

presented in the Appropriate Assessment Screening Report for the Proposed Development that accompanies this application.

In the case of NHAs and pNHAs the assessment considers whether the integrity of any such site would be affected by the Proposed Development with reference to the ecological features for which the site is designated or is proposed for designation.

6.5.2.1.1 European Sites

The assessment presented in the Appropriate Assessment Screening Report (Scott Cawley Ltd 2022) concluded that the potential impacts associated with the Proposed Development do not have the potential to affect the receiving environment and, consequently, do not have the potential to affect the conservation objectives supporting the qualifying interests or special conservation interests of any European sites; either alone or in combination with any other plans or projects.

As the Proposed Development does not traverse any European sites there is no potential for habitat fragmentation to occur.

There are no plant species listed on the Third Schedule of the *European Communities (Birds and Natural Habitats) Regulations, 2011* on the Proposed Development site. The Proposed Development site is hydrologically connected European sites in Dublin Bay, however, due to the absence of Third Schedule non-native invasive species within the Proposed Development site, there is no risk of non-native invasive species spreading from the Proposed Development site to any European site.

Construction-related disturbance and displacement of fauna species could potentially occur within the vicinity of the Proposed Development. For birds, disturbance effects would not be expected to extend beyond a distance of c. 300m, as noise levels associated with general construction activities would attenuate to close to background levels at that distance²⁵. There are no European sites within the disturbance Zol; the next nearest European site to the Proposed Development is c. 2.4km away.

There is some potential for contaminants arising from the construction phase of the Proposed Development to enter the downstream receiving environment via the existing surface water mains. Notwithstanding the location of the aforementioned designated sites in the downstream receiving environment, there is not considered to be any potential for significant effects arising from the construction or operation of the Proposed Development. This is because: -

- South Dublin Bay SAC (000210) (which overlaps with South Dublin Bay pNHA) is located to the east along c. 5.4km of the River Liffey channel from the Proposed Development, and South Dublin Bay and River Tolka Estuary SPA (004024) is located to the east along c. 4.7km of the River Liffey channel. There is therefore a large freshwater and estuarine water buffer separating the designated sites from the Proposed Development over which it is anticipated that any potential pollutants would be absorbed and diluted to an extent that they would not be perceptible at the designated sites.
- North Bull Island SPA (004006) (which partially overlaps with North Dublin Bay pNHA) is located to the east along c. 6.4km of the River Liffey channel (and the sea waters of the Dublin Bay) from the Proposed Development, and North Dublin Bay SAC (000206) is located to the east along c. 6.4km of the River Liffey channel (and the sea waters of the Dublin Bay). There is therefore a very large freshwater and estuarine water buffer separating the designated sites from the Proposed Development over which it is anticipated that any potential pollutants would be absorbed and diluted to an extent that they would not be perceptible at the designated sites.

²⁵ The disturbance zone of influence for waterbirds is based on the relationship between the noise levels generated by general construction traffic/works (BS 5228:2009 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1 Noise) and the proximity of those noise levels to birds – as assessed in Cutts, N. Phelps, A. & Burdon, D. (2009) Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance, and Wright, M., Goodman, P & Cameron, T. (2010) Exploring Behavioural Responses of Shorebirds to Impulsive Noise. *Wildfowl* (2010) 60: 150–167. At 300m, noise levels are below 60dB or, in most cases, are approaching the 50dB threshold below which no disturbance or displacement effects would arise.

- Rockabill to Dalkey Island SAC (003000) (which partially overlaps with Dalkey Coastal Zone And Killiney Hill pNHA) is located c. 11.3km from the Proposed Development along the River Liffey channel (and the sea waters of the Dublin Bay). There is therefore a very large marine and freshwater water buffer separating the designated site from the Proposed Development over which it is anticipated that any potential pollutants would be absorbed and diluted to an extent that they would not be perceptible at the designated site.
- Howth Head SAC (000202) (which overlaps with Howth Head Coast SPA) is located c. 11km north-east of the Proposed Development site along the River Liffey channel (and the sea waters of the Dublin Bay). There is therefore a very large marine and freshwater water buffer separating the designated site from the Proposed Development over which it is anticipated that any potential pollutants would be absorbed and diluted to an extent that they would not be perceptible at the designated site.

Due to the above reasons, there are no hydrological or hydrogeological risks associated with the Proposed Development, and therefore there are no European sites at risk of habitat degradation.

Excavation spoil and waste material will need to be removed offsite due to limited opportunities for reuse on site. It is anticipated that the surplus material will be suitable for acceptance at either inert or non-hazardous soil recovery facilities/landfills in Ireland or, in the unlikely event of hazardous material being encountered, be transported for treatment/recovery or exported abroad for disposal at suitable facilities. This could potentially extend the ZoI to areas where the material will be deposited, however the waste will be classified in accordance with the EPA publication Waste Classification, with environmental soil analysis carried out prior to removal of the material, in accordance with the requirements for acceptance of waste at landfills²⁶. Therefore there will be no impact associated with this on European sites.

There are no plant species listed on the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations, 2011 on the Proposed Development site. The Proposed Development site is hydrologically connected European sites in Dublin Bay, however, due to the absence of Third Schedule non-native invasive species within the Proposed Development site, there is no risk of non-native invasive species spreading from the Proposed Development site to any European site.

6.5.2.1.2 National Sites

In the case of NHAs and pNHAs the assessment considers whether the integrity of any such site would be affected by the Proposed Development with reference to the ecological features for which the site is designated, or is proposed for designation.

The Proposed Development does not overlap with any nationally designated sites.

As outlined within Section 6.5.2 of this chapter, the zone of influence of the Proposed Development in relation to designated sites extends to NHAs/pNHAs and European sites downstream of the Proposed Development in Dublin Bay. Therefore, the only nationally designated sites within the potential zone of influence of the Proposed Development are; South Dublin Bay pNHA (000210), Dolphins, Dublin Docks pNHA (000201), and North Dublin Bay pNHA (000206). These designated sites are in the downstream receiving environment within Dublin Bay, to which the surface waters from the lands ultimately discharge via the River Liffey. There is not considered to be any potential for significant effects arising from construction of the Proposed Development for the same reasons as European sites above. Dolphins, Dublin Docks pNHA, is designated for nesting terns, and as noise from the development is not predicted to extend more than a few hundred metres from the site, of which would consist of entirely built land in Dublin City Centre, no significant effects are predicted on this National site.

Grand Canal pNHA (002104) located c. 1.6km south and the Royal Canal pNHA (002103) located c. 1.3km north of the Proposed Development site, are not hydrologically connected or otherwise to the Proposed Development site., therefore no significant effects are predicted on these National sites.

²⁶ Chapter 15: Material Assets (Waste), AWN Consulting (2022).

As the Proposed Development will not result in significant effects on nationally designated sites on its own, and as all other developments within the area will be subject to the environmental protective policies and objectives of the Dublin City Development Plan 2016-2022, there is no potential for cumulative effects arising from the proposal in-combination with other plans or projects.

6.5.2.2 Potential Impact of the Proposed Development on Habitats during Construction Stage

There are no habitats of importance within the Proposed Development site, or in the immediate environs. Landscaping plans for the Proposed Development will aim to enhance the site, due to its urban nature. Therefore, the Proposed Development will not result in significant effects on habitats at any geographical scale.

6.5.2.3 Potential Impact of the Proposed Development on Birds during Construction Stage

6.5.2.3.1 Effects of Mortality and Disturbance

It is considered that temporary displacement of nesting herring gull and pigeon from rooftop habitat (as well as the potential for bird injury/mortality) if works are undertaken during the breeding bird season (i.e. 1 March to 31 August, inclusive). Feral pigeon are a green-listed species in Ireland and are commonly occurring within urban environments. Herring gull, an amber-listed and SCI species in Ireland, have been forced by anthropogenic pressures to occupy and breed in urban environments.

If site clearance works were to be undertaken during the bird breeding season (March to August, inclusive) it is likely that nesting sites holding eggs or chicks will be destroyed and birds killed. Mortality of birds at the scale of the Proposed Development (given the relatively low area of vegetation and roof cover that will be lost), over what is likely to be a single breeding bird season in terms of completing site clearance works, will probably have a short-term effect on local breeding bird population abundance. However, in the longer-term this would be unlikely to affect the abundance or distribution of the breeding bird species recorded in the study area nor would it be likely to affect the long-term viability of the local populations. The landscape planting proposed as part of the design may also serve to provide additional nesting and foraging opportunities as it matures over time, and upon the completion of the development the rooftops would continue to provide nesting opportunities for herring gulls.

The noise, vibration, increased human presence and the visual deterrent of construction traffic associated with site clearance and construction will disturb breeding bird species and is likely to displace breeding birds from habitat areas adjacent to the Proposed Development boundary. Although it is not possible to quantify the magnitude of this potential impact (or the potential effect zone) it could potentially extend for several hundred metres from the Proposed Development. Given the abundance of rooftops and buildings in the surrounding environs, disturbance or displacement effects will also be over the short-term and are therefore unlikely to affect the conservation status of the local breeding bird populations.

Overall, the site clearance and physical disturbance associated with the Proposed Development is not likely to result in long-term effects on local breeding bird populations, however will result in a likely short-term significant negative effect, at a local geographic scale. Following mitigation measures proposed in Section 6.7.3.2, this impact will not result in a significant effect at any geographical scale.

6.5.2.4 Potential Impacts of the Proposed Development on Habitats during Operational Stage

No operational phase impacts are predicted on habitats as a result of the Proposed Development.

6.5.2.5 Potential Impacts of the Proposed Development on Birds during Operational Stage

6.5.2.5.1 Disturbance

It is possible that birds using the site and environs may be temporarily disturbed as a result of increased noise and human activity levels during operation of the Proposed Development. This could potentially result in the temporary disturbance and displacement of birds until they habituate to the increased levels of noise and human activity. Birds recorded within the Proposed Development site are typical urban species which are considered to tolerate increased levels of disturbance providing suitable habitat remains which birds use as a refuge. The increase in vegetation and planting, will also provide habitat for other local bird species, in what is a heavily urbanised environment. Overall, the disturbance during operation is unlikely to result in a significant effect at any geographic scale.

6.5.2.6 Do-Nothing Impact

Under the do-nothing scenario, the site would continue to degrade and provide habitat for nesting gull species, and feral pigeons. The little areas of non-native ornamental scrub would likely continue to grow and spread across the site, potentially providing nesting opportunities for bird species, and invertebrate populations.

6.5.3 Cumulative

The Dublin Central Masterplan site, and subsequently the Proposed Development, is currently zoned as Z5 "City / Town / Village Centre, Central Area" with the zoning objective "to consolidate and facilitate the development of the central area, and to identify, reinforce, strengthen and protect its civic design character and dignity" within the Dublin City Development Plan 2016 – 2022.

This section of the chapter assesses the potential for any other Proposed Developments to act cumulatively with the development of the Proposed Development, to give rise to likely significant effects on biodiversity.

Based on a search of active or recent planning applications in the immediate environs of the Dublin Central site, most applications relate to minor additions or amendments to existing buildings, including installation of platform lifts, improved access facilities etc.

Potential cumulative impacts may arise during construction and operation, as a consequence of the development of the Proposed Development acting in-combination with other plans and projects, on water quality in the downstream surface water environment, and on disturbance and habitat loss to birds.

There is potential for cumulative impacts to arise with other local developments that would also result in increased noise, vibration, and human presence. However, as any disturbance effects from other such local developments are likely to be of a minor nature, temporary, localised and over a short-duration, they are not likely to cumulatively affect the local breeding bird populations in conjunction with the development of the Proposed Development.

Considering the predicted impacts associated with the development of the Proposed Development, the mitigation measures proposed to protect the local biodiversity resource and the receiving environment, and the protective policies and objectives on the land-use plans that will direct future development locally, significant cumulative negative effects on biodiversity are not predicted.

6.5.3.1 Do-Nothing Impact

Under the do-nothing scenario, the site would continue to degrade and provide habitat for nesting gull species, and feral pigeons. The minor areas of non-native ornamental scrub would likely continue to grow and spread across the site, potentially providing nesting opportunities for bird species, and invertebrate populations.

6.6 MITIGATION MEASURES (AMELIORATIVE, REMEDIAL OR REDUCTIVE MEASURES)

6.6.1 Dublin Central Masterplan

This section presents the mitigation measures that will be implemented during construction and operation to avoid the potential impacts of the Proposed Development on KERs as outlined above. All of the mitigation measures will be implemented in full. They are in accordance with best practice, and tried and tested, effective control measures to protect the receiving environment.

6.6.1.1 Mitigation Measures for Designated Sites during Construction Stage

6.6.1.1.1 European Sites

As set out in the Appropriate Assessment Screening Report, in concluding that the Proposed Development is not likely to have a significant effect on any European sites, mitigation measures intended to avoid or reduce any harmful effects of the Proposed Development on European sites were not required or taken into account.

6.6.1.1.2 National Sites

As there is no risk of the Proposed Development to affect the integrity of any nationally designated site, mitigation measures intended to avoid or reduce any harmful effects of the Proposed Development on nationally designated sites were not required or taken into account.

6.6.1.2 Mitigation Measures for Birds during Construction Stage

Bird species are protected under the Wildlife Acts and it is an offence to disturb birds while on their nests, or to wilfully take, remove, destroy, injure or mutilate their eggs or nests. There is potential for direct impacts on nesting birds and/or mortality of birds (including birds of local importance (higher value)) arising from the Proposed Development. This scenario would be most likely if works were to occur during the time of year when birds are likely to be nesting (which is from 1 March to 31 August, inclusive).

Where feasible, vegetation (e.g. scrub) will not be removed, between the 1 March and the 31 August, to avoid direct impacts on nesting birds. Where the construction programme does not allow this seasonal restriction to be observed, then these areas will be inspected by a suitably qualified ecologist for the presence of breeding birds prior to clearance. Areas found not to contain nests will be cleared within 3 days of the nest survey, otherwise repeat surveys will be required.

Measures to prevent herring gulls nesting on the rooftops of the buildings and pigeons within the buildings may also be undertaken well in advance of breeding bird season. This includes measures such as: -

- Kite hawks to discourage birds from the site.
- A specialist bird proof net to restrict access and prevent gulls from nesting.²⁷
- Blocking up any broken windows/access points into buildings.

These measures must be undertaken by a specialist, and before any birds begin to nest on or in the buildings (i.e. between October – February).

²⁷ Sullivan, I. & Lusby, J. (2021). Wildlife in Buildings: Linking our built and natural heritage. BirdWatch Ireland.

6.6.1.3 Operational Stage

6.6.1.4 Mitigation Measures for Birds during Operational Stage

Mitigation measures are not required as operational phase impacts predicted on bird species as a result of the Proposed Development will be short-term and not significant.

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

This section presents the mitigation measures that will be implemented during construction and operation to avoid the potential impacts of the Proposed Development on KERs as outlined above. All of the mitigation measures will be implemented in full. They are in accordance with best practice, and tried and tested, effective control measures to protect the receiving environment.

6.6.2.1 Mitigation Measures for Designated sites during Construction Stage

6.6.2.1.1 European Sites

As set out in the Appropriate Assessment Screening Report (Scott Cawley Ltd 2022), in concluding that the Proposed Development is not likely to have a significant effect on any European sites, mitigation measures intended to avoid or reduce any harmful effects of the Proposed Development on European sites were not required or taken into account.

6.6.2.1.2 National Sites

As there is no risk of the Proposed Development to affect the integrity of any nationally designated site, mitigation measures intended to avoid or reduce any harmful effects of the Proposed Development on nationally designated sites were not required or taken into account.

6.6.2.2 Mitigation measures for Birds during Construction Stage

Bird species are protected under the Wildlife Acts and it is an offence to disturb birds while on their nests, or to wilfully take, remove, destroy, injure or mutilate their eggs or nests. There is potential for direct impacts on nesting birds and/or mortality of birds (including birds of local importance (higher value) arising from the Proposed Development. This scenario would be most likely if works were to occur during the time of year when birds are likely to be nesting (which is from 1 March to 31 August, inclusive).

Where feasible, vegetation (e.g. scrub) will not be removed, between the 1 March and the 31 August, to avoid direct impacts on nesting birds. Where the construction programme does not allow this seasonal restriction to be observed, then these areas will be inspected by a suitably qualified ecologist for the presence of breeding birds prior to clearance. Areas found not to contain nests will be cleared within 3 days of the nest survey, otherwise repeat surveys will be required.

Measures to prevent herring gulls nesting on the rooftops of the buildings, and pigeons nesting within the buildings, may also be undertaken well in advance of breeding bird season. This includes measures such as:

- Kite hawks to discourage birds from the site.
- A specialist bird proof net to restrict access and prevent gulls from nesting.²⁸
- Blocking up any open/broken windows or access points into the buildings.

