the closest approach to the nearest noise sensitive receptors.

The noise levels associated with the Construction Phase of the Proposed Project have been calculated using a Model constructed in accordance with ISO9613-2 and BS5228-1. The noise model accounts for the impacts on noise propagation associated with the magnitude of the noise source, the distance from the source to the receptor, the intervening ground type and topography, the presence of screens or buildings, meteorological impacts and the time that a noise source would be operating.

Noise data for plant and machinery associated with the various construction activities of the Construction Phase were sourced from *BS 5228-1 Noise and Vibration Control on Construction and Open Sites, 2014*, which provides sound pressure level data for a wide range of plant and equipment used for different construction activities, and also from machinery manufacturers for plant and equipment likely to be used during the Construction Phase. Building layouts and heights have also been taken into account. Ground topography has been considered as flat as there are no hills, mountains, valleys or notable geographical features near the subject sites.

The noise model has calculated noise levels for a set of specified NSR locations. NSR locations were chosen for the closest NSRs near the Proposed Project works to account for where construction works will take place. The nearest noise sensitive receptor (NSR) locations to the proposed construction works are the properties within the other elements of the as-built HSQ scheme. The closest distance for the construction works to approach the NSRs is approximately 11m from the closest commercial and residential units and

approximately 10m from the boundary of the Royal Hospital grounds. All other works will occur across the site at varying distances of up to 150m. The named NSR locations for the purposes of the impact assessment are:

- NSR1 – Offices at circa 10m from nearest site construction works;
- NSR2 – Offices at circa 10m from nearest site construction works.
- NSR3 – Royal Hospital Kilmainham at circa 120m from the nearest construction works.
- NSR4 - Royal Hospital Kilmainham grounds at circa 10m from the nearest construction works.

For some of the works, the distances are much greater eg for the only demolition works that will occur, the distances from those activities at the closest point to each receptor are between 25m and 150m and this has been considered in the assessment.

The construction works have been broken down into a number of separate stages to differentiate the key construction activities for the impact assessment:

- Stage 1 relates to site excavation and site preparatory works;
- Stage 2 relates to demolition works,
- Stage 3 is the foundation works;
- Stage 4 is general site activities, and
- Stage 5 relates to the construction of the buildings.

The predicted noise levels are indicative only and are intended for comparison with the adopted noise criteria. Depending on the specific activities occurring at the site, the predicted noise levels will vary accordingly.

For the purposes of a conservative assessment, Table 10.6.1.1 presents the typical expected plant items and their estimated on-time which have been assumed in the model for each of the key construction activities associated with each Stage assessed. An on-time or operating time of 66% for plant items is presented in the assessment, which assumes that plant will operate for a full eight hours over a 12-hour daytime working period (07:00 to 19:00) or for 40 minutes every hour. This is considered a conservative approach for construction activities such as those on this Proposed Project, considering the dynamic nature of construction works and construction sites.

The nearest NSR locations have been used as the named receptors in order to assess the potential noise impacts associated with the different stages of the construction works. The plant items are assumed to be operating at a nominal 10m from the construction boundary closest to the nearest NSR, even though in reality they will be much further removed for much of the time. There are no screening reductions applied for the unmitigated assessment scenario other than the screening achieved with standard construction site hoarding, and all relevant plant and equipment was assessed as running simultaneously.

**Table 10.6.1.1 Construction Phase Activity**

| Construction Works | Plant Detail | BS 5228-1 Reference | Number of Plant Items Operating | Sound Power Level (Lw, dB(A)) | Operating Time (%) |
|---|---|---|---|---|---|
| **Stage 1** Excavation and site preparation | Tracked excavator | C2.2 | 2 | 105 | 66 |
| | Dozer | C2.11 | 2 | 107 | 66 |
| | Wheeled loader | C2.28 | 1 | 104 | 66 |
| | Dump truck | C2.30 | 2 | 107 | 66 |
| **Stage 2** Demolition | Concrete saw | C.4.72 | 1 | 108 | 66 |
| | Concrete breaking | C.1.6 | 1 | 114 | 66 |
| | Angle grinder | C4.93 | 1 | 108 | 25 |
| **Stage 3** Foundations | Piling rig (CFA) | C.4.21 | 1 | 111 | 66 |
| | Generator | C4.77 | 1 | 88 | 66 |
| | Dewatering | C4.88 | 2 | 97 | 100 |
| | Concrete pump and truck | C4.28 | 1 | 103 | 66 |
| | Poker vibrator | C4.34 | 1 | 97 | 66 |
| | Angle grinder | C4.93 | 1 | 108 | 10 |
| **Stage 4** General site activities | Dump truck | C2.30 | 1 | 107 | 66 |
| | Wheeled loader | C2.28 | 1 | 104 | 66 |
| | Mobile crane | C4.41 | 1 | 99 | 66 |
| | Generator | C4.77 | 2 | 88 | 66 |
| | Angle grinder | C4.93 | 1 | 108 | 25 |
| **Stage 5** Building construction | Mobile crane | C4.41 | 1 | 99 | 66 |
| | Tower crane | C4.48 | 2 | 104 | 66 |
| | Dump truck | C2.30 | 1 | 107 | 66 |
| | Generator | C4.77 | 2 | 88 | 66 |
| | Concrete pump and truck | C4.28 | 1 | 103 | 66 |
| | Poker vibrator | C4.34 | 1 | 97 | 66 |
| | Cutting/grinding | C4.72 | 1 | 107 | 66 |

Note

These are typical scenarios for construction sites of this type listing likely types of plant and machinery and operating conditions.

