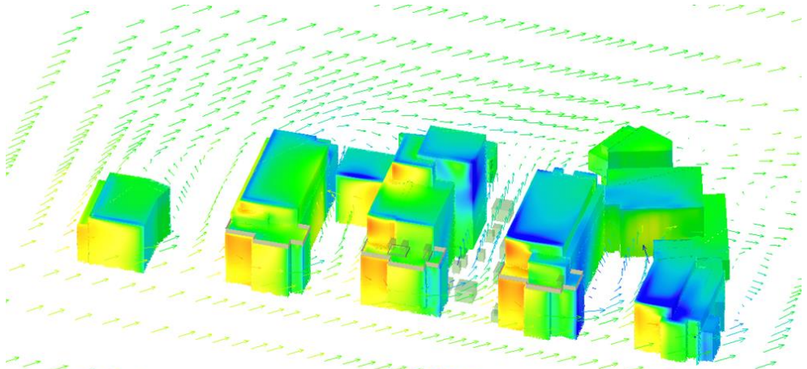
White Heather Residential Development

South Circular Road
Dublin 8



Microclimatic Wind Analysis and Pedestrian Comfort Report

IN2 Project No. D2044
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REV08

Revision History

Date	Revision	Description
22/12/2020	00	Initial issue for review
08/04/2021	01	Updated for revised architectural design
04/05/2021	02	Project Description added
12/05/2021	03	Project Description updated
31/01/2022	04	Updated to reflect revised building design
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16/03/2022	07	Project Description updated

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2.0 Executive Summary

This report compiles the results of Microclimatic Wind Analysis undertaken by IN2 Engineering Design Partnership for the Proposed development at the South Circular Road, Dublin 8, comprising of assessments for predicted Wind conditions to the local and surrounding environment.

The report summarises the analysis undertaken, and conclusions determined from sophisticated Building Simulations performed with regards to Wind/ Pedestrian Comfort, in all cases validating results in accordance with robust Best Practice Guidelines to ensure compliance.

Detailed assessment of predicted Wind conditions and associated Pedestrian Comfort were undertaken in Sections 2.0 and 3.0, respectively.

Wind Analysis was assessed utilising Airflow Simulation techniques, calculating predicted pressures and velocities throughout the proposed development site.

These wind simulations were then compiled and assessed against Lawson Criteria Methodology- an assessment method for Pedestrian Comfort adopted internationally as National Standards/ City Guidelines (Netherlands/ London respectively) that enables utilisation of recorded meteorological station data of annual hourly averaged wind speed and direction (in this case from Dublin Airport), terrain effects, surface roughness and the form of the proposed built environment in order to predict activity suitability (sitting/ standing etc.) for persons in the vicinity of the development.

This analysis undertaken identified that the proposed development was determined to not introduce any adverse wind effects to the receiving environment.

The majority of ground level amenity spaces across the proposed development are determined to be suited to “Long/Short Term Sitting” in accordance with the Lawson Criteria methodology utilised. The proposed landscaping was seen to positively impact sheltering effects between the two residential blocks.

While the majority of the 5th floor roof terraces are suitable for “Long/Short Term Sitting” localised mitigation measures such as trees and shrubbery were seen improve wind conditions in areas which were subjected to higher exposure.

All balconies across the development were assessed and deemed suitable for “Long/Short Term Sitting” according to the Lawson scale.