These measures must be undertaken by a specialist, and before any birds begin to nest on or in the buildings.

²⁸ Sullivan, I. & Lusby, J. (2021). Wildlife in Buildings: Linking our built and natural heritage. BirdWatch Ireland

6.6.2.3 Mitigation measures for birds Operational Stage

Mitigation measures are not required as operational phase impacts predicted on bird species as a result of the Proposed Development, will be **short-term** and **not significant**.

6.7 RESIDUAL IMPACT

6.7.1 Dublin Central Masterplan

6.7.1.1 Designated Sites

6.7.1.1.1 European Sites

The assessment presented in the Appropriate Assessment Screening Report (Scott Cawley Ltd 2022) concluded that there was no risk of the Proposed Development resulting in a likely significant effect on any European site, either alone or in combination with other plans or projects. Therefore, the Proposed Development is not likely to have significant residual effects on any European sites.

6.7.1.1.2 National sites

There is no risk of the Proposed Development to affect the integrity of any nationally designated site, either alone or in combination with other plans or projects. Therefore, the Proposed Development is not likely to have significant residual effects on any nationally designated sites.

6.7.1.2 Birds

The effects of the Proposed Development on breeding birds have been considered within Section 6.6.2.5 of this chapter. Measures to avoid, reduce and mitigate effects on breeding birds have been provided in Section 6.6.3.2 of this chapter. Following the implementation of these measures, residual effects on breeding birds arising from the Proposed Development will be reduced to levels not considered to be significant.

6.7.1.3 Worst Case Impact

Construction and operational activities are assessed under the best and worst-case operating conditions, to determine all potential impacts associated with the Dublin Central Masterplan.

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

6.7.2.1 Designated Sites

6.7.2.1.1 European Sites

The assessment presented in the Appropriate Assessment Screening Report concluded that there was no risk of the Proposed Development resulting in a likely significant effect on any European site, either alone or in combination with other plans or projects. Therefore, the Proposed Development is not likely to have significant residual effects on any European sites.

6.7.2.1.2 National Sites

There is no risk of the Proposed Development to affect the integrity of any nationally designated site, either alone or in combination with other plans or projects. Therefore, the Proposed Development is not likely to have significant residual effects on any nationally designated sites.

6.7.2.2 Birds

The effects of the Proposed Development on breeding birds have been considered within Section 6.7.2.3 of this chapter. Measures to avoid, reduce and mitigate effects on breeding birds have been provided in Section 6.7.3.2 of this chapter. Following the implementation of these measures, residual effects on breeding birds arising from the Proposed Development will be reduced to levels not considered to be significant.

6.7.2.3 Worst Case Impact

Construction and operational activities are assessed under the best and worst-case operating conditions, to determine all potential impacts associated with the Proposed Development.

6.8 ENHANCEMENT

There are currently no natural habitats within the Proposed Development, as the site is entirely artificial and manmade in nature. Therefore, landscaping elements proposed are enhancing the site, and will provide opportunities for urban wildlife and stepping-stones for animals navigating the human-dominated landscape. The planting proposed for Site 2, will occur across six levels, including level B1, 1, 4, 5, 6, and 7 (See landscape drawings for more information²⁹). The proposed landscape plan includes 239m of planting of Yew *Taxus baccata* across the various levels. This native evergreen plant will provide both privacy screening and noise reduction to the residents of the development, whilst also providing food and shelter for a variety of bird and invertebrate species. This plant can survive heavily shaded areas and in a variety of soils, which adds to its suitability for the Proposed Development.

A number of planting beds are also proposed, including species such as; Meadowsweet *Filipendula ulmaria*, purple moor-grass *Molinia caerulea*, Tennessee coneflower *Echinacea tennesseensis*, giant bellflower *Campanula latifolia*, common hedgenettle *Betonica officinalis*, blue hair grass *Koeleria glauca*, hemp-agrimony *Eupatorium cannabinum*, purple loosestrife *Lythrum salicaria*, great burnet *Sanguisorba officinalis*, apple mint *Mentha suaveolens*, and male fern *Dryopteris affinis*. Whilst not all native species, these species have been chosen as practical alternatives of native species due to their tolerance to shaded areas, and the benefits they provide to a range of invertebrates, specifically for pollinators such as bees, hoverflies, butterflies and moths. Evergreen climbing species Henry's honeysuckle *Lonicera henryi* and Boston ivy *Parthenocissus tricuspidata*, will be planted on level one. Honeysuckle is very effective at attracting pollinating moth species³⁰, which are in turn, preyed upon by bat species. The climbing stems can also be utilized as nesting sites for small bird species. Boston ivy is listed on the *All-Ireland Pollinator Plan 2015-2020* (National Biodiversity Data Centre, 2015), as an ornamental plant recognised to be particularly good for pollinators in Ireland.

6.9 MONITORING

Monitoring will be carried out in accordance with the Landscape Management Plan of the project. Overtime, the proposed landscaping plan will increase the benefits for biodiversity within the site and wider environs. However, monitoring and subsequent management is required to ensure the planting regime is successful and continues to be of benefit to local biodiversity. This may include removal of plants that are failing, and replanting, and/or cutting back any plants that are outcompeting other species.

6.10 REINSTATEMENT

This heading is not considered relevant to this Chapter.

²⁹ Dublin Central, Dublin. Gross Max Landscape Architects (2021)

³⁰ Honeysuckle. Wildlife Trusts. Accessed here: <https://www.wildlifetrusts.org/wildlife-explorer/wildflowers/honeysuckle>

6.11 DIFFICULTIES ENCOUNTERED

It was not possible to fully survey all of the buildings within the Proposed Development boundary internally due to access issues as a result of the Covid 19 pandemic. This is not considered to be a limitation however as the buildings not surveyed internally were not deemed to have any potential for roosting bats. In addition, the absence of any surrounding vegetation, the large amount of disturbance from artificial light and noise, would exclude bats from using the Proposed Development for roosting. The coverage during bat activity surveys was also sufficient enough to identify if there were any bats roosting on site.

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7 LAND, SOIL & GEOLOGY

7.1 INTRODUCTION

This chapter of the Environmental Impact Assessment Report (EIAR) provides an assessment of the impact that the proposed mixed-use developments at the Dublin Central Masterplan and also at Site 2AB, Site 2C and No. 61 O'Connell Street Upper of Dublin Central will have on the surrounding soil and geology in the vicinity of the site. It also sets out mitigation and remedial measures and methods of monitoring once the development is operational.

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

This chapter was completed by Stephen Dent-Neville and Joe Gibbons of Waterman Moylan Consulting Engineers. Stephen is a Chartered Engineer with 8 years' experience and Joe is a Chartered Engineer with 35 years' experience.

7.2 ASSESSMENT METHODOLOGY

A desktop study to classify the geological features related to the site was undertaken. Data from the Geological Survey of Ireland (GSI) was reviewed, including the following maps:

- Bedrock Geology Map
- Bedrock Aquifer Map
- Ground Water Vulnerability Map

This information was supplemented by a review of geotechnical Site Investigations carried out within the Dublin Central site by IGSL in 2008. This comprehensive ground investigation assessed the soil, rock and groundwater conditions across the site and included boreholes, rotary coreholes, piezometers, geophysical surveys, permeability testing and laboratory testing of selected soil and rock samples.

7.3 RECEIVING ENVIRONMENT

The subject development is located in Dublin City Centre. The overall Dublin Central Masterplan site is bounded by Henry Street to the south, O'Connell Street Upper to the east, Parnell Street and O'Rahilly Parade to the north-east and north-west respectively, and Moore Street to the west. Topographic survey data shows that the subject site and the surrounding roads are generally flat, at a level of between 4.85m OD Malin and 5.40m OD Malin.

The site is a brownfield site, comprising of numerous buildings including various retail units, restaurants, offices, and derelict buildings. The subject development will involve a complete redevelopment of the site, though several protected buildings and façades are to be retained, rejuvenated and incorporated into the scheme.

The baseline conditions associated with the Dublin Central Masterplan area are considered to be the same for the individual sites which are subject to this planning application (i.e. Site 2AB, Site 2C and O'Connell Street Upper).

7.3.1 Desktop Study

Geological Survey Ireland (GSI) produces a wide range of datasets, including bedrock geology mapping, extracted in the Figure below.

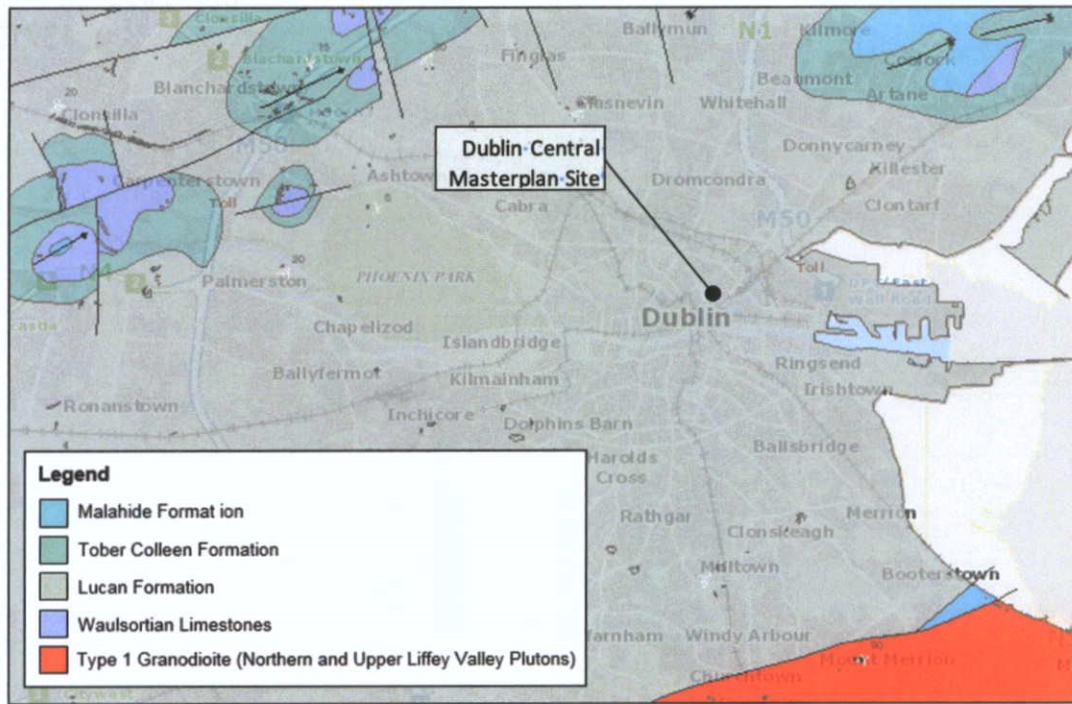


Figure 7.1: Extract from GSI Bedrock Geology Map

The bedrock geology map indicates that most of Dublin City Centre, including the subject site, lies within the Lucan Formation. This formation comprises dark-grey to black, fine-grained, occasionally cherty, micritic limestones that weather paler, usually to pale grey. There are rare dark coarser grained calcarenitic limestones, sometimes graded, and interbedded dark-grey calcar.

The National Aquifer Bedrock Map prepared by the Geological Survey of Ireland was consulted and is extracted below. From this map, it was established that the entirety of the site is within the designation LI, which represents locally important moderately productive aquifer.

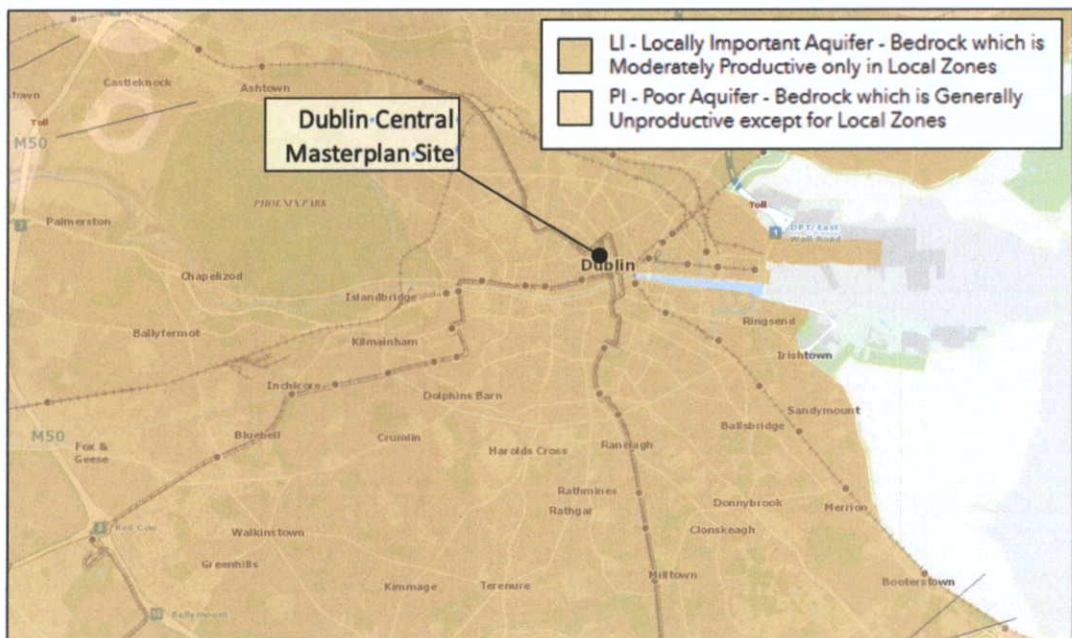


Figure 7.2: Extract from GSI Groundwater Aquifer Map

The vulnerability of the groundwater in the vicinity of the subject site was also examined by referencing the Geological Survey of Ireland, and it was established that the vulnerability of the aquifer is low.

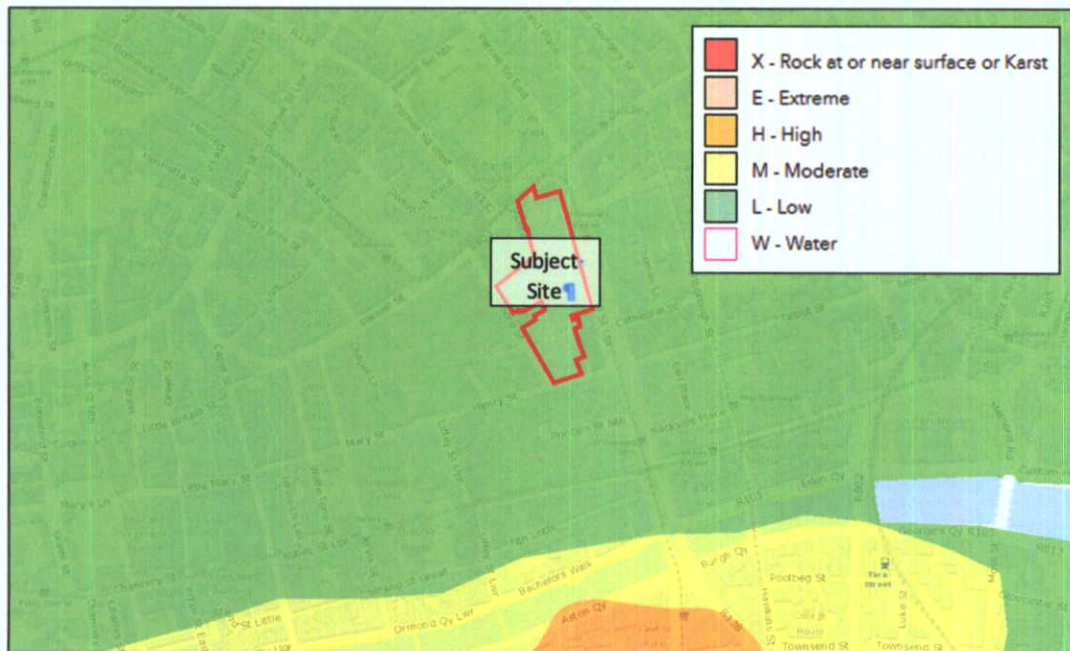


Figure 7.3: Extract from GSI Groundwater Vulnerability Map

7.3.2 Ground Investigations

Intrusive ground investigations carried out at the site in 2008 by IGSL. The scope of the site investigation works carried out at the site comprised the following:

- 10no. shell and auger boreholes on an approximately 50m grid spacing across the site. The boreholes were taken to refusal in dense gravel or very stiff to hard boulder clay over rock.
- 13no. rotary coreholes on taken a minimum of 10m into rock to depths of 30-37m using a special triple-tube coring system with a polymer gel drilling fluid to maximise core recovery in very stiff to hard boulder clay and weathered rock.
- Sealed piezometers in soil and rock to observe groundwater levels across the site and any variations in water level between the gravel aquifer and the bedrock. A total 20no. piezometers were installed in 11no. locations (with multiple piezometers in some boreholes).
- 2no. wells and 2no. observation wells for pump tests were installed in the centre of the site for the purpose of measuring the mass permeability of the gravel and the bedrock.
- In-situ SPT tests and variable head permeability testing in boreholes.
- In-situ packer testing in rotary coreholes to assess the permeability of the rock.
- Downhole optical and acoustic imaging of rock coreholes to determine the in situ characteristics of the rock discontinuities such as joints and fractures to assess the stability of rock slopes and the variability in rock quality and type with depth.
- 2-D geophysical profiles around the perimeter of the excavation to obtain a continuous profile of soil and rock along the line of retaining walls and to obtain advanced parameters for numerical modelling of excavation support systems. This consisted of 2-D seismic refraction surveys and shear velocity (MASW) surveys carried out to an effective depth of 30m. A 2-D Resistivity survey was also carried out through the centre of the site.