Predicted noise levels have been calculated at each of the closest NSR locations that have been identified for the subject site. A worst-case scenario is assumed by having all plant and equipment items operating continuously for two thirds of the time at the construction boundary point in the vicinity closest to the noise sensitive receptor even though in reality they will be much further removed. Hand-held equipment are assessed as operational for 25% of the time. The generators and cranes are assumed to operate for 100% of the time. A partial screening contribution from an acoustic construction barrier has also been considered in the assessment. For the Piling works which will be of relatively short duration, a Continuous Flight Auger (CFA) piling technique will be employed to minimise noise emissions. This type of work which is one of the noisiest activities proposed will be undertaken at the least sensitive times to minimise disruption to the neighbouring properties. The duration of this Phase of works is short at approximately 2 months.

Therefore, the results presented in Tables 10.6.1.2 to 10.6.1.7 show the maximum noise levels predicted for each NSR and represent the noise levels when the construction activity is ongoing at the closest point within the construction site to each NSR. This is a very conservative approach and for the majority of the time, works will be undertaken at greater distances from the noise sensitive receptors and therefore the noise levels will be lower.

**Table 10.6.1.2 Calculated Construction Noise Levels for Excavation & Site Preparation Works**

| Plant Details | Calculated Noise Level, dB $L_{Aeq,T}$ at the named receptor locations | | | |
|---|---|---|---|---|
| | NSR1 | NSR2 | NSR3 | NSR4 |
| Tracked excavator | 62 | 62 | 41 | 62 |
| Dozer | 64 | 64 | 43 | 64 |
| Wheeled loader | 61 | 61 | 40 | 61 |
| Dump truck | 64 | 64 | 43 | 64 |
| Combined $L_{Aeq}$ (when all plant items are operating together) | 69 | 69 | 48 | 69 |

Note These are representative noise impact calculations for these types of construction activities

**Table 10.6.1.3 Calculated Construction Noise Levels for Demolition Stage**

| Plant Details | Calculated Noise Level, dB $L_{Aeq,T}$ at the named receptor locations | | | |
|---|---|---|---|---|
| | NSR1 | NSR2 | NSR3 | NSR4 |
| Concrete saw | 57 | 57 | 44 | 57 |
| Concrete breaking | 63 | 63 | 50 | 63 |
| Angle grinder | 57 | 57 | 44 | 57 |
| Combined $L_{Aeq}$ (when all plant items are operating together) | 65 | 65 | 51 | 65 |

Note These are representative noise impact calculations for these types of construction activities

**Table 10.6.1.4 Calculated Construction Noise Levels for Foundations**

| Plant Details | Calculated Noise Level, dB $L_{Aeq,T}$ at the named receptor locations | | | |
|---|---|---|---|---|
| | NSR1 | NSR2 | NSR3 | NSR4 |
| Piling rig (CFA) | 68 | 68 | 47 | 68 |
| Generator | 45 | 45 | 24 | 45 |
| Dewatering | 54 | 54 | 33 | 54 |
| Concrete pump and truck | 60 | 60 | 39 | 60 |
| Poker vibrator | 54 | 54 | 33 | 54 |
| Angle grinder | 61 | 61 | 44 | 61 |
| Combined $L_{Aeq}$ (when all plant items are operating together) | 70 | 70 | 49 | 70 |

Note These are representative noise impact calculations for these types of construction activities

**Table 10.6.1.5 Calculated Construction Noise Levels for General Site activities**

| Plant Details | Calculated Noise Level, dB $L_{Aeq,T}$ at the named receptor locations | | | |
|---|---|---|---|---|
| | NSR1 | NSR2 | NSR3 | NSR4 |
| Dump truck | 64 | 64 | 43 | 64 |
| Wheeled loader | 61 | 61 | 40 | 61 |
| Mobile crane | 56 | 56 | 35 | 56 |
| Generator | 45 | 45 | 24 | 45 |
| Angle grinder | 65 | 65 | 44 | 65 |
| Combined $L_{Aeq}$ (when all plant items are operating together) | 69 | 69 | 47 | 69 |

Note These are representative noise impact calculations for these types of construction activities

**Table 10.6.1.6 Calculated Construction Noise Levels for construction of buildings**

| Plant Details | Calculated Noise Level, dB $L_{Aeq,T}$ at the named receptor locations | | | |
|---|---|---|---|---|
| | NSR1 | NSR2 | NSR3 | NSR4 |
| Mobile crane | 56 | 56 | 35 | 56 |
| Tower crane | 61 | 61 | 40 | 61 |
| Dump truck | 64 | 64 | 43 | 64 |
| Generator | 45 | 45 | 24 | 45 |
| Concrete pump and truck | 60 | 60 | 39 | 60 |
| Poker vibrator | 54 | 54 | 33 | 54 |
| Cutting/grinding | 64 | 64 | 43 | 64 |
| Combined $L_{Aeq}$ (when all plant items are operating together) | 69 | 69 | 48 | 69 |

Note These are representative noise impact calculations for these types of construction activities