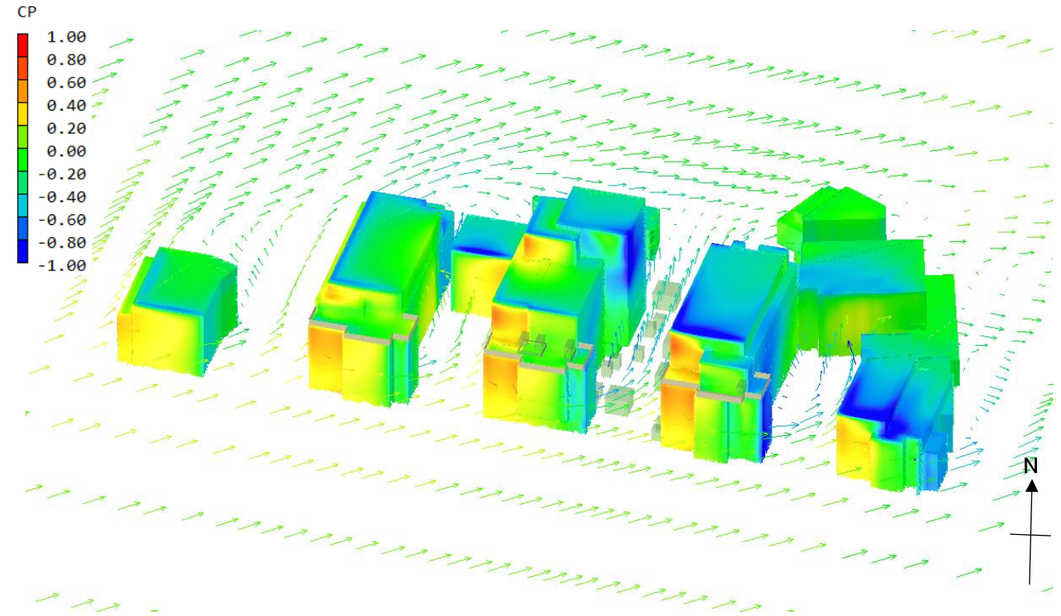

Fig 1.1 – Surface Pressure Coefficients on Proposed White Heather Development

3.0 Project Description

Permission is sought by U and I (White Heather) Limited for a Strategic Housing Development at the White Heather Industrial Estate, South Circular Road, Dolphin's Barn, Dublin 8 and No. 307/307a South Circular Road, Dublin 8 and an industrial building at 12a St James's Terrace. The 1.535ha site is bounded by the Grand Canal to the south; Our Lady of Dolours Church and residential dwellings on the South Circular Road to the north; Priestfield Cottages to the east; and residential dwellings at St James's Terrace to the west.

A new residential neighbourhood development of 335 no. units is proposed to make efficient use of this residentially zoned site, which benefits from high-quality amenity space along the Grand Canal and access to high-quality transport links. The site benefits from the opportunity to access the existing Dolphins Barn neighbourhood facilities, as well as enhancing the connectivity of the area for the Dublin 8 community as a whole. A core principle of the proposed residential scheme is to put residential amenity and recreation to the fore, opening up the site and the local area to the Grand Canal.

The proposed development is intended to provide for a vibrant and diverse community, while delivering a connected residential neighbourhood which knits in to both the established and the emerging residential developments in the area. High-quality landscaping and public realm, with a focus on the creation of distinctive character areas is proposed. A new street will run east-west across the north of the site and the creation of a new public space at the heart of the proposed scheme will connect to a publicly accessible linear park along the canal to the south. Permeability is a key feature of the proposed pedestrian realm, including a mix of dedicated and shared surface areas through the site with a c. 190 m continuous amenity strip along the Grand Canal Linear Park.

The entrance to the scheme will be from the existing junction at the South Circular Road, which will be reconfigured and upgraded. The existing access road at St James's Terrace will provide pedestrian access only to the development. Car parking is proposed at undercroft and at surface levels, with a number of dedicated car sharing spaces in convenient locations. Covered and secure bicycle storage facilities are located at undercroft and at surface level, adjacent to block entrances. A sustainable travel approach has been adopted, particularly with regards to access to Dublin City Centre, with the Luas (850m) and Dublin Bus stops adjacent to the development site. The City Centre area is also accessible by bicycle and walking, at approximately 10 and 30 minutes respectively.

The proposed residential mix includes a combination of studio units, 1-bedroom apartments, 2-bedroomapartments units within 7 no. blocks and a terrace of 3-bedroom townhouse units. A change of use of an existing residential building at 307/307a South Circular Road to be used as a shared workspace. The proposed Part V social housing requirement is provided at 10% in 2 no. discrete blocks within the proposed scheme. This high-quality Build to Rent scheme will also include 2 no. cafés and a 2-storey creche unit, while the residents will also have access to residential amenity areas at ground floor level and at fifth floor level with access to a roof terrace area overlooking the canal. A landscaped square will be accessible to the public, with private open space and amenity areas for the residents also provided including children's play areas and roof level terraces. Building heights range from 2 no. to 10 no. storeys, with finger blocks arranged in a north-south direction and height tapering down from the centre of the site to the boundary.