- 9no. trial pits carried out at the Nos. 40 – 41 O'Connell Street site to investigate the foundations of existing buildings for underpinning design.
- Laboratory classification and strength testing. This included: -
 - Moisture content and Atterburg limit tests.
 - Particle size distribution tests – wet sieve and hydrometer.
 - Consolidated Undrained Triaxial tests.
 - Bender Element Tests carried out by a specialist laboratory to obtain the small strain stiffness of the boulder clay.
 - pH, sulphate and chloride tests.
 - Uniaxial compressive strength and point load index tests on rock.

Borehole locations are indicated on the Figure below: -

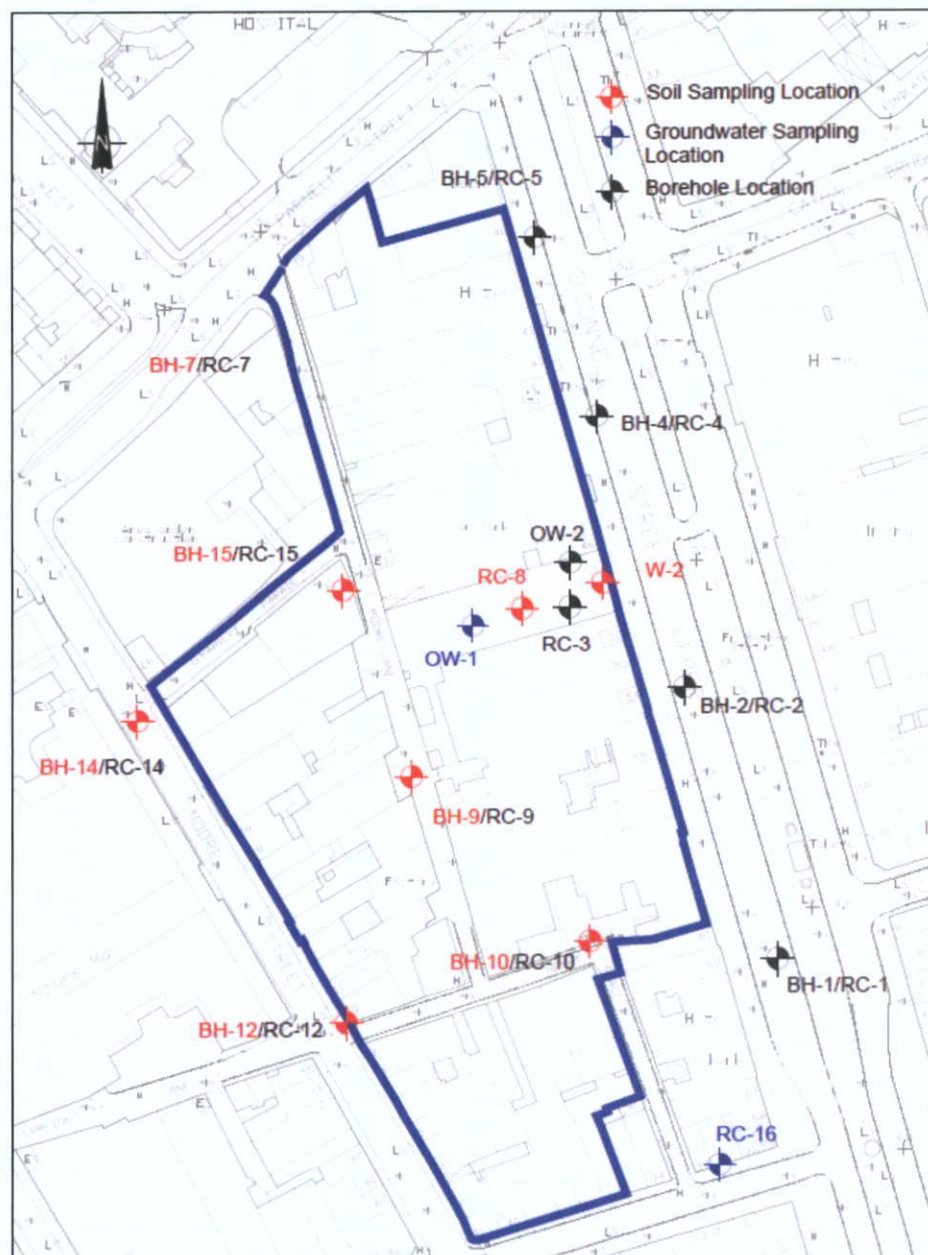


Figure 7.4: Site Investigation Locations.

The ground conditions encountered during the site investigations included made ground immediately below the ground surface between 2m to 5m deep. It was found to be predominantly a gravel with varying proportions of silt, sand and clay. It was also found to be highly variable in strength and stiffness.

Gravel was generally encountered below the fill material, with a high degree of variability in thickness, ranging from about 6m to 21m but thinning out to less than 1m at the corner of Moore Street and Henry Place. The gravel is a medium dense to dense sandy gravel with cobbles and boulders and occasional layers of sand and silt.

The gravel is underlain by Boulder Clay at a depth of 13m to 16m below ground level. The boulder clay is typically a stiff, very stiff or hard stony fine-grained soil which contains varying amounts of gravel, cobbles and boulders. However, some seams of boulder clay were encountered in the gravel at higher levels, and locally at Nos. 40 – 41 O'Connell St. the depth to the top of the Boulder Clay drops to 23.5m. The gravel and boulder clay deposits are water bearing, although the gravel deposits would have a significantly higher permeability.

Bedrock was encountered at depths that varied between 17 and 27m below ground level and comprised interbedded Limestone and Shale with strengths in the range of moderately weak to strong. A thin layer of weathered rock up to 1m thick was occasionally encountered at the upper surface of the bedrock. Weathered seams were also encountered with the Limestone and the Shale.

Waste Acceptance Criteria (WAC) testing was carried out on soil samples. In RC-8 and W-2, the levels of sulphate, total dissolved solids, TPH and PAHs exceeded the inert waste WAC. However all of the levels were less than the non-hazardous WAC. In BH-12, which was located on the southeast perimeter of the site TPH and mercury were detected above the inert waste WAC in the upper fill sample; however the levels of these parameters in the underlying fill and natural ground were less than the inert WAC.

There was no evidence of significant contamination in any of the other samples and the tested parameters, where detected, are at levels generally below the inert WAC.

The groundwater table was found to be between +0.1 and +0.5m OD Malin, within the overburden and the bedrock. Groundwater samples were collected from four groundwater monitoring wells (OW-1 Subsoils, OW-1 Bedrock, RC-16 Subsoils and RC-16 Bedrock) and sent to the STL laboratory in Santry for analysis.

The range of parameters tested included dissolved metals (arsenic, antimony, barium, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, tin and zinc), sodium, chloride, potassium, magnesium, sulphate, sulphide, total hardness, bicarbonate, TPH, BTEX and PAH.

Elevated PAH levels were detected in the groundwater wells immediately to the south but not within the portion of the site where deep excavation will occur.

7.4 CHARACTERISTICS OF PROPOSED DEVELOPMENT

7.4.1 Dublin Central Masterplan

The Dublin Central Masterplan is divided into seven sites. The overall development site is bounded by Henry Street to the south, O'Connell Street Upper to the east, Parnell Street and O'Rahilly Parade to the north-east and north-west respectively, and Moore Street to the west. The development is a mixed-use development, and includes office, hotel, residential, café / restaurant and retail spaces. There is also provision made in Site 2AB and Site 2C for a proposed Metrolink station, to be implemented separately by Transport Infrastructure Ireland (TII).

A breakdown of the schedule of accommodation is shown in the Table below: -

	Site 1	Site 2AB	Site 2C	Site 3	Site 4	Site 5	No. 61	Total
	sq. m	sq. m	sq. m	sq. m	sq. m	sq. m	sq. m	sq. m
Office	3,610	16,804	16,910	-	295	5,799	-	43,418
Hotel	8,094	-	-	7,175	-	-	-	15,270
Residential	-	-	-	6,452	1,454	-	294	8,200
Retail	-	1,810	812	1,954	617	-	-	5,193
Café / Restaurant	-	1,705	473	138	864	679	52	3,876
Cultural / Gallery / Cafe	-	-	-	123	-	-	-	123
Leisure (Gym / Studio)	-	-	-	-	-	-	206	206
Extension to National Monument for ancillary use to National Monument – a cultural facility	-	-	-	-	60	-	-	60
Metro Enabling Works	-	2,388	7,424	-	-	-	-	9,812
Total	11,704	22,707	25,583	15,842	3,290	6,478	552	86,157

Table 7.1: Schedule of Accommodation by Site.

The blocks which form the sites of the Dublin Central Masterplan are highly interconnected, and as such a holistic approach has been taken in preparing this EIAR.

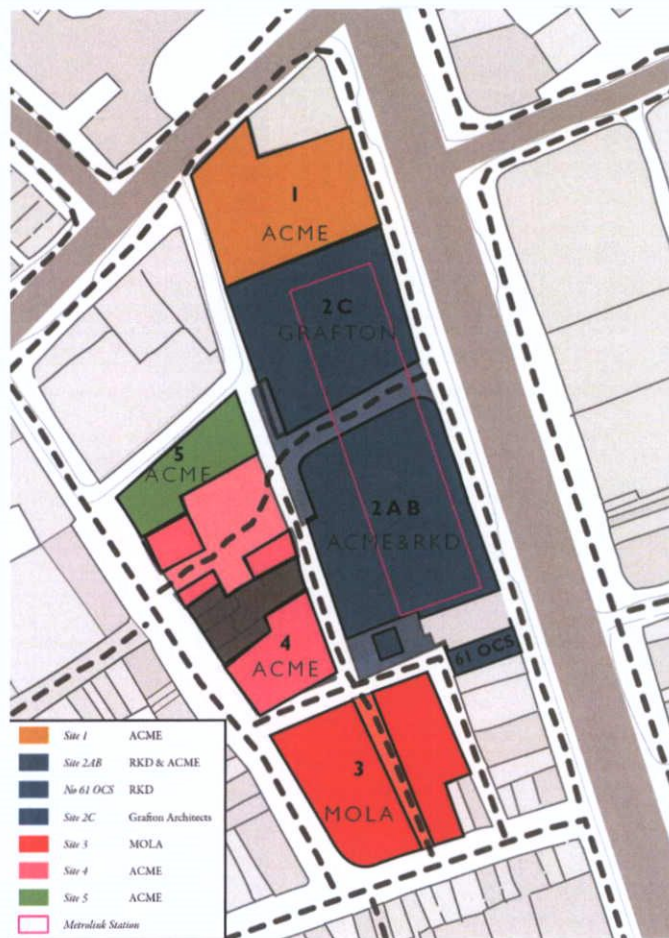


Figure 7.5: Dublin Central Masterplan with each site identified

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

The proposed development includes provision of a new street connecting O'Connell Street and Moore Lane, with Site 2C to the north and Site 2AB to the south of this new street. No. 61 O'Connell Street Upper, to the south of Site 2AB, is also included.

7.4.2.1 Site 2AB

Site 2AB is a mixed use scheme accommodating office, retail and café/restaurant uses in 1no. block ranging in height from 2 to 7 storeys over a new single storey combined basement with Phase 2C. Site 2AB also includes provision of an arcade at ground floor under No. 61 O'Connell Street Upper and a new pocket square.

7.4.2.2 Site 2C

Site 2C accommodates office, retail and café/restaurant uses in a single block, with the Site 2 block ranging in height from 5 to 8 storeys over a new single storey combined basement with Phase 2AB.

7.4.2.3 No. 61 O'Connell Street Upper

It is proposed to carry out refurbishment work to No. 61 O'Connell Street Upper. The proposed refurbishment comprises residential accommodation over 4-storeys, all over the existing single-storey basement. A new pedestrian through-route is proposed at ground floor, linking between O'Connell Street Upper and Henry Place/Moore Lane. A café/restaurant and a retail kiosk are proposed at ground floor level, while the basement is to be utilised as a gym/studio space with changing facilities. An external area to the rear will replace the existing single-storey extension, to provide cycle and refuse storage areas.

7.4.2.4 Metro Enabling Works

The Applicant has agreed a Memorandum of Understanding with the NTA/TII to complete the enabling works that would accommodate the planned future MetroLink O'Connell Street station under Dublin Central Site 2AB and Site 2C. This would also ensure that the Applicant's project is structurally independent of, and not prejudicial to, the TII MetroLink Project. It should be noted that no metro enabling works will be undertaken by the Applicant until the NTA / TII have secured an enforceable railway order.

The Site 2 proposals accommodate a structural box beneath ground floor level that has been designed to accommodate the independent construction and operation of the planned O'Connell Street MetroLink Station by Transport Infrastructure Ireland (TII), including provision of the structural envelope and co-ordinated voids to accommodate station entrances, ventilation and fire escape shafts through this part of the proposed development. These MetroLink Enabling Works (MEW) ensure that the Dublin Central proposed development is structurally independent of, and not prejudicial to, the MetroLink project. This application does not include any request for permission for railway works, the use of railway works or the operation of a railway. The MetroLink project will be the subject of a separate application for Railway Order to be made by TII. In the event that MetroLink project is delayed or does not proceed, the Dublin Central proposed development can be completed, occupied and used regardless. The Dublin Central proposed development is not dependent on the MetroLink project in any way, whether functionally or otherwise. The MetroLink project is not, therefore, part of the project the subject of this application or its accompanying EIAR.

This EIAR describes, in outline, the likely evolution of the current state of the environment (the baseline scenario), both with and without the MetroLink project. This outline has been completed with reasonable effort on the basis of available information, at the date of this application. For this purpose, the potential for the Dublin Central proposed development to impact on a future environment that includes the MetroLink project has been carefully considered, by the Applicant and

TII. The MEW has been designed and incorporated to the Dublin Central proposed development to ensure that it is structurally independent of, and not prejudicial to, the MetroLink project. It follows that the Dublin Central proposed development is not likely to have any significant impact on the MetroLink project to report within this EIAR, or any different effect on the environment, after its evolution to include the MetroLink project.

The likely evolution of the current state of the environment (the baseline scenario) with the MetroLink project involves the excavation of material for construction of the intended station and railway line. The Dublin Central proposed development is not likely to have any significant impact on the MetroLink project to report within this EIAR, or any different effect on the environment, after its evolution to include the MetroLink project.

7.4.2.5 Public Realm Works

The subject Site 2 application includes public realm works to Henry Place, Moore Lane and O'Rahilly Parade, and road opening will be required at Parnell Street to facilitate drainage connection to the existing surface water network.

The Proposed Development of Site 2AB, Site 2C and No. 61 O'Connell Street Upper, including associated Metro Enabling Works and Public Realm Works, with respect to soils and geology, includes the following characteristics: -

- Excavation of basements and foundations.
- Excavation of drainage sewers and utilities.
- Minor regrading and landscaping.
- Disposal of any surplus excavated soils including any contaminated material.

7.5 POTENTIAL IMPACTS

7.5.1 Dublin Central Masterplan

7.5.1.1 Construction Stage

The removal of topsoil during earthworks and the construction of roads, services and buildings, in particular basements and foundations, will expose subsoil to weathering and may result in the erosion of soils during adverse weather conditions. Surface water runoff from the surface of the excavated areas may result in silt discharges to the River Liffey.

Excavations for foundations, remaining roadworks and services will result in a surplus of subsoil. Surplus subsoil will be used in fill areas where applicable.

Dust from the site and from soil spillages on the existing road network around the site may be problematic, especially during dry conditions.

Accidental oil or diesel spillages from construction plant and equipment, in particular at refuelling areas, may result in oil contamination of the soils and underlying geological structures.

7.5.1.2 Operational Stage

During the operational stage of the development it is not envisaged that there will be any ongoing impacts on the underlying soil as a result of the proposed development. Any hydro-geological impacts are temporary and associated with the construction of the proposed development.

7.5.1.3 Do-Nothing Impact

There is no impact on the soils and geology in the do-nothing scenario.

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

7.5.2.1 Construction Stage

The potential impacts of the Proposed Development (Site 2AB, Site 2C and No. 61 O'Connell Street Upper, including associated Metro Enabling Works and Public Realm Works) are the same as the potential impacts of the Dublin Central Masterplan described in Section 7.5.1.1.

7.5.2.2 Operational Stage

The potential impacts of the Proposed Development (Site 2AB, Site 2C and No. 61 O'Connell Street Upper, including associated Metro Enabling Works and Public Realm Works) are the same as the potential impacts of the Dublin Central Masterplan described in Section 7.5.1.2.

7.5.2.3 Do-Nothing Impact

The do-noting impact of the Proposed Development (Site 2AB, Site 2C and No. 61 O'Connell Street Upper, including associated Metro Enabling Works and Public Realm Works) is the same as the do noting impact of the Dublin Central Masterplan described in Section 7.5.1.3.

7.6 MITIGATION MEASURES (AMELIORATIVE, REMEDIAL OR REDUCTIVE MEASURES)

7.6.1 Dublin Central Masterplan

7.6.1.1 Construction Stage

To reduce the quantity of soil to be removed from or imported into the site, the floor levels of the proposed buildings and roads are designed to match existing levels and minimise the cut and fill balance. The number of vehicle movements offsite will be minimised by this optimisation. However, given that there are significant basement areas proposed, including the proposed underground Metrolink station, it is anticipated that there will be a significant surplus of soil to be removed from the site.

Surplus subsoil and rock that may be required to be removed from site will be deposited in approved fill areas or to an approved waste disposal facility. Surplus subsoil will be stockpiled on site, in such a manner as to avoid contamination with builders' waste materials, etc., and so as to preserve the materials for future use as clean fill. A Construction Management Plan will need to include protocols for soil removal and should be implemented by the development's main contractor during the construction stage.

Where contaminated soils are encountered during the works, they will be excavated and disposed of off-site in accordance with the Waste Management Acts, 1998-2006, and associated regulations and guidance provided in Guidelines for the Management of Waste from National Road Construction Projects published by the National Roads Authority in 2008.

The provision of wheel wash facilities at the construction entrances to the development will minimise the amount of soils deposited on the surrounding road network. The adjoining road network will be cleaned on a regular basis, as required, to prevent the build-up of soils from the development site on the existing public roads.

Measures will be implemented throughout the construction stage to prevent contamination of the soil and adjacent watercourses from oil and petrol leakages. Suitable bunded areas will be installed for oil and petrol storage tanks. Designated fuel filling points will be put in place with appropriate oil and petrol interceptors to provide protection from accidental spills. Refuelling will be restricted to these allocated re-fuelling areas. This area is to be an impermeable bunded area designed to contain 110% of the volume of fuel stored.

During excavation works, temporary sumps will be used to collect any surface water run-off thereby avoiding of standing water within the basement and other excavations.

Silt traps, silt fences and tailing ponds will need to be provided by the contractor where necessary to prevent silts and soils being washed away by heavy rains during the course of the construction stage. Surface water runoff and water pumped from the excavation works will be discharged via a silt trap / settlement pond to the existing combined drainage system which discharges to the Dublin Wastewater Treatment Plant at Ringsend. Straw bales will be used at the outfall to filter surface water to remove contaminants.

Dampening down measures with water sprays will be implemented during periods of dry weather to reduce dust levels arising from the development works.

After implementation of the above measures, the proposed development will not give rise to any significant long term adverse impact. Moderate negative impacts during the construction stage will be short term only in duration.

A Construction Management Plan, Traffic Management Plan and Waste Management Plan will be implemented by the contractor during the construction stage to control the above remedial measures.

7.6.1.2 Operational Stage

No mitigation measures for soils or geology will required during the operational stage.

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

7.6.2.1 Construction Stage

The mitigation measures for the Proposed Development (Site 2AB, Site 2C and No. 61 O'Connell Street Upper, including associated Metro Enabling Works and Public Realm Works) are the same as the mitigation measures set out for the Dublin Central Masterplan described in Section 7.6.1.1.

7.6.2.2 Operational Stage

No mitigation measures for soils or geology will required during the operational stage.

7.7 RESIDUAL IMPACT

7.7.1 Dublin Central Masterplan

7.7.1.1 Construction Stage

With the protective measures noted above in place during excavation works, any potential impacts on soils and geology in the area will be minimised.

The Proposed Development will result in a surplus of excavated material, which may contain contaminants. Any contaminated material will be exported to an approved licensed waste facility.

No significant adverse impacts on the soils and geology of the subject lands are envisaged.

7.7.1.2 Operational Stage

During the operational stage, the buildings and public realm will be an urban environment, largely covered in roof and hard standing. Some areas with permeable paving, tree pits and green planting will allow for some surface water to permeate the soil. These SuDS devices treat and improve water quality by trapping suspended solids and filtering pollutants before they enter the soil.

No likely significant adverse impacts are predicted on soils or geology.

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7.7.1.3 Worst Case Impact

The worst case scenario would be for contaminated soils to be encountered during the works. As noted above, any contaminated soils encountered will be excavated and disposed of off-site in accordance with the Waste Management Acts, 1998-2006, and associated regulations and guidance provided in Guidelines for the Management of Waste from National Road Construction Projects published by the National Roads Authority in 2008.

In the worst case scenario, subsoil may be exposed to inclement weather during construction and may result in the erosion of soils. However, with the proposed mitigation measures the quantity of soils exposed and the duration of that exposure will be minimised.

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

7.7.2.1 Construction Stage

The residual impacts for the Proposed Development (Site 2AB, Site 2C and No. 61 O'Connell Street Upper, including associated Metro Enabling Works and Public Realm Works) are the same as the residual impacts described for the Dublin Central Masterplan described in Section 7.7.1.1.

7.7.2.2 Operational Stage

The residual impacts for the Proposed Development (Site 2AB, Site 2C and No. 61 O'Connell Street Upper, including associated Metro Enabling Works and Public Realm Works) are the same as the residual impacts described for the Dublin Central Masterplan described in Section 7.7.1.2.

7.7.2.3 Worst Case Impact

The worst case impact for the Proposed Development (Site 2AB, Site 2C and No. 61 O'Connell Street Upper, including associated Metro Enabling Works and Public Realm Works) are the same as the worst case impact described for the Dublin Central Masterplan described in Section 7.7.1.3.

7.8 MONITORING

7.8.1 Dublin Central Masterplan

7.8.1.1 Construction Stage

Monitoring during the construction stage is recommended, in particular in relation to the following:

- Adequate protection from contamination of soils for removal.
- Monitoring of surface water discharging to the existing drainage network.
- Monitoring cleanliness of the adjoining road network.
- Monitoring measures for prevention of oil and petrol spillages.
- Dust control by dampening down measures close to the boundaries of the site, when required due to unusually dry weather conditions.

7.8.1.2 Operational Stage

During the operational stage, the surface water network (drains, gullies, manholes, AJs, SuDS devices, attenuation system) will need to be regularly maintained and where required cleaned out. A suitable maintenance regime of inspecting and cleaning should be incorporated into the safety file/maintenance manual for the development.

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

7.8.2.1 Construction Stage

The monitoring for the Proposed Development (Site 2AB, Site 2C and No. 61 O'Connell Street Upper, including associated Metro Enabling Works and Public Realm Works) is the same as the monitoring for the Dublin Central Masterplan described in Section 7.8.1.1.

7.8.2.2 Operational Stage

The monitoring for the Proposed Development (Site 2AB, Site 2C and No. 61 O'Connell Street Upper, including associated Metro Enabling Works and Public Realm Works) is the same as the monitoring for the Dublin Central Masterplan described in Section 7.8.1.2.

7.9 REINSTATEMENT

7.9.1 Dublin Central Masterplan

Trenches opened during construction will be backfilled with subsoil to reinstate existing ground levels. Upon completion no impact is foreseen.

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

The reinstatement for the Proposed Development (Site 2, including associated Metro Enabling Works and Public Realm Works) is the same as the reinstatement for the Dublin Central Masterplan described in Section 7.9.1.

7.10 DIFFICULTIES ENCOUNTERED

There were no difficulties encountered when undertaking this assessment.

8 WATER

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8.1 INTRODUCTION

This chapter of the Environmental Impact Assessment Report (EIAR) provides an assessment of the impact that the proposed mixed-use developments at the Dublin Central Masterplan and also at Site 2AB, Site 2C and No. 61 O'Connell Street Upper of Dublin Central will have on the network of water (water supply, foul drainage, surface water) in the vicinity of the site. It also sets out mitigation and remedial measures and methods of monitoring while the development is operational.

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

This chapter was completed by Stephen Dent-Neville and Joe Gibbons of Waterman Moylan Consulting Engineers. Stephen is a Chartered Engineer with 8 years' experience and Joe is a Chartered Engineer with 35 years' experience.

8.2 ASSESSMENT METHODOLOGY

8.2.1 Water Supply

Research for this section included a review of the existing watermain layout from Irish Water / Dublin City Council records for the area.

8.2.2 Foul Water Drainage

Research for this section included a review of the existing foul water layout from Irish Water / Dublin City Council records for the area.

8.2.3 Surface Water Drainage

Research for this section included a review of Ordnance Survey and Topographical surveys of the subject site and surrounding area and a review of the existing surface water layout from Irish Water / Dublin City Council records for the area.

8.3 RECEIVING ENVIRONMENT

8.3.1 Water Supply

There are a number of existing interconnected water supply mains in the vicinity of the Dublin Central Masterplan site, including: -

- A 200mm ductile iron main in Moore Street, constructed in 1986.
- A 350mm ductile iron main in Parnell Street, constructed in 1986.
- A 250mm ductile iron main on the western side of O'Connell Street Upper, constructed in 2006.
- A 12-inch (c. 300mm) cast iron main on the northern side of Henry Street, constructed in 1900.
- A 6-inch (c. 150mm) cast iron main on the southern side of Henry Street, constructed in 1900.
- A 125mm HDPE main in Henry Place, constructed in 2019.
- A 4-inch (c. 100mm) cast iron main in Moore Lane, constructed in 1900.
- A 110mm HPPE main in O'Rahilly Parade, constructed in 2007.

Existing buildings at the subject site are currently fed water by various connections to this existing network.

8.3.2 Foul Water Drainage

The drainage network surrounding the Dublin Central Masterplan site consists of combined foul and surface water sewers. There are a number of existing combined sewers in the vicinity of the subject Dublin Central Masterplan site, including: -

- A brick sewer conveying flows in a southerly direction along Moore Street, varying in size from 2220mm x 1200mm at Parnell Street to the north to 2160mm x 1230mm at Henry Street to the south.
- This brick sewer continues east along Henry Street, where it reduces in size to 1860mm x 730mm.
- A brick sewer conveying flows in a southerly direction along O'Connell Street Upper, varying in size from 1670mm x 970mm near the north-east corner of the site to 2200 x 760 near the south-eastern corner, where it connects with the sewer coming from Henry Street and both continue east away from the site along North Earl Street.
- A 1200mm concrete sewer in Parnell Street flowing west.
- An 810mm x 510mm brick sewer in Henry Place, connected to the Henry Street sewer.
- An 810mm x 510mm brick sewer in Moore Lane flowing south to the sewer in Henry Place.
- A 300mm vitrified clay sewer in Moore Lane, flowing west to the brick sewer in Moore Street.
- A 300mm concrete sewer on the eastern side of O'Rahilly Parade, flowing westwards into a 300mm concrete sewer at the eastern side of O'Rahilly Parade, connected to the Moore Street brick sewer.

Foul and surface water currently run uncontrolled / unattenuated from the Dublin Central Masterplan site, discharging to the existing combined network via several connections.

8.3.3 Surface Water Drainage

The Dublin Central Masterplan site is bounded by Henry Street to the south, O'Connell Street Upper to the east, Parnell Street and O'Rahilly Parade to the north-east and north-west respectively, and Moore Street to the west. The site is generally flat, at a level of approximately 5m OD Malin.

The surrounding drainage network consists of combined foul and surface water sewers, as described in Section 8.3.2 above. Foul and surface water currently run uncontrolled / unattenuated from the subject site, discharging to the existing combined network via several connections.

In addition to this combined network, there are also some separated surface water sewers in the vicinity of the site. There is a 225mm concrete sewer in Parnell Street, increasing to 300mm near the intersection with Dominick Street Lower. There is a 375mm concrete surface water sewer in Henry Street approximately 110m west of the site's southern boundary.

8.4 CHARACTERISTICS OF PROPOSED DEVELOPMENT

8.4.1 Dublin Central Masterplan

The Dublin Central Masterplan site is divided into seven separate sites. The overall development site is bounded by Henry Street to the south, O'Connell Street Upper to the east, Parnell Street and O'Rahilly Parade to the north-east and north-west respectively, and Moore Street to the west. The development is a mixed use development, and includes office, hotel, residential, café / restaurant and retail spaces. There is also provision made in Site 2AB and Site 2C for a proposed Metrolink station, to be implemented separately by Transport Infrastructure Ireland (TII). A breakdown of the schedule of accommodation is shown in the Table below: -

	Site 1	Site 2AB	Site 2C	Site 3	Site 4	Site 5	No. 61	Total
	sq. m	sq. m	sq. m	sq. m	sq. m	sq. m	sq. m	sq. m
Office	3,610	16,804	16,910	-	295	5,799	-	43,418
Hotel	8,094	-	-	7,175	-	-	-	15,270
Residential	-	-	-	6,452	1,454	-	294	8,200
Retail	-	1,810	812	1,954	617	-	-	5,193
Café / Restaurant	-	1,705	473	138	864	679	52	3,876
Cultural / Gallery / Cafe	-	-	-	123	-	-	-	123
Leisure (Gym / Studio)	-	-	-	-	-	-	206	206
Extension to National Monument for ancillary use to National Monument – a cultural facility	-	-	-	-	60	-	-	60
Metro Enabling Works	-	2,388	7,424	-	-	-	-	9,812
Total	11,704	22,707	25,583	15,842	3,290	6,478	552	86,157

Table 8.1: Schedule of Accommodation by 'Site' within the Dublin Central Masterplan.



Figure 8.1: Dublin Central Masterplan with each site identified.

8.4.1.1 Water Supply

It is proposed to supply water to each site within the Dublin Central Masterplan via new metered connections to the existing watermain network.

An estimate of the water demand from the public water supply system for the Dublin Central Masterplan is shown in the Table below. An approximate allocation has been made for the Metrolink project also to provide a more robust assessment of water demand.

The average domestic demand has been established based on an average occupancy ratio of 2.7 persons per dwelling with a daily domestic per capita consumption of 150 litres per head per day and with a 10% allowance factor. Note that the Irish Water Code of Practice assumes 2.7 residents per unit regardless of the unit type. In the case of the subject development, the residential units are studio, 1-bed and 2-bed apartments, so 2.7 persons per unit is considered a very conservative estimate and the actual number of residents will likely be much lower.

The average day / peak week demand has been taken as 1.25 times the average daily domestic demand, while the peak demand has been taken as 5 times the average day / peak week demand, as per Section 3.7.2 of the Irish Water Code of Practice for Water Infrastructure.

Description		Quantity	Total Population	Per Capita Water Demand	Water Demand	Average Demand	Average Peak Demand	Peak Demand
			No. People	l/hd/day	l/day	l/s	l/s	l/s
Office	Staff	1 staff per 10m ² GFA	4,342 Staff	90	429,837	4.975	6.219	31.094
Hotel	Guests	210 Rooms	420 Customers	250	115,500	1.337	1.671	8.355
	Staff	1 staff per 5 rooms	42 Staff	90	4,158	0.048	0.060	0.301
Residential	Residents	97 Apartments	262 Residents	150	43,214	0.500	0.625	3.126
Retail	Customers	1 customer per 5m ² GFA	1,039 Customers	15	17,138	0.198	0.248	1.240
	Staff	1 staff per 15m ² GFA	346 Staff	45	17,138	0.198	0.248	1.240
Café/ Restaurant	Customers	1 customer per 3m ² GFA	1,292 Customers	30	42,632	0.493	0.617	3.084
	Staff	1 staff per 15m ² GFA	258 Staff	45	12,789	0.148	0.185	0.925
Gym/ Studio	Customers	1 customer per 10m ² GFA	21 Customers	30	680	0.008	0.010	0.049
	Staff	1 staff per 30m ² GFA	7 Staff	45	340	0.004	0.005	0.025
Metro	Public Restrooms	2 Toilet Blocks	250 Uses	10	2,750	0.032	0.040	0.199
	Staff	25 Full Time Staff	25 Staff	90	2,475	0.029	0.036	0.179
Total					688,651	7.970	9.963	49.816

Table 8.2: Estimate of the Water Demand for the Dublin Central Masterplan.