3.0 Wind Analysis

3.1 Methodology

In order to determine the predicted wind patterns around the proposed development, airflow simulations were undertaken using Computational Fluid Dynamics (CFD) software (Phoenics / Flair).

This enabled an assessment of the site wind conditions: highlighting zones of high pressure, negative pressure, and air movement for varying wind conditions.

An initial 3D representational model of the proposed buildings and their immediate surroundings was created, and simulations undertaken for 12 cardinal wind directions.

The CFD simulations utilised wind profiles accounting for terrain effects. Allowing for the nature of the site and location, a surface roughness layer profile representative of "Dense Urban Terrain (z_0=0.4m height)" was utilised, derived from GIS survey analysis[1].

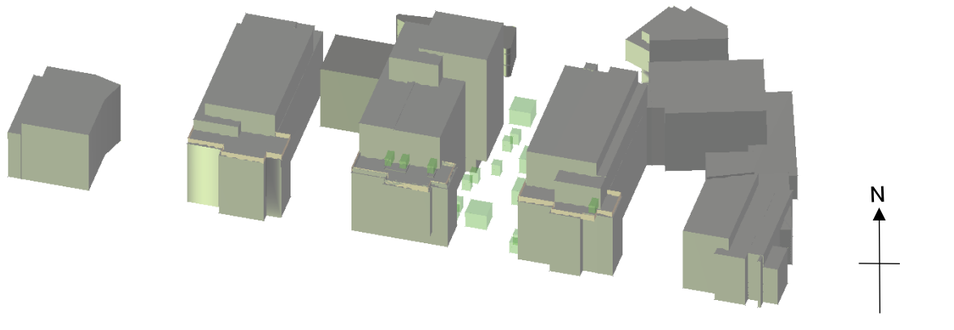

Fig 3.1.1 – 3D Model of Proposed White Heather Development

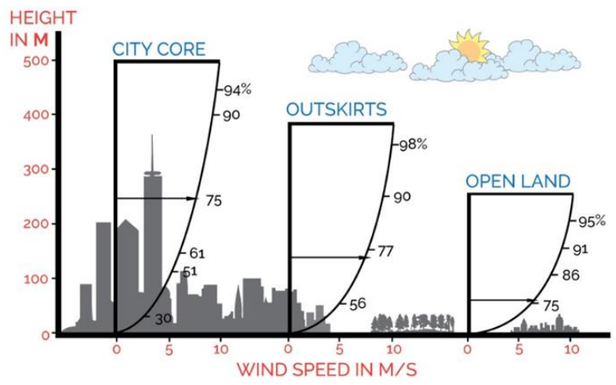

Fig 3.1.2 – Wind Profiles accounting for Terrain Effects

[1] European Space Agency's Climate Change Initiative Land Cover (CCI-LC) dataset v2.0.7.

3.0 Wind Analysis

3.2 Results

Figure 3.2.1 indicates predicted pressure co-efficient contours for the prevailing 240° wind direction. Red contours indicate regions of positive pressure, green as neutral and blue negative.

Figure 3.2.2 illustrates predicted wind velocities across the development, at 10m above ground level.

As the proposed development is to be located on a site which is surrounded by predominantly low rise (2 to 3 storey) development, the shape and form of the building must be designed so that it is sensitive to the wind microclimate in the receiving environment, and provide comfortable and safe conditions for pedestrians at ground level.

Owing to the stepped nature of the facades facing into the prevailing SW winds, no incidences of excessive downwash are predicted to occur within the proposed development.

The courtyard spaces within the development experience predominantly negative or neutral pressures. The orientation of the buildings results in slight acceleration of air around the corners of the buildings and into the courtyards, but this is not deemed to be excessive.

The shape and form of the proposed buildings provides sheltering to both the public and private courtyard amenity spaces within the proposed development, and the proposed Canal Amenity space to the South.

The CFD simulations form the basis of the Pedestrian Comfort Analysis undertaken, which is described in detail in Section 3.0 below.