Based on these figures, the water demand that will be generated by the Dublin Central Masterplan is approximately 7.970l/s, or 688.651m³ per day.

Irish Water issued a Confirmation of Feasibility letter for the proposal, dated 12 May 2022, which is included in Appendix 8.1 of this report (reference number CDS20006528). The letter notes that connection to the existing water supply network is feasible without the need for any infrastructure upgrade works by Irish Water.

8.4.1.2 Foul Water Drainage

An estimate of the foul water discharge rate from the Dublin Central Masterplan to the public drainage network is shown in the Table below. An approximate allocation has been made for the Metrolink project also to provide a more robust assessment of water demand.

Domestic wastewater loads have been calculated based on 2.7 persons per unit with a per capita wastewater flow of 150 litres per head per day along with a 10% unit consumption allowance, in line with Section 3.6 of the Irish Water Code of Practice for Wastewater Infrastructure. Note that the Irish Water Code of Practice assumes 2.7 residents per unit regardless of the unit type. In the case of the subject development, the residential units are studio, 1-bed and 2-bed apartments, so 2.7 persons per unit is considered a very conservative estimate and the actual number of residents will likely be much lower.

Per capita wastewater flows for the commercial areas have been based on the flow rates set out in Appendix C of the Code of Practice, and a peak flow multiplier of 6 has been used, as per Section 2.2.5 of Appendix B of the Code of Practice.

Description		Quantity	Total Population	Load per Capita	Daily Load	Total DWF	Peak Flow
			No. People	l/hd/day	l/day	l/s	l/s
Office	Staff	1 staff per 10m ² GFA	4,342 Staff	90	429,837	4.975	29.850
Hotel	Guests	210 Rooms	420 Customers	250	115,500	1.337	8.021
	Staff	1 staff per 5 rooms	42 Staff	90	4,158	0.048	0.289
Residential	Residents	97 Apartments	262 Residents	150	43,214	0.500	3.001
Retail	Customers	1 customer per 5m ² GFA	1,039 Customers	15	17,138	0.198	1.190
	Staff	1 staff per 15m ² GFA	346 Staff	45	17,138	0.198	1.190
Café/ Restaurant	Customers	1 customer per 3m ² GFA	1,292 Customers	30	42,632	0.493	2.961
	Staff	1 staff per 15m ² GFA	258 Staff	45	12,789	0.148	0.888
Gym/ Studio	Customers	1 customer per 10m ² GFA	21 Customers	30	680	0.008	0.047
	Staff	1 staff per 30m ² GFA	7 Staff	45	340	0.004	0.024
Metro	Public Restrooms	2 Toilet Blocks	250 Uses	10	2,750	0.032	0.191
	Staff	25 Full Time Staff	25 Staff	90	2,475	0.029	0.172
Total					688,651	7.970	47.823

Table 8.3: Foul Discharge Rate for the Dublin Central Masterplan.

Dry Weather Flow (DWF) from the Development = 7.970 l/s. Peak Flow (6 x DWF) = 47.823 l/s

It is proposed to drain wastewater from each site within the Dublin Central Masterplan via new connections to the existing combined drainage network.

Irish Water issued a Confirmation of Feasibility letter for the proposal, dated 12 May 2022, which is included in Appendix 8.1 of this report (reference number CDS20006528). The letter notes that connection to the existing wastewater network is feasible without the need for any infrastructure upgrade works by Irish Water.

8.4.1.3 Surface Water Drainage

It is proposed to drain surface water from Dublin Central Masterplan site to the existing public surface water sewer at Parnell Street where feasible, and elsewhere to the adjacent combined network.

Dublin Central Masterplan incorporates a Storm Water Management Plan within each Site through the use of various SuDS techniques. Treatment and storage of surface water at source will intercept and slow down the rate of runoff from the site to the existing surface water sewer system.

Based on three key elements, Water Quantity, Water Quality and Amenity, the targets of the SuDS train concept have been implemented in the design. The SuDS devices proposed within and around the individual sites include green and blue roofing, permeable paving, tree pits and planted areas, underground attenuation and flow control devices.

Attenuation storage is provided to limit the discharge rate from the site into the public network. As per the GDSDS, the required attenuation volume is calculated assuming 100% runoff from paved areas, and has been calculated for the 1-year, 30-year and 100-year return periods, identifying the critical storm for each. Surface water runoff will be restricted via a hydro-brake or similar approved flow control device, limited to 2 l/s for each Site.

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

A full description of the development can be found in Chapter 3: Description of Proposed Development of this EIAR. The following is a broad outline of the subject development: -

- The Proposed Development includes provision of a new street connecting O'Connell Street and Moore Lane, with Site 2C to the north and Site 2AB to the south of this new street.
- Site 2AB: Site 2AB is a mixed-use scheme accommodating office, retail and café/restaurant uses in 1no. block ranging in height from 2 to 6 storeys over a new single storey combined basement with Phase 2C. Site 2AB also includes provision of an arcade at ground floor under No. 61 O'Connell Street Upper and a new pocket square.
- Site 2C: Site 2C accommodates office, retail and café/restaurant uses in a single block, with the Site 2 block ranging in height from 5 to 8 storeys over a new single storey combined basement with Phase 2AB.
- No. 61 O'Connell Street Upper: It is proposed to carry out refurbishment work to No. 61 O'Connell Street Upper. The proposed refurbishment comprises residential accommodation over 4-storeys, all over the existing single-storey basement. A new pedestrian through-route is proposed at ground floor, linking between O'Connell Street Upper and Henry Place/Moore Lane. A café/restaurant and a retail kiosk are proposed at ground floor level, while the basement is to be utilised as a gym/studio space with changing facilities. An external area to the rear will replace the existing single-storey extension, to provide cycle and refuse storage areas.
- Metro Enabling Works: The planned MetroLink, to be delivered independently by Transport Infrastructure Ireland (TII), will have a future station under Site 2. The entire combined basement under Sites 2AB and 2C, and the associated site development works, will be provided to enable delivery of the Metro by TII.
- Public Realm Works: The subject Site 2 application includes public realm works to Henry Place, Moore Lane and O'Rahilly Parade, and road opening will be required at Parnell Street to facilitate drainage connection to the existing surface water network.

8.4.2.1 Water Supply

It is proposed to supply water to the subject blocks via new metered connections to the existing watermain network, as indicated on the watermain layout drawings which accompany this submission. Water supply will be provided for each site as follows: -

- **Site 2AB:** It is proposed to provide two new metered water supply connections to serve the development. One connection will be made to the existing 4" (c.100mm) watermain in Moore Lane, to the west of the site. The second connection will be to the existing 125mm HDPE watermain in Henry Place, to the south of the site.
- **Site C:** It is proposed to provide one new metered water supply connection to serve the development, to the existing 4" (c.100mm) watermain in Moore Lane, to the west of the site.
- **No. 61 O'Connell Street Upper:** The proposed refurbishment includes revisions to the internal water supply network within the building. However, no change is proposed to the existing connection to the public network. Water will continue to be supplied to the building via the same connection to the existing 250mm ductile iron main in O'Connell Street Upper.

8.4.2.2 Foul Water Drainage

It is proposed to drain wastewater from the subject development to the existing combined network. Any existing drainage connections at the sites are to be decommissioned, with the existing drain capped from within the site to decommission the pipe. Although the existing drainage infrastructure comprises of combined foul and surface water sewers, private foul and surface water will be drained on completely separate systems throughout the development (refer also to Section 8.4.2.3 below). Foul water will be drained from each site as follows: -

- **Site 2AB:** It is proposed to provide two new 225mm connections to the existing public network, with both connecting to the existing public network in Moore Lane to the west of the site. A new manhole will be constructed at each of the two connection points.
- **Site 2C:** It is proposed to provide one new 225mm connection to the existing public network in Moore Lane to the west of the site. A new manhole will be constructed at the connection point.
- **No. 61 O'Connell Street Upper:** The proposed refurbishment includes revisions to the internal drainage layout within the building. However, no change is proposed to the existing connection to the public network. Foul water will continue to discharge from the site via the same connection to the existing 2,200mm x 760mm foul water sewer in O'Connell Street Upper.

8.4.2.3 Surface Water Drainage

The option to discharge surface water from each site to the public surface water sewers in Henry Street and in Parnell Street were examined. However, given the depths of these existing sewers and given the flat gradients of the surrounding road network, it was determined only to be feasible for Site 2C to discharge to the surface water network. Site 2AB will discharge surface water to the existing combined network.

Under the proposed scheme, surface water discharges will be restricted through the use of flow control devices, and each site will incorporate suitable attenuation for the 1-in-100 year storm. Appropriate Sustainable Drainage System (SuDS) measures are proposed, including the use of green roofs, blue roofs and tree pits. These surface water proposals will significantly reduce the rate of surface water runoff to the existing combined network compared to the current scenario.

Surface water will be drained from each site as follows: -

- **Site 2AB:** Attenuation is to be provided in two adjacent tanks at the basement level. These will be on-line attenuation tanks, with all surface water discharging to the tanks before outfalling by gravity to the existing combined network in O'Connell Street Upper. The shared outfall from the tanks will be fitted with a Hydrobrake or similar approved flow control device limited to the practical minimum rate of 2l/s.
- **Site 2C:** New surface water drains will be laid along Moore Lane adjacent to Site 2C, continuing north to Parnell Street and connecting to the existing surface water sewer in Parnell Street. The final outfall manhole from Site 2C will be fitted with a Hydrobrake or similar approved flow

control device limited to the practical minimum rate of 2l/s. A high-level overflow to an underground attenuation tank will be provided for flows that exceed this limit. The proposed attenuation tank to serve Site 2C is at the second basement level. From here, attenuated water to be pumped back up to the drainage network. The attenuation tank will typically be empty, only filling up during storm events, and similarly the pumps will only be active during storm events when water enters the tank.

- No. 61 O'Connell Street Upper: The proposed refurbishment includes upgrading existing rainwater goods throughout the property to modern standards. However, no change is proposed to the existing connection to the public network. Surface water will continue to discharge from the site via the same connection to the existing 2,200mm x 760mm foul water sewer in O'Connell Street Upper.

8.5 POTENTIAL IMPACTS

8.5.1 Dublin Central Masterplan

8.5.1.1 Water Supply

8.5.1.1.1 Construction Stage

Many of the existing buildings within the Dublin Central Masterplan site are currently occupied and in use. Although there will be some water demand for site offices, commencement of construction will result in a net decrease in the water demand for the site.

There is a risk of contamination to the existing water supply during connection of the individual sites watermains within the Dublin Central Masterplan to the public water supply.

8.5.1.1.2 Operational Stage

During the operational stage of the Dublin Central Masterplan, there will be an increase in demand for water from the public water supply.

8.5.1.2 Foul Water Drainage

8.5.1.2.1 Construction Stage

During the construction of the new foul sewers there is the potential for surface water to be discharged to the existing public foul sewer system due to pipes and manholes being left open.

There is a risk of pollution of groundwater and water courses by accidental spillage of foul effluent during connections being made to live sewers.

8.5.1.2.2 Operational Stage

There will be a net peak foul water flow of 52.776l/s discharging to the foul water system serving the Dublin Central Masterplan site. Foul and surface water currently flow uncontrolled / unattenuated from the Dublin Central Masterplan site to the existing combined network. The proposal will result in a net reduction in flows to the network.

There is a possibility of some surface water ingress into the foul water drainage system due to poor workmanship. There is also a possibility of leakage from sewers and drains within the Dublin Central Masterplan site and along the route to the outfall sewer. Any foul water leakage would result in local contamination of soil and ground waters in the area.

8.5.1.3 Surface Water Drainage

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8.5.1.3.1 Construction Stage

Foul and surface water currently flow uncontrolled / unattenuated from Dublin Central Masterplan site to the existing combined network. The proposal will result in a net reduction in flows to the combined network.

There is a possibility of some surface water ingress into the combined drainage system due to poor workmanship. There is also a possibility of leakage from sewers and drains within the Dublin Central Masterplan site and along the route to the outfall sewer. Any leakage would result in local contamination of soil and ground waters in the area.

8.5.1.3.2 Operational Stage

The development of the Dublin Central Masterplan will result in a net reduction in the runoff volume through the introduction of SuDS devices and in a reduction in the runoff rate through the introduction of flow control devices and attenuation storage. However, the Dublin Central Masterplan site currently discharges surface water to the existing combined network, whereas the Dublin Central Masterplan will discharge from Site 2C to the existing separated surface water network. The increase in the runoff to the surface water network could therefore result in downstream flooding.

The runoff from the roads and hardstanding areas will discharge contaminants, including oils and silts, to the surface water system which might result in polluting of the surface water network.

8.5.1.4 Do-Nothing Impact

In the do-nothing scenario, surface water will continue to flow from the site uncontrolled and unrestricted to the existing combined network.

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

8.5.2.1 Water Supply

The potential impacts on water supply of the Proposed Development (Site 2AB, Site 2C and No. 61 O'Connell Street Upper, including associated Metro Enabling Works and Public Realm Works) are the same as the potential impacts of the Dublin Central Masterplan described in Section 8.5.1.1.

8.5.2.2 Foul Water Drainage

The potential impacts on foul water drainage of the Proposed Development (Site 2AB, Site 2C and No. 61 O'Connell Street Upper, including associated Metro Enabling Works and Public Realm Works) are the same as the potential impacts of the Dublin Central Masterplan described in Section 8.5.1.2.

8.5.2.3 Surface Water Drainage

The potential impacts on surface water drainage of the Proposed Development (Site 2AB, Site 2C and No. 61 O'Connell Street Upper, including associated Metro Enabling Works and Public Realm Works) are the same as the potential impacts of the Dublin Central Masterplan described in Section 8.5.1.3.

8.5.2.4 Do-Nothing Impact

The do-noting impact of the Proposed Development (Site 2AB, Site 2C and No. 61 O'Connell Street Upper, including associated Metro Enabling Works and Public Realm Works) is the same as the do noting impact of the Dublin Central Masterplan described in Section 8.5.1.4.

8.6 MITIGATION MEASURES (AMELIORATIVE, REMEDIAL OR REDUCTIVE MEASURES)

8.6.1 Dublin Central Masterplan

Mitigation measures will be implemented on a site by site basis in line with best practice standards. The relevant mitigation measures for Site 2AB, Site 2C and No. 61 O'Connell Street Upper are set out in Section 8.6.2 below. The same standards will be implemented as part of the development of the other sites within the Dublin Central Masterplan area.

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

8.6.2.1 Water Supply

8.6.2.1.1 Construction Stage

A method statement setting out in detail the procedures to be used when working in the vicinity of existing watermains will be produced by the contractor for any construction works within the vicinity of watermains and for roads or services crossing watermains.

All watermains will be cleaned and tested in accordance with Irish Water guidelines prior to connection to the public watermain.

All connections to the public watermain will be carried out by, or under the supervision of, Irish Water.

Potential negative impacts during construction stage will be short term only.

8.6.2.1.2 Operational Stage

Water meters will be installed at connection points, with locations to be agreed and approved by Irish Water, and these meters will be linked to Irish Water's monitoring system by telemetry. These meters will facilitate the early detection of unusual water usage in the network and identify potential leaks in the system.

All plumbing fixtures and fittings and sanitary wear to be installed within the development should be to the current best practice for water consumption to minimise future water usage.

It is not envisaged that any further remedial or reductive measures will be necessary on completion.

8.6.2.2 Foul Water Drainage

8.6.2.2.1 Construction Stage

In order to reduce the risk of defective or leaking foul sewers, the following remedial measures will be implemented: -

- All new foul sewers will be tested by means of an approved air test during the construction stage in accordance with Irish Waters Code of Practice and Standard Details.
- All private drainage will be inspected and signed off by the design Engineer in accordance with the Building Regulations Part H and BCAR requirements.
- Foul sewers will be surveyed by CCTV to identify possible physical defects.
- The connection of the new foul sewers to the public sewer will be carried out under the supervision of Irish Water and will be checked prior to commissioning.
- Prior to commencement of excavations in public areas, all utilities and public services will be identified and checked, to ensure that adequate protection measures are implemented during the construction stage.

8.6.2.2.2 Operational Stage

All foul drains will be tested and surveyed prior to connection to the public sewers to minimise the risk of uncontrolled ground water penetration or leakage of the foul water to ground water on the site.

Otherwise, no remedial or reductive measures are deemed to be necessary after completion of the development of the Dublin Central Masterplan, other than normal maintenance of the foul sewer system.

8.6.2.3 Surface Water Drainage

8.6.2.3.1 Construction Stage

The contractor will prepare and implement a Construction Management Plan which will outline the requirements for the storage and handling of fuel, including the refuelling of vehicles in designated refuelling zones to minimise the risk of spillages, and the impact of spillages should they occur.

The Construction Management Plan will also utilise sedimentation controls, including silt traps, tailings ponds and silt fences during the construction period.

All private drainage will be inspected and signed off by the design Engineer in accordance with the Building Regulations Part H and Building Control (Amendment) Regulations (BCAR) requirements. This will reduce the possibility of any cross connections being constructed.

8.6.2.3.2 Operational Stage

Surface water will be attenuated privately within each site of the Dublin Central Masterplan, and will discharge to the public network at a controlled rate limited to 2l/s from each site.

In addition, the SuDS devices outlined in Section 8.4.1.3 will reduce and slow down the rate of surface water runoff from each site within the Dublin Central Masterplan. This will minimise peak flows in the downstream system during major storm events. Gullies and the flow control devices shall be regularly maintained to avoid blockages.

The SuDS treatment train will also treat the surface water discharging to the public network, removing pollutants from the surface water runoff. Maintenance of these SuDS devices will be required to ensure that they continue to treat the surface water as designed.

8.7 RESIDUAL IMPACT

8.7.1 Dublin Central Masterplan

8.7.1.1 Water Supply

8.7.1.1.1 Construction Stage

Due to the proposed remedial measures outlined above no significant adverse impacts are expected to arise during the construction stage of the implementation of the Dublin Central Masterplan on the water supply network.

8.7.1.1.2 Operational Stage

There will be a water demand for the implementation of the Dublin Central Masterplan of approximately 760m³ per day. Irish Water will confirm whether the existing network has sufficient capacity, or alternatively will outline any upgrades required to facilitate the development.

8.7.1.2 Foul Water Drainage

8.7.1.2.1 Construction Stage

During the construction stage of implementation of the Dublin Central Masterplan some short term negative impacts as identified above may result. However, if the proposed remedial and reductive measures are implemented, the impact of the implementation of the Dublin Central Masterplan during the construction stage will be minimised and no significant long term impacts will result from the construction works.

8.7.1.2.2 Operational Stage

By removing surface water flows from the combined network, the implementation of the Dublin Central Masterplan will result in a net decrease in the wastewater flows discharging to the existing combined drainage system.

8.7.1.3 Surface Water Drainage

8.7.1.3.1 Construction Stage

During the construction stage of implementation of the Dublin Central Masterplan some short term negative impacts as identified above may result. However, if the proposed remedial and reductive measures are implemented, the impact of the implementation of the Dublin Central Masterplan during the construction stage will be minimised and no significant long term impacts will result from the construction works.

8.7.1.3.2 Operational Stage

With the implementation of the SuDS treatment train, attenuation and flow control, there will be a net improvement in the quality and a net reduction in the quantity of surface water discharging from the individual site within the Dublin Central Masterplan. The proposal to discharge Site 2C to the existing surface water network, rather than the combined network, will result in a significant decrease in flows to the combined network and a net increase in flows to the surface water network.

No significant adverse impacts are envisaged.

8.7.1.4 Worst Case Impact

In the worst case scenario, there could be some surface water ingress into the foul water drainage system due to poor workmanship. Leakage from sewers and drains could result in local contamination of soil and ground waters in the area. The runoff from the roads and hardstanding areas will discharge contaminants, including oils and silts, to the surface water system which might result in polluting of the surface water network. However, with the mitigation measures set out above, the likelihood of these impacts will be minimised, and no significant long term impacts will result from the development.

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

8.7.2.1 Water Supply

The potential impacts on water supply of the Proposed Development (Site 2AB, Site 2C and No. 61 O'Connell Street Upper, including associated Metro Enabling Works and Public Realm Works) are the same as the potential impacts of the Dublin Central Masterplan described in Section 8.7.1.1.

8.7.2.2 Foul Water Drainage

The potential impacts on foul water drainage of the Proposed Development (Site 2AB, Site 2C and No. 61 O'Connell Street Upper, including associated Metro Enabling Works and Public Realm Works) are the same as the potential impacts of the Dublin Central Masterplan described in Section 8.7.1.2.

8.7.2.3 Surface Water Drainage

The potential impacts on surface water drainage of the Proposed Development (Site 2AB, Site 2C and No. 61 O'Connell Street Upper, including associated Metro Enabling Works and Public Realm Works) are the same as the potential impacts of the Dublin Central Masterplan described in Section 8.7.1.3.

8.7.2.4 Worst Case Impact

The worst case impact of the Proposed Development (Site 2AB, Site 2C and No. 61 O'Connell Street Upper, including associated Metro Enabling Works and Public Realm Works) is the same as the do noting impact of the Dublin Central Masterplan described in Section 8.5.1.4.

8.8 MONITORING

8.8.1 Dublin Central Masterplan

Monitoring will be implemented on a site by site basis in line with best practice standards. The relevant mitigation measures for Site 2AB and Site 2C are set out in Section 8.8.2 below. The same standards will be implemented as part of the development of the other sites within the Dublin Central Masterplan area.

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

8.8.2.1 Water Supply

Water usage and potential leakage will be monitored by Irish Water using the water meters which will be installed on the supply pipes so that the development can be monitored in sections. The location of these meters will be agreed with Irish Water and the meters will be linked to Irish Water's monitoring system via telemetry.

8.8.2.2 Foul Water Drainage

Following completion of construction of the Dublin Central Masterplan there are no monitoring requirements envisaged other than normal monitoring and maintenance of the wastewater system by Irish Water.

8.8.2.3 Surface Water Drainage

The surface water network (drains, gullies, manholes, AJs, SuDS devices, attenuation systems) will need to be regularly maintained and where required cleaned out. A suitable maintenance regime of inspecting and cleaning shall be incorporated into the safety file/maintenance manual for the Dublin Central Masterplan.

8.9 REINSTATEMENT

8.9.1 Dublin Central Masterplan

Any existing roads and footpaths that are opened to facilitate water supply, foul water drainage and surface water drainage connections will be reinstated.

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

The reinstatement for the Proposed Development (Site 2AB, Site 2C and No. 61 O'Connell Street Upper, including associated Metro Enabling Works and Public Realm Works) is the same as the reinstatement for the Dublin Central Masterplan described in Section 7.9.1.

8.10 DIFFICULTIES ENCOUNTERED

There were no difficulties encountered when undertaking this assessment.

9 CLIMATE (AIR QUALITY & CLIMATE CHANGE)

9.1 INTRODUCTION

This chapter assesses the likely air quality and climate impacts associated with the Proposed Development at O'Connell Street, Dublin 1. The Proposed Development which is the subject of this planning application consists of Site 2 and No. 61 O'Connell Street Upper. Dublin Central is underpinned by a Masterplan which will be assessed also. A full description of the development is available in Chapter 3: Description of Proposed Development.

This chapter was completed by Ciara Nolan, an environmental consultant in the air quality section of AWN Consulting Ltd. She holds an MSc. (First Class) in Environmental Science from University College Dublin and has also completed a BSc. in Energy Systems Engineering. She is an Associate Member of both the Institute of Air Quality Management (AMIAQM) and the Institution of Environmental Science (AMIEEnvSc). She has been active in the field of air quality for over 5 years, with a primary focus on consultancy.

9.2 ASSESSMENT METHODOLOGY

9.2.1 Criteria for Rating of Impacts

9.2.1.1 Ambient Air Quality Standards

In order to reduce the risk to health from poor air quality, national and European statutory bodies have set limit values in ambient air for a range of air pollutants. These limit values or "Air Quality Standards" are health or environmental-based levels for which additional factors may be considered. For example, natural background levels, environmental conditions and socio-economic factors may all play a part in the limit value which is set (see Table 9.1 and Appendix 9.1).

Air quality significance criteria are assessed on the basis of compliance with the appropriate standards or limit values. The applicable standards in Ireland include the Air Quality Standards Regulations 2011 (S.I. no. 180 of 2011), which incorporate EU Directive 2008/50/EC, which has set limit values for a number of pollutants. The limit values for NO₂, PM₁₀ and PM_{2.5} are relevant to this assessment (see Table 9.1). Although the EU Air Quality Limit Values are the basis of legislation, other thresholds outlined by the EU Directives are used which are triggers for particular actions (see Appendix 9.1).

Pollutant	Regulation ^{Note 1}	Limit Type	Value
Nitrogen Dioxide	2008/50/EC	Hourly limit for protection of human health – not to be exceeded more than 18 times / year.	200 µg/m ³
		Annual limit for protection of human health.	40 µg/m ³
		Critical level for protection of vegetation.	30 µg/m ³ NO + NO ₂
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 µg/m ³
		Annual limit for protection of human health.	40 µg/m ³
Particulate Matter (as PM _{2.5})	2008/50/EC	Annual limit for protection of human health.	25 µg/m ³

^{Note 1} EU 2008/50/EC – Clean Air For Europe (CAFÉ) Directive replaces the previous Air Framework Directive (1996/30/EC) and daughter directives 1999/30/EC and 2000/69/EC.

Table 9.1: Air Quality Standards Regulations.

9.2.1.2 Dust Deposition Guidelines

The concern from a health perspective is focussed on particles of dust which are less than 10 microns (PM₁₀) and less than 2.5 microns (PM_{2.5}) and the EU ambient air quality standards outlined in Table 9.1 have set ambient air quality limit values for PM₁₀ and PM_{2.5}.

With regards to larger dust particles that can give rise to nuisance dust, there are no statutory guidelines regarding the maximum dust deposition levels that may be generated during the construction phase of a development in Ireland. Furthermore, no specific criteria have been stipulated for nuisance dust in respect of this development.

With regard to dust deposition, the German TA-Luft standard for dust deposition (non-hazardous dust) (German VDI, 2002) sets a maximum permissible emission level for dust deposition of 350 mg/(m²*day) averaged over a one year period at any receptors outside the site boundary. Recommendations from the Department of the Environment, Heritage & Local Government (DEHLG, 2004) apply the Bergerhoff limit of 350 mg/(m²*day) to the site boundary of quarries. This limit value can also be implemented with regard to dust impacts from construction of the Proposed Development.

9.2.1.3 Climate Agreements

Ireland is party to both the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol. The Paris Agreement, which entered into force in 2016, is an important milestone in terms of international climate change agreements and includes an aim of limiting global temperature increases to no more than 2°C above pre-industrial levels with efforts to limit this rise to 1.5°C. The aim is to limit global GHG emissions to 40 gigatonnes as soon as possible whilst acknowledging that peaking of GHG emissions will take longer for developing countries. Contributions to GHG emissions will be based on Intended Nationally Determined Contributions (INDCs) which will form the foundation for climate action post 2020. Significant progress was also made in the Paris Agreement on elevating adaptation onto the same level as action to cut and curb emissions.

In order to meet the commitments under the Paris Agreement, the EU enacted *Regulation (EU) 2018/842 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No. 525/2013* (the Regulation). The Regulation aims to deliver, collectively by the EU in the most cost-effective manner possible, reductions in GHG emissions from the Emission Trading Scheme (ETS) and non-ETS sectors amounting to 43% and 30%, respectively, by 2030 compared to 2005. Ireland's obligation under the Regulation is a 30% reduction in non-ETS greenhouse gas emissions by 2030 relative to its 2005 levels.

In 2015, the Climate Action and Low Carbon Development Act 2015 (No. 46 of 2015) (Government of Ireland, 2015) was enacted (the Act). The purpose of the Act was to enable Ireland 'to pursue, and achieve, the transition to a low carbon, climate resilient and environmentally sustainable economy by the end of the year 2050' (3.(1) of No. 46 of 2015). This is referred to in the Act as the 'national transition objective'. The Act made provision for a national mitigation plan, and a national adaptation framework. In addition, the Act provided for the establishment of the Climate Change Advisory Council with the function to advise and make recommendations on the preparation of the national mitigation and adaptation plans and compliance with existing climate obligations.

The first Climate Action Plan (CAP) was published by the Irish Government in June 2019 (Government of Ireland, 2019a). The Climate Action Plan 2019 outlined the current status across key sectors including Electricity, Transport, Built Environment, Industry and Agriculture and outlined the various broadscale measures required for each sector to achieve ambitious decarbonisation targets. The 2019 CAP also detailed the required governance arrangements for implementation including carbon-proofing of policies, establishment of carbon budgets, a strengthened Climate Change Advisory Council and greater accountability to the Oireachtas. The Government published the second Climate Action Plan in November 2021 (Government of Ireland, 2021a). The plan contains similar elements as the 2019 CAP and aims to set out how Ireland can reduce our greenhouse gas emissions by 51% by 2030 (compared to 2018 levels) which is in line with the EU ambitions, and a longer-term goal of to

achieving net-zero emissions no later than 2050. The 2021 CAP outlines that emissions from the Built Environment sector must be reduced to 4 – 5 MtCO₂e by 2030 in order to meet our climate targets. This will require further measures in addition to those committed to in the 2019 CAP. This will include phasing out the use of fossil fuels for the space and water heating of buildings, improving the fabric and energy of our buildings, and promoting the use of lower carbon alternatives in construction.

Following on from Ireland declaring a climate and biodiversity emergency in May 2019 and the European Parliament approving a resolution declaring a climate and environment emergency in Europe in November 2019, the Government approved the publication of the General Scheme for the Climate Action (Amendment) Bill 2019 in December 2019 (Government of Ireland, 2019) followed by the publication of the Climate Action and Low Carbon Development (Amendment) Act 2021 (hereafter referred to as the 2021 Climate Act) in July 2021 (Government of Ireland, 2021b). The 2021 Climate Act was prepared for the purposes of giving statutory effect to the core objectives stated within the CAP.

The purpose of the 2021 Climate Act is to provide for the approval of plans '*for the purpose of pursuing the transition to a climate resilient, biodiversity rich and climate neutral economy by no later than the end of the year 2050*'. The 2021 Climate Act will also '*provide for carbon budgets and a decarbonisation target range for certain sectors of the economy*'. The 2021 Climate Act defines the carbon budget as '*the total amount of greenhouse gas emissions that are permitted during the budget period*'. The 2021 Climate Act removes any reference to a national mitigation plan and instead refers to both the Climate Action Plan, as published in 2019, and a series of National Long Term Climate Action Strategies. In addition, the Environment Minister shall request each local authority to make a 'local authority climate action plan' lasting five years and to specify the mitigation measures and the adaptation measures to be adopted by the local authority.

The Dublin City Council Climate Change Action Plan published in 2019 (Dublin City Council and Codema, 2019) outlines a number of goals and plans to prepare for and adapt to climate change. There are five key action areas within the plan: energy and buildings, transport, flood resilience, nature-based solutions and resource management. Some of the measures promoted within the Action Plan under the 5 key areas involve building retrofits, energy master-planning, development of segregated cycle routes, the promotion of bike share schemes, development of flood resilient designs, promotion of the use of green infrastructure and water conservation initiatives. The implementation of these measures will enable the Dublin City Council area to adapt to climate change and will assist in bringing Ireland closer to achieving its climate related targets in future years. New developments need to be cognisant of the Action Plan and incorporate climate friendly designs and measures where possible.

9.2.2 Construction Phase

9.2.2.1 Air Quality

The Institute of Air Quality Management in the UK (IAQM) guidance document '*Guidance on the Assessment of Dust from Demolition and Construction*' (2014) outlines an assessment method for predicting the impact of dust emissions from demolition, earthworks, construction and haulage activities based on the scale and nature of the works and the sensitivity of the area to dust impacts. The IAQM methodology has been applied to the construction phase of this development in order to predict the likely risk of dust impacts in the absence of mitigation measures and to determine the level of site specific mitigation required. The use of UK guidance is considered best practice in the absence of applicable Irish guidance.

The major dust generating activities are divided into four types within the IAQM guidance (2014) to reflect their different potential impacts. These are: -

- Demolition.
- Earthworks.
- Construction.
- Trackout (movement of heavy vehicles).

The magnitude of each of the four categories is divided into Large, Medium or Small scale depending on the nature of the activities involved. These are described below for each category as per the IAQM guidance (2014).

Demolition

Demolition will primarily involve the removal of buildings or structures currently on the site in a potentially dusty manner. This may also involve dust generation at heights. Dust emission magnitude from demolition can be classified as small, medium and large and are described below: -

- **Large:** Total building volume $>50,000\text{m}^3$, potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities $>20\text{m}$ above ground level.
- **Medium:** Total building volume $20,000\text{m}^3 - 50,000\text{m}^3$, potentially dusty construction material, demolition activities $10 - 20\text{m}$ above ground level.
- **Small:** Total building volume less than $20,000\text{m}^3$.