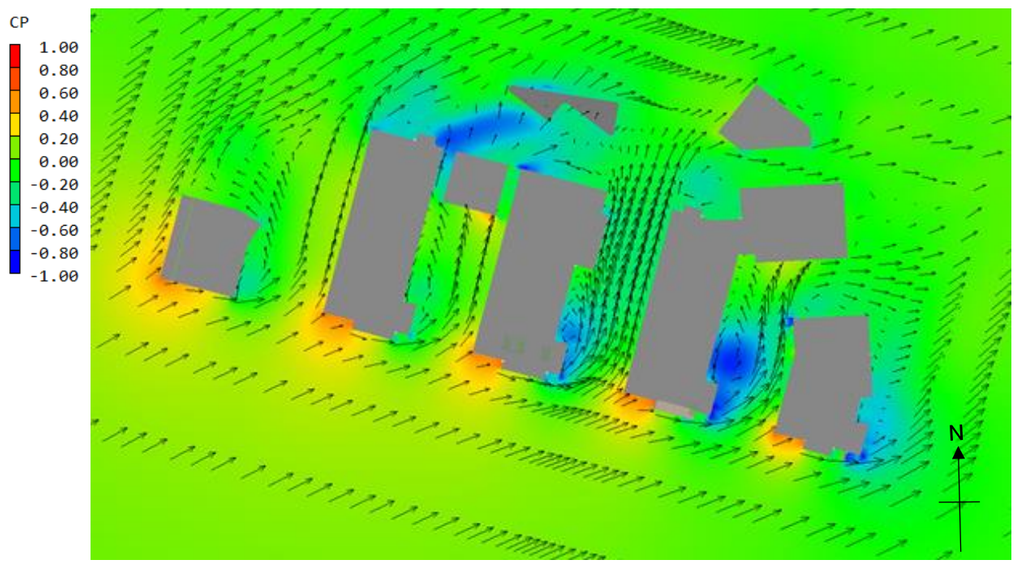

Fig 3.2.1 - Pressure Coefficients at 10m above Ground Level

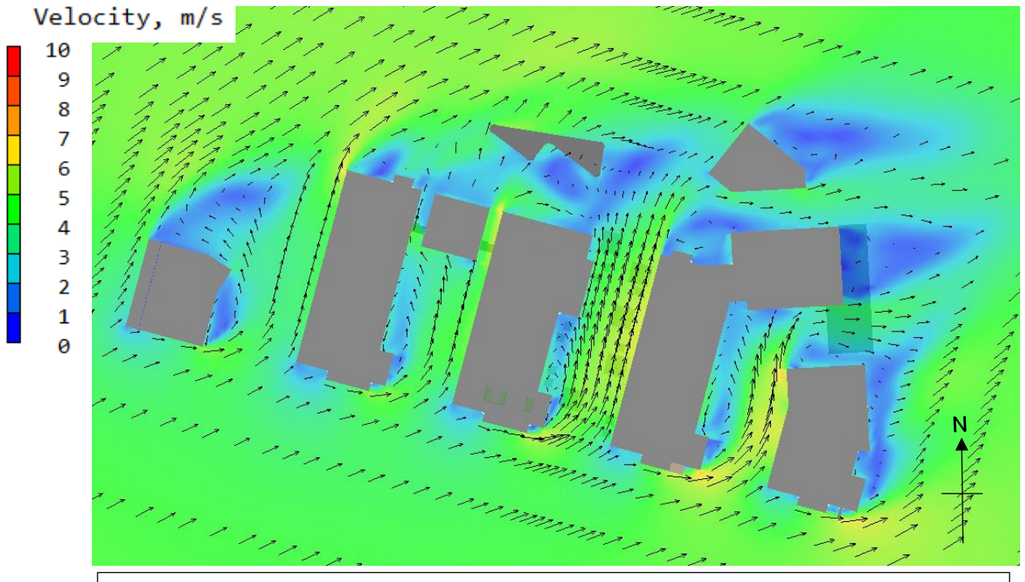

Fig. 3.2.2 Wind Velocity at 10m above Ground Level

4.0 Pedestrian Comfort

4.1 Methodology

Pedestrian Wind Comfort was assessed utilising the “Lawson Criteria” scale, which has been developed as a means of assessing the long term suitability of urban areas for walking or sitting, accounting for both microclimatic wind effects (i.e. site location and prevailing winds) and microclimatic air movement associated with wind forces influenced by the localised built environment form.

Figure 4.1.1 illustrates the Lawson Criteria scale, which ranges from areas deemed suitable for long term sitting through to regions uncomfortable for pedestrian comfort. Walking leisurely areas, for example, are defined as areas that would not experience wind velocities in excess of 5.3m/s for more than 2% of the year, whereas uncomfortable areas would experience averaged wind velocities greater than 7.6m/s for more than 2% of the year.

The Lawson Criteria (as described in Building Aerodynamics, Tom Lawson, Imperial College Press, 2001) assesses probability of wind discomfort based on the Beaufort Scale as referenced in Figure 4.1.2.

The band indicated as “Suitable for short term sitting / standing” (cyan contours) corresponds to that of that for the vast majority of time (94%) throughout the year, winds will be “Light” at a Beaufort Force of B3 (average hourly wind speeds 3.35-5.60 m/s) defined as “Leaves and twigs in motion: wind extends a flag”. For only 4% of the time are average winds predicted to be in excess of this: i.e. “Moderate” B4 Beaufort Force described as “Raises dust and loose paper: small branches move”.

The assessment identifies area where potential wind occurrence, based on probability of wind direction and speed, would either be mitigated (long term sitting/ short term sitting) or exacerbated (walking fast / uncomfortable) due to proposed massing from potential developments.

However, it should be noted that in terms of pedestrian comfort, the Lawson Criteria assesses solely for wind/associated air velocity effects. Therefore, other environmental aspects that may influence a space’s microclimate, such as exposure to sunlight and envisaged temperature variation throughout the year are not accounted for within this methodology.

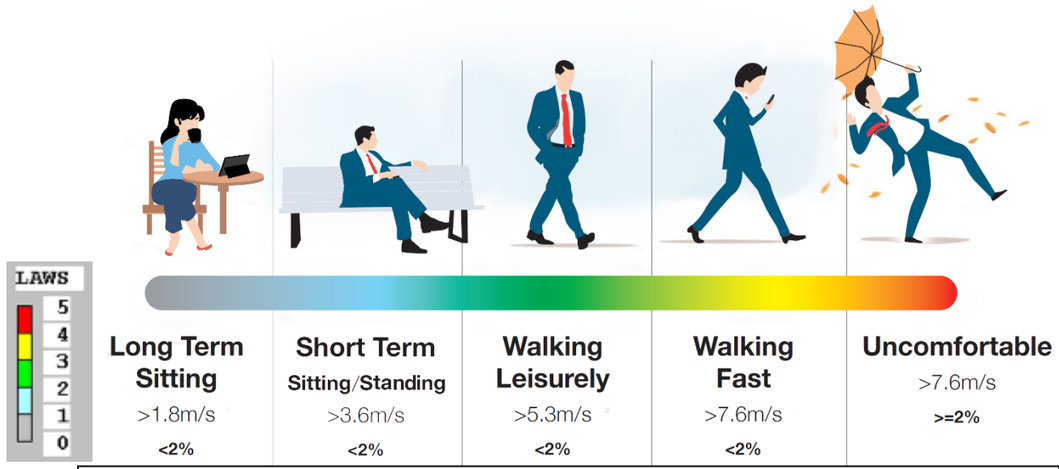

Fig 4.1.1 Lawson Scale

Beaufort Force	Hourly-Average Windspeed m/s	Description of Wind	Noticable Effect of Wind
0	<0.45	Calm	Smoke rises vertically
1	0.45 - 1.55	Light	Direction shown by Smoke drift but not by vanes
2	1.55 - 3.35	Light	Wind felt on faces: leaves rustle: wind vane moves
3	3.35 - 5.60	Light	Leaves and twigs in motion: wind extends a flag
4	5.60 - 8.25	Moderate	Raises dust and loose paper: small branches move
5	8.25 - 10.95	Fresh	Small trees in leaf sway
6	10.95 - 14.10	Strong	Large branches begin to move: telephone wires whistle
7	14.10 - 17.20	Strong	Whole trees in motion