Earthworks

Earthworks typically involve excavating material, loading and unloading of materials, tipping and stockpiling activities. Activities such as levelling the site and landscaping works are also considered under this category. Dust emission magnitude from earthworks can be classified as small, medium and large and are described below: -

- **Large:** Total site area $> 10,000\text{m}^2$, potentially dusty soil type (e.g. clay which will be prone to suspension when dry due to small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds $>8\text{m}$ in height, total material moved $>100,000$ tonnes.
- **Medium:** Total site area $2,500\text{m}^2 - 10,000\text{m}^2$, moderately dusty soil type (e.g. silt), $5 - 10$ heavy earth moving vehicles active at any one time, formation of bunds $4 - 8\text{m}$ in height, total material moved $20,000 - 100,000$ tonnes.
- **Small:** Total site area $<2,500\text{m}^2$, soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds $< 4\text{m}$ in height, total material moved $<20,000$ tonnes, earthworks during wetter months.

Construction

Dust emission magnitude from construction can be classified as small, medium or large based on the definitions from the IAQM guidance as transcribed below: -

- **Large:** Total building volume $>100,000\text{m}^3$, on-site concrete batching, sandblasting.
- **Medium:** Total building volume $25,000\text{m}^3 - 100,000\text{m}^3$, potentially dusty construction material (e.g. concrete), on-site concrete batching.
- **Small:** Total building volume $<25,000\text{m}^3$, construction material with low potential for dust release (e.g. metal cladding or timber).

Trackout

Factors which determine the dust emission magnitude associated with trackout are vehicle size, vehicle speed, number of vehicles, road surface material and duration of movement. Dust emission magnitude from trackout can be classified as small, medium or large based on the definitions from the IAQM guidance as transcribed below: -

- **Large:** >50 HGV ($>3.5\text{t}$) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length $>100\text{m}$.

- **Medium:** 10 – 50 HGV (>3.5 t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 – 100 m.
- **Small:** <10 HGV (>3.5 t) outward movements in any one day, surface material with low potential for dust release, unpaved road length <50 m.

The magnitude of each activity is combined with the overall sensitivity of the area to determine the risk of dust impacts from site activities. This allows the level of site specific mitigation to be determined.

Construction phase traffic also has the potential to impact air quality and climate. The UK Highways Agency Design Manual for Roads and Bridges (DMRB) guidance (UK Highways Agency, 2019a), states that road links meeting one or more of the following criteria can be defined as being 'affected' by a Proposed Development and should be included in the local air quality assessment. The use of the UK guidance is recommended by the TII (2011) in the absence of specific Irish guidance, this approach is considered best practice and can be applied to any development that causes a change in traffic.

- Annual average daily traffic (AADT) changes by 1,000 or more.
- Heavy duty vehicle (HDV) AADT changes by 200 or more.
- A change in speed band.
- A change in carriageway alignment by 5m or greater.

In addition, the impact of construction activities on vehicle movements shall be assessed where construction activities are programmed to last for more than 2 years (UK Highways Agency, 2019a). The construction phase of the Proposed Development will last for over 2 years, in addition, the traffic associated with the overall Dublin Central Masterplan will increase the construction phase HDV AADT by over 200 on certain roads.

As a result, the impact of construction phase traffic emissions on local air quality was investigated using the UK Highways Agency DMRB screening model (2007). Air dispersion modelling of NO₂ emissions was undertaken for the worst case construction year of 2025. Only modelling of NO₂ was undertaken in detail as per the UK Highways Agency guidance (2019a). The traffic data used in the modelling assessment was obtained from Waterman Moylan, the consulting engineers on this project and is detailed in Table 9.2 below. Modelling was undertaken at 2 worst-case sensitive receptors within 200m of the impacted road links as per the DMRB guidance (UK Highways Agency, 2019a). These receptors are the Rotunda Hospital (R1) and an apartment building on the corner of Moore Street and Parnell Street (R2).

Road Name	Speed (kph)	% HGV	Do Nothing AADT	Do Something AADT
			Construction Year 2025	
Link 7 (Parnell St, east of Moore St)	30	2%	13,309	13,552
Link 9 (Parnell St, west of Moore St)	30	2%	13,309	13,552

Table 9.2: Construction Phase Traffic Data used in Air Quality Assessment

9.2.2.2 Climate

The impact of the construction phase of the development on climate was determined by a qualitative assessment of the nature and scale of greenhouse gas generating construction activities associated with the Proposed Development.

9.2.3 Operational Phase

9.2.3.1 Air Quality

Operational phase traffic has the potential to impact local air quality as a result of increased vehicle movements associated with the Proposed Development. The UK Highways Agency DMRB scoping criteria detailed in Section 9.2.2.1 was used to determine if any road links are affected by the Proposed Development and require inclusion in a detailed air dispersion modelling assessment. As there is minimal car parking associated with the Proposed Development it is not predicted to significantly change the existing traffic on the nearby road links. Therefore, according to the DMRB scoping criteria in section 9.2.2.1 none of the local road links can be classed as 'affected' and detailed air dispersion modelling of operational phase traffic emissions is not required as there is no potential for significant impacts to air quality.

9.2.3.2 Climate

Ireland has annual GHG targets which are set at an EU level and need to be complied with in order to reduce the impact of climate change. Impacts to climate as a result of GHG emissions are assessed against the targets set out by the EU under *Regulation (EU) 2018/842 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No. 525/2013*. Which has set a target of a 30% reduction in non-ETS sector emissions by 2030 relative to 2005 levels.

As per the EU guidance document *Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment* (European Commission, 2013) the climate baseline is first established by reference to EPA data on annual GHG emissions (see Section 9.3.3). Thereafter the impact of the Proposed Development on climate is determined. Emissions from road traffic associated with the Proposed Development have the potential to emit carbon dioxide (CO₂) which will impact climate.

The UK Highways Agency has published an updated DMRB guidance document in relation to climate impact assessments *LA 114 Climate*. The following scoping criteria are used to determine whether a detailed climate assessment is required for a proposed project during the operational stage. During the operational phase, if any of the road links impacted by the Proposed Development meet the below criteria then further assessment is required.

- A change of more than 10% in AADT.
- A change of more than 10% to the number of heavy duty vehicles.
- A change in daily average speed of more than 20 km/hr.

The Proposed Development will not increase traffic by more than 10% AADT on any nearby road links, therefore, none of the above scoping criteria are met and a detailed climate assessment is not required as there is no potential for significant impacts to climate as a result of traffic emissions.

The EU guidance (2013) also states indirect GHG emissions as a result of a development must be considered, this includes emissions associated with energy usage. The Energy & Sustainability Statement, prepared by BDP M&E Consulting Engineers in relation to the Proposed Development has been reviewed and used to inform the operational phase climate assessment. This report outlines a number of measures in relation to energy usage from the Proposed Development primarily in relation to heat and electricity. A number of measures have been incorporated into the overall design of the development to reduce the impact to climate where possible.

9.3 RECEIVING ENVIRONMENT

The receiving environment in terms of air quality and climate is the same for the Dublin Central Masterplan and each individual site of the development. Therefore, the following sections detail the existing air quality and climate environment and do not differentiate between the Dublin Central

Masterplan or the individual site of the Proposed Development being assessed within this EIAR chapter.

9.3.1 Meteorological Conditions

A key factor in assessing temporal and spatial variations in air quality is the prevailing meteorological conditions. Depending on wind speed and direction, individual receptors may experience very significant variations in pollutant levels under the same source strength (i.e. traffic levels) (World Health Organisation, 2006). Wind is of key importance in dispersing air pollutants and for ground level sources, such as traffic emissions, pollutant concentrations are generally inversely related to wind speed. Thus, concentrations of pollutants derived from traffic sources will generally be greatest under very calm conditions and low wind speeds when the movement of air is restricted. In relation to PM₁₀, the situation is more complex due to the range of sources of this pollutant. Smaller particles (less than PM_{2.5}) from traffic sources will be dispersed more rapidly at higher wind speeds.

However, fugitive emissions of coarse particles (PM_{2.5} – PM₁₀) will actually increase at higher wind speeds. Thus, measured levels of PM₁₀ will be a non-linear function of wind speed.

The nearest representative weather station collating detailed weather records is Dublin Airport, which is located approximately 8 km north of the site. Dublin Airport met data has been examined to identify the prevailing wind direction and average wind speeds over a five-year period (see Figure 9.1). For data collated during five representative years (2016 – 2020), the predominant wind direction is westerly to south-westerly with a mean wind speed of 5.5 m/s over the period 1981 – 2010 (Met Eireann, 2021).

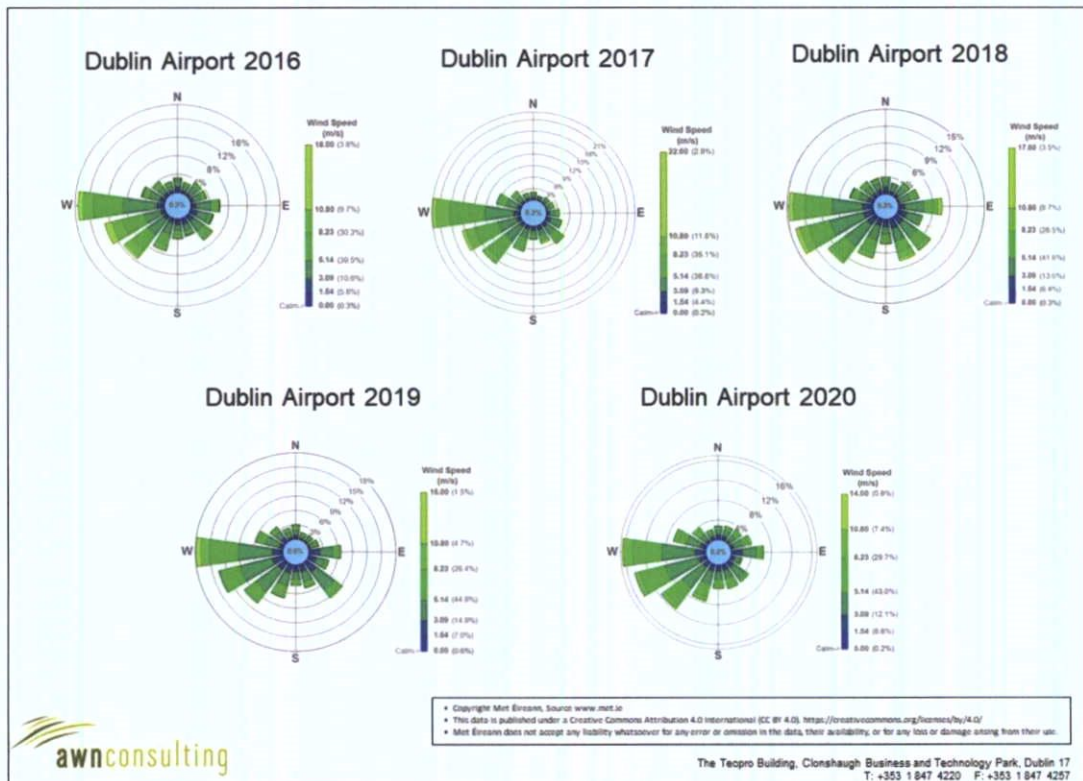


Figure 9.1: Dublin Airport Windrose 2016 – 2020.

9.3.2 Baseline Air Quality

Air quality monitoring programs have been undertaken in recent years by the EPA and Local Authorities. The most recent annual report on air quality in Ireland is “Air Quality In Ireland 2020”

(EPA, 2021a). The EPA website details the range and scope of monitoring undertaken throughout Ireland and provides both monitoring data and the results of previous air quality assessments (EPA, 2021a).

As part of the implementation of the Air Quality Standards Regulations 2002 (S.I. No. 271 of 2002), four air quality zones have been defined in Ireland for air quality management and assessment purposes (EPA, 2021a). Dublin is defined as Zone A and Cork as Zone B. Zone C is composed of 23 towns with a population of greater than 15,000. The remainder of the country, which represents rural Ireland but also includes all towns with a population of less than 15,000, is defined as Zone D.

In terms of air monitoring and assessment, the Proposed Development site is within Zone A (EPA, 2020a). The long-term monitoring data has been used to determine background concentrations for the key pollutants in the region of the Proposed Development. The background concentration accounts for all non-traffic derived emissions (e.g. natural sources, industry, home heating etc.).

In 2020 the EPA reported (EPA, 2021a) that Ireland was compliant with EU legal air quality limits at all locations, however this was largely due to the reduction in traffic due to Covid-19 restrictions. The EPA *Air Quality in Ireland 2020* report details the effect that the Covid-19 restrictions had on air monitoring stations, which included reductions of up to 50% at some monitoring stations which have traffic as a dominant source. The report also notes that CSO figures show that while traffic volumes are still slightly below 2019 levels, they have significantly increased since 2020 levels. 2020 concentrations are therefore predicted to be an exceptional year and not consistent with long-term trends. For this reason, they have not been included in the baseline section and previous long-term data has been used to determine baseline levels of pollutants in the vicinity of the Proposed Development.

Long-term NO₂ monitoring was carried out at the Zone A suburban locations of Rathmines, Ballyfermot, Dun Laoghaire and Swords and the urban location of Winetavern Street for the period 2015 - 2019 (EPA, 2020a). Long term average concentrations are significantly below the annual average limit of 40 µg/m³ for both the urban and suburban locations. Average results range from 13 – 22 µg/m³ for the suburban background locations and from 27 – 37 µg/m³ for the urban location of Winetavern Street. The NO₂ annual average for this five year period suggests an upper average limit of no more than 22 µg/m³ (Table 9.3) as a background concentration for the suburban locations. Based on the above information and having regard to the Proposed Developments location within Dublin City Centre, a conservative estimate of the current background NO₂ concentration for the region of the Proposed Development is 25 µg/m³.

Station	Station Classification	Averaging Period ^{Note 1}	Year				
			2015	2016	2017	2018	2019
Rathmines	Suburban Background	Annual Mean NO ₂ (µg/m ³)	18	20	17	20	22
		99.8 th %ile 1-hr NO ₂ (µg/m ³)	105	88	86	87	102
Ballyfermot	Suburban Background	Annual Mean NO ₂ (µg/m ³)	16	17	17	17	20
		99.8 th %ile 1-hr NO ₂ (µg/m ³)	127	90	112	101	101
Dun Laoghaire	Suburban Background	Annual Mean NO ₂ (µg/m ³)	16	19	17	19	15
		99.8 th %ile 1-hr NO ₂ (µg/m ³)	91	105	101	91	91
Swords	Suburban Background	Annual Mean NO ₂ (µg/m ³)	13	16	14	16	15
		99.8 th %ile 1-hr NO ₂ (µg/m ³)	93	96	79	85	80
Winetavern Street	Urban Traffic	Annual Mean NO ₂ (µg/m ³)	31	37	27	29	28
		99.8 th %ile 1-hr NO ₂ (µg/m ³)	128	120	110	115	115

Note 1 Annual average limit value of 40 µg/m³ and hourly limit value of 200 µg/m³ (EU Council Directive 2008/50/EC & S.I. No. 180 of 2011).

Table 9.3: Trends in Zone A Air Quality – NO₂

Continuous PM₁₀ monitoring was carried out at the Zone A locations of Winetavern Street, Rathmines, Dun Laoghaire, Ballyfermot and Phoenix Park from 2015 – 2019. These showed an upper average limit of no more than 15 µg/m³ (Table 9.4). Levels range from 9 – 16 µg/m³ over the five year period with at most 9 exceedances of the 24-hour limit value of 50 µg/m³ in Rathmines and Winetavern Street in 2019 (35 exceedances are permitted per year) (EPA, 2020a). Sufficient data is available for the urban background location in the Phoenix Park to observe long-term trends in the data. Data from 2015 – 2019 suggests an upper average annual mean value of at most 12 µg/m³ as a background concentration at the Phoenix Park location. Based on the EPA data, a conservative estimate of the current background PM₁₀ concentration in the region of the Proposed Development is 15 µg/m³.

Station	Station Classification	Averaging Period	Year				
			2015	2016	2017	2018	2019
Ballyfermot	Suburban Background	Annual Mean PM ₁₀ (µg/m ³)	12	11	12	16	14
		24-hr Mean > 50 µg/m ³ (days)	3	0	1	0	7
Dún Laoghaire	Suburban Background	Annual Mean PM ₁₀ (µg/m ³)	13	13	12	13	12
		24-hr Mean > 50 µg/m ³ (days)	3	0	2	0	2
Winetavern Street	Urban Traffic	Annual Mean PM ₁₀ (µg/m ³)	14	14	13	14	15
		24-hr Mean > 50 µg/m ³ (days)	4	2	3	1	9
Rathmines	Suburban Background	Annual Mean PM ₁₀ (µg/m ³)	15	15	13	15	15
		24-hr Mean > 50 µg/m ³ (days)	5	3	5	2	9
Phoenix Park	Urban Background	Annual Mean PM ₁₀ (µg/m ³)	12	11	9	11	11
		24-hr Mean > 50 µg/m ³ (days)	2	0	1	0	2

Note 1 Annual average limit value of 40 µg/m³ and 24-hour limit value of 50 µg/m³ (EU Council Directive 2008/50/EC & S.I. No. 180 of 2011).