	USE SYMBOL	UNACCEPTABLE	TOLERABLE	CRITERIA
Roads and Car Parks	A	6% > B5	2% > B5	10 9
People Around Buildings	B	2% > B5	2% > B4	9 7
Pedestrian Walk-through	C	4% > B4	6% > B3	8 6
Pedestrian Standing	D	6% > B3	6% > B2	6 4
Entrance Doors	E	6% > B3	4% > B2	6 3
Sitting	F	1% > B3	4% > B2	5 3

Fig 4.1.2 Beaufort Scale and Classic Wind Comfort Definitions

4.0 Pedestrian Comfort

4.1 Methodology (Cont'd)

In terms of microclimate assessment, wind data for the nearest meteorological station at Dublin Airport was utilised. Analysis is based on frequency of hourly wind speeds and direction data included in European Wind Atlas for Dublin Airport. Wind data and subsequent analysis is therefore based on hourly averages and does not include for example, intermittent gusting effects.

Figure 4.1.3 indicates the long-term annual "Wind Rose" for Dublin Airport. The rose diagram illustrates the frequency that wind will be from a certain direction and at what speed. It can be seen how the prevailing Westerly winds entirely predominate due to the Atlantic gulf stream, with only lower occurrence from other directions. Recorded wind speeds are also high- in what is one of Europe's windier meteorological weather stations.

Furthermore, higher wind speeds (which accentuate pedestrian discomfort) occur for prevailing Westerly conditions and therefore will predominate in terms of the potential impact on pedestrian comfort as analysed below.

The methodology calculates predicted airflow patterns around buildings for all wind orientations and calculates average velocity applying weighting based on probability of occurrence throughout the year. It should be noted that wind effects around buildings for prevailing wind conditions are deemed to have more of a potential impact to pedestrian discomfort, as these will occur on a more regular occurrence.

However, it should be noted that the methodology assesses averaged (hourly) wind conditions for the purposes of general pedestrian comfort and does not intend to predict gusting, abnormal nor potential future climate change conditions.

Nevertheless, the Lawson Criteria methodology basis has been proven to be a robust means of analysing Pedestrian Comfort and its basis has been successfully adapted and implemented in both National Standards (Netherlands NEN.8100) and Design Guidelines (City of London – Wind Microclimate Guidelines (2019)).

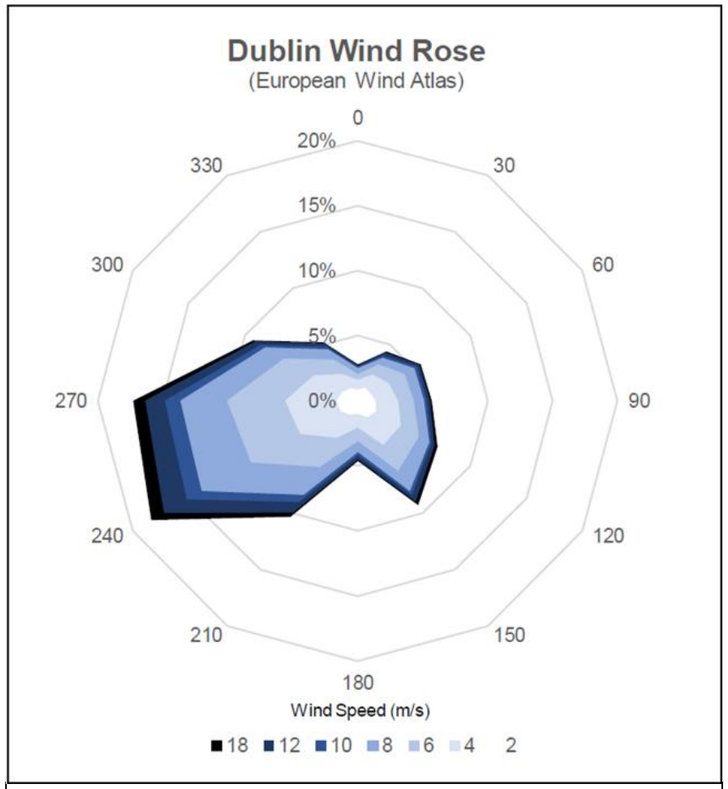

Fig. 4.1.3 - Dublin Wind Rose

4.0 Pedestrian Comfort

4.2 Ground Level

CFD simulations were undertaken to determine the Lawson Criteria results for the proposed development.

Pedestrian comfort at ground level was assessed by predicting Lawson Criteria values at 1.5m above ground level.

Grey/ cyan contours illustrate areas deemed “Suitable for Long Term Sitting” and “Suitable for Short Term Sitting” respectively as well as standing. Green contours indicate areas “Suitable for Walking and Strolling”, with yellow illustrative of being “Suitable for Business Walking”. Red areas highlight zones as “Not Suitable for Pedestrian Comfort”.

Fig. 4.2.1 indicates sheltered wind conditions at ground level, with the majority of the site determined by the methodology to be suitable for “Short/Long Term Sitting”.

The U-Shaped footprint of the proposed development provides a self-sheltering effect, resulting in comfortable wind conditions for users of both the public and private outdoor amenity spaces. The presence of landscaping in the centre of the development provides suitable sheltering and prevents regions of pedestrian discomfort being formed due to a “funnelling effect”.

Additionally, the proposed Canal Amenity to the South of the development is predicted to experience a comfortable wind environment, with all of this area deemed suitable for “Short/ Long Term Sitting”.

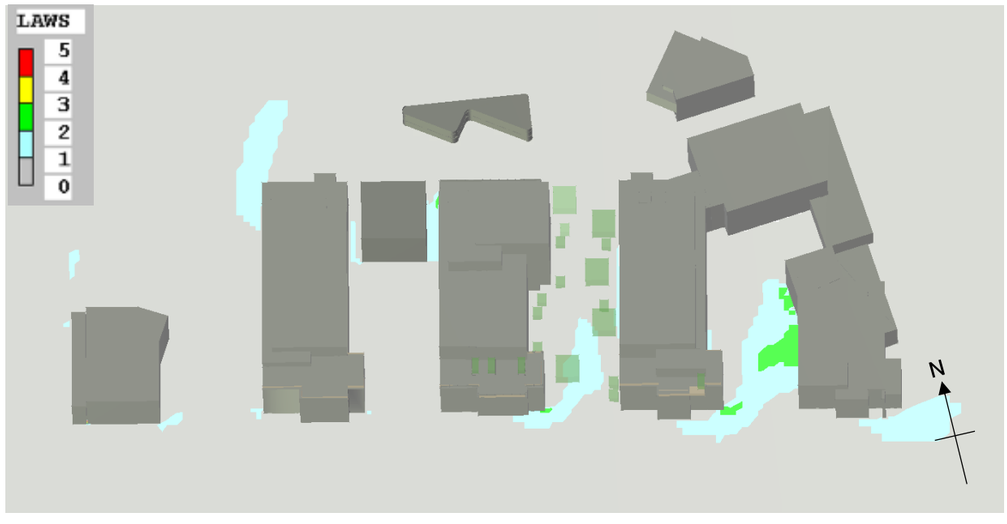

Fig. 4.2.1 - Lawson Criteria at 1.5m above Ground Level

4.0 Pedestrian Comfort

4.3 Roof Terrace Level

CFD simulations were undertaken to determine the Lawson Criteria results for the proposed development.

Pedestrian comfort at ground level was assessed by predicting Lawson Criteria values at 1.5m above roof terrace levels on the 5th floor level.

Grey/ cyan contours illustrate areas deemed “Suitable for Long Term Sitting” and “suitable for standing or short term sitting” respectively as well as standing. Green contours indicate areas “Suitable for Walking and Strolling”, with yellow illustrative of being “Suitable for Business Walking”. Red areas highlight zones as “Not Suitable for Pedestrian Comfort”.

Fig. 4.3.1 indicates generally favourable wind conditions at roof terrace levels, with the majority of the spaces determined by the methodology to be suitable for “Short/Long Term Sitting”.