Table 9.4: Trends in Zone A Air Quality – PM₁₀

Monitoring of both PM₁₀ and PM_{2.5} takes place at the station in Rathmines which allows for the PM_{2.5}/PM₁₀ ratio to be calculated. Average PM_{2.5} levels in Rathmines over the period 2015 – 2019 ranged from 9 – 10 µg/m³, with a PM_{2.5}/PM₁₀ ratio ranging from 0.60 – 0.68 (EPA, 2020a). Based on this information, a conservative ratio of 0.7 was used to generate an existing PM_{2.5} concentration in the region of the development of 10.5 µg/m³.

9.3.3 Climate Baseline

Anthropogenic emissions of GHGs in Ireland included in the European Union's Effort Sharing Regulation (ESR) (EU 2018/842) are outlined in the most recent review by the EPA, which details provisional emissions up to 2021 (EPA, 2022b). The GHG emission inventory for 2021 is the first of ten years over which compliance with targets set in the ESR will be assessed. This Regulation sets 2030 targets for emissions outside of the Emissions Trading Scheme (known as ESR emissions) and annual binding national limits for the period 2021-2030. Ireland's target is to reduce ESR emissions by 30% by 2030 compared with 2005 levels, with a number of flexibilities available to assist in achieving this. Ireland's ESR emissions annual limit for 2021 is 43.48 Mt CO₂eq¹. Ireland's provisional 2021 GHG ESR emissions are 46.19 Mt CO₂eq, this is 2.71 Mt CO₂eq more than the annual limit for 2021 (EPA, 2022b). Agriculture continues to be the largest contributor to overall emissions at 37.5% of the total. Transport, energy industries and the residential sector are the next largest contributors, at 17.7%, 16.7% and 11.4%, respectively. GHG emissions for 2021 are estimated to be 4.7% higher than emissions in 2020, this is due to a gradual lifting of Covid-19 restrictions and an increase in the use of

¹ Mt CO₂eq – million tonnes carbon dioxide equivalent

coal and less renewables within electricity generation. Ireland's GHG emissions have increased by 11.4% from 1990 – 2021.

Provisional national total emissions (including Land Use, Land-use Change and Forestry (LULUCF)) for 2021 are 69.29 Mt CO₂eq, these have used 23.5% of the 295 Mt CO₂eq carbon budget for the five-year period 2021-2025. This leaves 76.5% of the budget available for the succeeding four years, requiring an 8.4% average annual emissions reduction from 2022-2025 to stay within budget.

The EPA 2022 GHG Emissions Projections Report for 2021 – 2040 (EPA, 2022c) provides an assessment of Ireland's total projected GHG emissions from 2021 to 2040, using the latest inventory data for 2020, and provides an assessment of Ireland's progress towards achieving its national ambitions under the Climate Action and Low Carbon Development (Amendment) Act 2021 (Government of Ireland, 2021) and EU emission reduction targets for 2030 as set out under the EU ESR 2018/842. Two scenarios are assessed – a “*With Existing Measures*” (WEM) scenario, which is a projection of future emissions based on the measures currently implemented and actions committed to by Government, and a “*With Additional Measures*” (WAM) scenario, which is the projection of future emissions based on the measures outlined in the latest Government plans at the time projections are compiled. This includes all policies and measures included in the WEM scenario, plus those included in government plans but not yet implemented.

The EPA report states under the WEM scenario, the projections indicate that Ireland will cumulatively exceed its ESR emissions allocation by 52.3 Mt CO₂eq over the 2021-2030 period, even with full use of the flexibilities available. Under the WAM scenario, the projections indicate that Ireland can achieve compliance under the ESR over the 2021-2030 period using both flexibilities but only with full implementation of the 2021 Climate Action Plan. Both projected scenarios indicate that implementation of all climate plans and policies, plus further new measures, are needed for Ireland to meet the 51 per cent emissions reduction target and put the country on track for climate neutrality by 2050 (EPA, 2022c).

9.3.4 Sensitivity of the Receiving Environment

In line with the UK Institute of Air Quality Management (IAQM) guidance document ‘*Guidance on the Assessment of Dust from Demolition and Construction*’ (2014) prior to assessing the impact of dust from a Proposed Development, the sensitivity of the area must first be assessed as outlined below. Both receptor sensitivity and proximity to proposed works areas are taken into consideration. For the purposes of this assessment, high sensitivity receptors are regarded as residential properties where people are likely to spend the majority of their time or areas where users would expect a high level of amenity. Commercial properties, parks and places of work are regarded as medium sensitivity while low sensitivity receptors are places where people are present for short periods or do not expect a high level of amenity. Figure 9.2 shows the sensitive receptors within 50m of the Dublin Central Masterplan area.

The surrounding land use in the vicinity of the Proposed Development site is predominantly commercial in nature which would typically be considered of medium sensitivity in terms of dust emissions. However, due to the location of the Proposed Development in the O'Connell Street area and the high level of tourism in the area, users would typically expect a high level of amenity. Therefore, the surrounding area would be considered high sensitivity in terms of dust soiling. It is estimated that there are over 100 receptors within 50m of the site due to the presence of a number of hotels, an apartment block, the Rotunda Hospital, and numerous commercial premises. Based on the IAQM criteria outlined in Table 9.5, the worst case sensitivity of the area to dust soiling is considered to be high.

Receptor Sensitivity	Number Of Receptors	Distance from source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Table 9.5: Sensitivity of the Area to Dust Soiling Effects on People and Property

In addition to sensitivity to dust soiling, the IAQM guidelines also outline the assessment criteria for determining the sensitivity of the area to human health impacts. The criteria take into consideration the current annual mean PM₁₀ concentration, receptor sensitivity and the number of receptors affected within various distance bands from the construction works.

In terms of receptor sensitivity to human health impacts, the IAQM guidance defines high sensitivity receptors as “locations where members of the public are exposed over a time period relevant to the air quality objective for PM₁₀ (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day)” (IAQM, 2014). Examples include residential properties, schools and hospitals. Office and shop workers are considered of medium sensitivity. Low sensitivity receptors are areas where exposure is transient such as public footpaths and shopping streets.

There are high, medium and low sensitivity receptors within close proximity to the Proposed Development site. However, for the purposes of this assessment the worst-case sensitivity has been used. It is estimated that there are between 10-100 high sensitivity receptors within 50m of the Proposed Development site, this includes the Rotunda Hospital and an apartment building on Moore Street. A conservative estimate of the current annual mean PM₁₀ concentration in the vicinity of the Proposed Development is 15 µg/m³ (see Section 9.3.2). Based on the IAQM criteria outlined in Table 9.6, the worst case sensitivity of the area to human health is considered to be low.

Receptor Sensitivity	Annual Mean PM ₁₀ Concentration	Number Of Receptors	Distance from source (m)				
			<20	<50	<100	<200	<350
High	< 24 µg/m ³	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	< 24 µg/m ³	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	< 24 µg/m ³	>1	Low	Low	Low	Low	Low

Table 9.6: Sensitivity of the Area to Human Health Impacts.

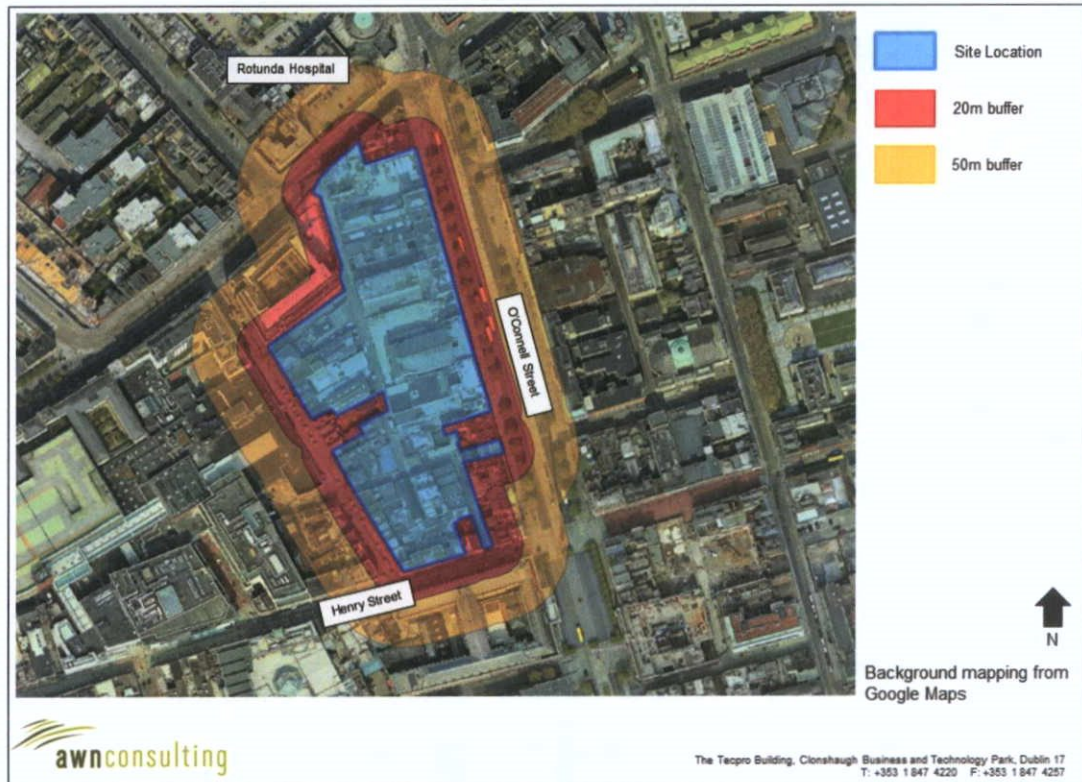


Figure 9.2: Sensitive Receptors within 50m of Dublin Central Masterplan area.

9.4 CHARACTERISTICS OF PROPOSED DEVELOPMENT

9.4.1 Dublin Central Masterplan

The Dublin Central Masterplan site is located within Dublin City Centre, it is bounded by O'Connell St. to the east, Parnell St. to the north, Moore St. to the west and Henry St. to the south. A full description of the development is provided in Chapter 3 – Description of Proposed Development.

Air quality and climate impacts have been considered for both the construction and operational phases of the Dublin Central Masterplan. During the demolition and construction phase of the Dublin Central Masterplan (which includes Site 2) there will be different sources of potential air quality impacts, primarily construction dust emissions. Construction plant, machinery and site vehicles are a source of GHG emissions which have the potential to impact climate. The primary sources of air and climatic emissions in the operational context are deemed long term and will involve the change in traffic flows in the local areas which are associated with the development.

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

The Dublin Central Masterplan development is comprised of a number of individual sites (Site 1 – 5). A planning application for Site 2 and No. 61 O'Connell Street Upper is now being made. These are 2 no. separate and concurrent planning applications. A full description of the development is provided in Chapter 3: Description of Proposed Development, a brief description is provided below.

The **Site 2** development comprises a mixed-use scheme ranging in height from 2 – 8 storeys (over single storey basement) incorporating office, retail and café / restaurant uses. The Site 2 development also includes enabling works to facilitate the future Metrolink Project.

The **No. 61 O'Connell Street** development consists of the refurbishment of No. 61 O'Connell Street Upper as residential use from 1st to 3rd floor including the creation of a new covered pedestrian link through part of the ground floor connecting O'Connell Street Upper and Henry Place. 2 no. café /

restaurant units are proposed at ground floor onto O'Connell Street and Henry Place. A leisure studio / gym is proposed at basement including the provision of 2 no. changing rooms.

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

The Applicant has agreed a Memorandum of Understanding with the NTA/TII to complete the enabling works that would accommodate the planned future MetroLink O'Connell Street station under Dublin Central Site 2AB and Site 2C. This would also ensure that the Applicant's project is structurally independent of, and not prejudicial to, the TII MetroLink Project. It should be noted that no metro enabling works will be undertaken by the Applicant until the NTA / TII have secured an enforceable railway order.

The Site 2 proposals accommodate a structural box beneath ground floor level that has been designed to accommodate the independent construction and operation of the planned O'Connell Street MetroLink Station by Transport Infrastructure Ireland (TII), including provision of the structural envelope and co-ordinated voids to accommodate station entrances, ventilation and fire escape shafts through this part of the proposed development. These MetroLink Enabling Works (MEW) ensure that the Dublin Central proposed development is structurally independent of, and not prejudicial to, the MetroLink project. This application does not include any request for permission for railway works, the use of railway works or the operation of a railway. The MetroLink project will be the subject of a separate application for Railway Order to be made by TII. In the event that MetroLink project is delayed or does not proceed, the Dublin Central proposed development can be completed, occupied and used regardless. The Dublin Central proposed development is not dependent on the MetroLink project in any way, whether functionally or otherwise. The MetroLink project is not, therefore, part of the project the subject of this application or its accompanying EIAR.

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

The potential air quality and climate impacts identified in Section 9.4 for the Dublin Central Masterplan area are also applicable to the Proposed Development (i.e. Site 2 and No. 61 O'Connell Street Upper). These include construction dust emissions and traffic and plant emissions associated with the proposed works.

9.5 POTENTIAL IMPACTS

9.5.1 Dublin Central Masterplan

9.5.1.1 Construction Stage

9.5.1.1.1 Air Quality

The greatest potential impact on air quality during the demolition and construction phase of the implementation of the Dublin Central Masterplan is from construction dust emissions and the potential for nuisance dust. While construction dust tends to be deposited within 350m of a construction site, the majority of the deposition occurs within the first 50m. The extent of any dust generation depends on the nature of the dust (soils, peat, sands, gravels, silts etc.) and the nature of the construction activity. In addition, the potential for dust dispersion and deposition depends on local meteorological factors such as rainfall, wind speed and wind direction. A review of Dublin Airport meteorological data (see Section 9.3.1) indicates that the prevailing wind direction is westerly to south-westerly and wind speeds are generally moderate in nature. In addition, dust generation is

considered negligible on days where rainfall is greater than 0.2 mm. A review of historical 30 year average data for Dublin Airport indicates that on average 191 days per year have rainfall over 0.2 mm (Met Eireann, 2021) and therefore it can be determined that over 50% of the time dust generation will be reduced.

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

Demolition

There is a large amount of demolition work required for the implementation of the Dublin Central Masterplan with significantly greater than 50,000m³ of buildings to be demolished. Therefore, the demolition works can be classified as large as per the criteria in Section 9.2.2.1. As the overall sensitivity of the area to dust soiling impacts is high there is a high risk of dust soiling impacts from the proposed demolition activities according to the IAQM guidance (see Table 9.7). There is an overall medium risk of human health impacts as a result of the demolition activities as the overall sensitivity of the area to human health impacts is low (Section 9.3.4).

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

Table 9.7: Risk of Dust Impacts - Demolition – Dublin Central Masterplan.

Earthworks

Under the IAQM guidance (2014) the proposed earthworks can be classified as large as the total site area is greater than 10,000m² and there will be a large volume of material involved in infill and excavation works (see Section 9.2.2.1). The excavation of the MEW in Site 2 in particular and basements will be the primary sources of excavated materials. This results in an overall high risk of dust soiling impacts and a low risk of human health impacts as a result of earthworks activities (see Table 9.8).

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

Table 9.8: Risk of Dust Impacts - Earthworks – Dublin Central Masterplan.

Construction

The dust emission magnitude from construction associated with the Dublin Central Masterplan works can be classified as large due to the total building volume involved exceeding 100,000m³ as per the criteria in Section 9.2.2.1. Therefore, there is an overall high risk of dust soiling impacts and a low risk of human health impacts as a result of the proposed construction activities (Table 9.9).

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

Table 9.9: Risk of Dust Impacts – Construction – Dublin Central Masterplan.

Trackout

Dust emission magnitude from trackout can be classified as large under IAQM guidance as there are predicted to be 95 outward HGV movements per day during the worst-case construction phase (see Section 9.2.2.1). This results in an overall high risk of dust soiling impacts and a low risk of human health impacts as a result of the proposed trackout activities (see Table 9.10).

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

Table 9.10: Risk of Dust Impacts – Trackout – Dublin Central Masterplan.

Summary of Dust Emission Risk

The risk of dust impacts as a result of the implementation of the Dublin Central Masterplan are summarised in Table 9.11 for each activity. The magnitude of risk determined is used to prescribe the level of site specific mitigation required for each activity in order to prevent significant impacts occurring.

Overall, in order to ensure that no dust nuisance occurs during the demolition, earthworks, construction and trackout activities, a range of dust mitigation measures associated with a high risk of dust impacts must be implemented. In the absence of mitigation there is the potential for **short-term, localised, significant** dust related impacts to air quality as a result of the implementation of the Dublin Central Masterplan.

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

Table 9.11: Summary of Dust Impact Risk used to Define Site-Specific Mitigation – Dublin Central Masterplan.