Landscaping in the form of trees and shrubbery at terrace level aid in mitigating any potential adverse wind conditions in these areas, particularly at south-facing roof terraces.

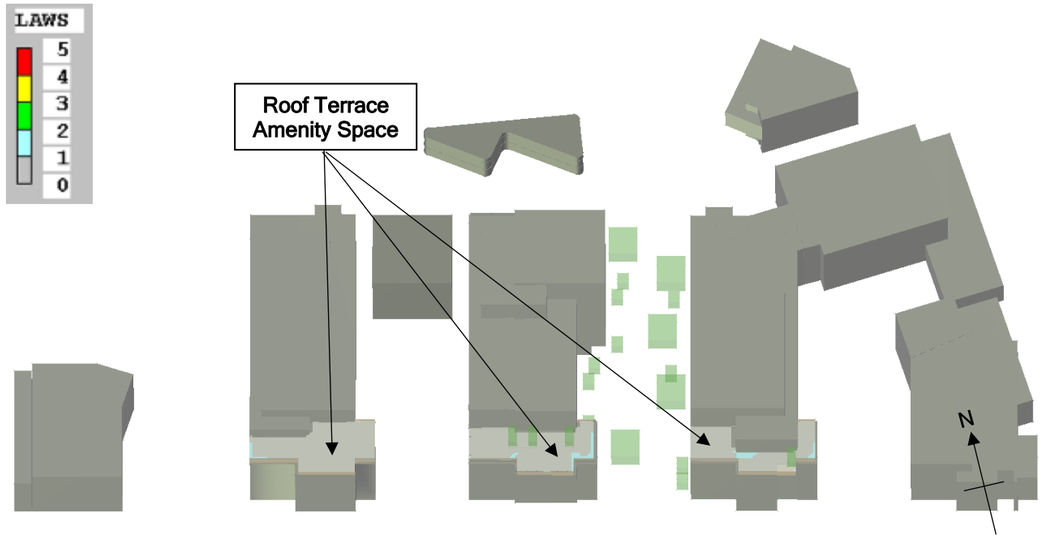

Fig. 4.3.1 - Lawson Criteria at 1.5m above South-Facing Roof Terraces

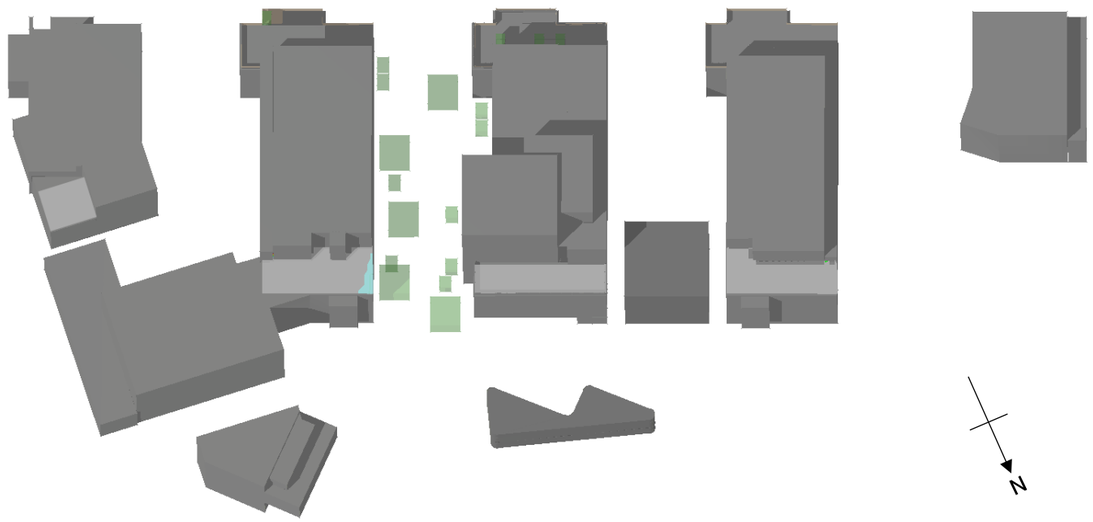

Fig. 4.3.1 - Lawson Criteria at 1.5m above North-Facing Roof Terraces

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