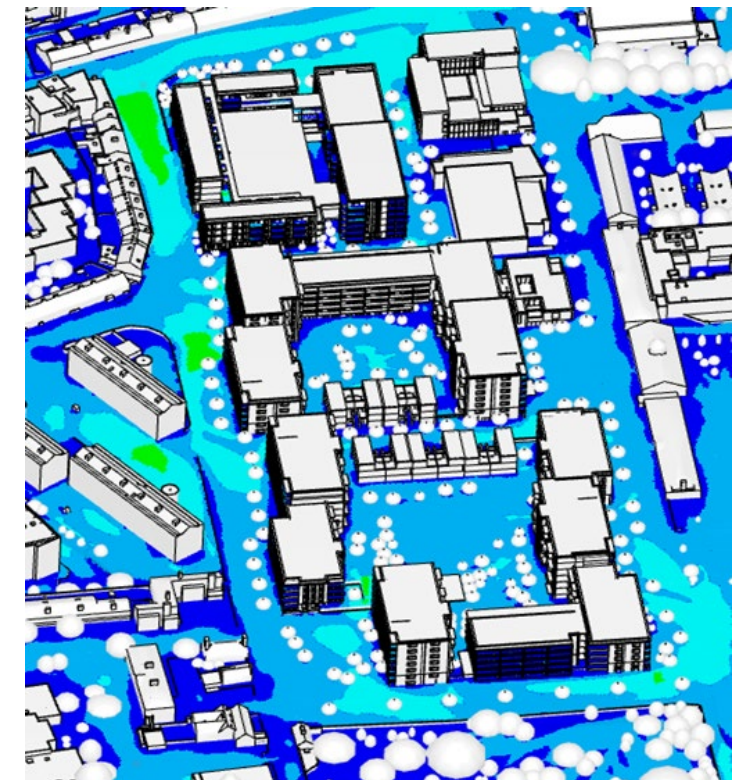


Proposed Mixed Use Development
Emmet Road,
Inchicore,
Dublin 8



Dublin City Council

Microclimatic Wind Analysis and Pedestrian Comfort Report

IN2 Project No. D2030

22/09/2022

REV03

Revision History

Date	Revision	Description
04/12/2020	00	Issue for review
19/05/2022	01	Revised to reflect comments
27/07/2022	02	Revised with updated design
22/09/2022	03	Revised for final planning submission

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Table of Contents

1.0	Executive Summary	4
2.0	Methodology.....	5
3.0	Wind Analysis.....	8
4.0	Pedestrian Comfort – Emmet Rd	10

1.0 Executive Summary

This report compiles the results of Microclimatic Wind Analysis undertaken by IN2 Engineering Design Partnership for the proposed Residential development at Emmet Road, Dublin 8, based on 3D modelling information received from BMCEA Architects, comprising of assessments for predicted Wind conditions to the local environment.

The proposed development site is located in a suburban area to the west of central Dublin. The site terrain is primarily low lying with terraced housing to the north and east of the site. Additionally, there is higher density housing to the west and existing mature landscaping to the south, both of which act as reasonable shelters to reduce the high wind speed effects seen across open fields.

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.

Wind Analysis was assessed utilising Airflow Simulation techniques through Computational Fluid Dynamics (CFD) Simscale software, for the proposed development as detailed in Section 3.0. This determines regions of positive and negative pressures and associated predicted wind velocities for the proposed development for varying wind speeds and directions.

These wind simulations were then compiled and assessed against Lawson Criteria Methodology- an assessment method for Pedestrian Comfort in order to predict activity suitability (sitting/ standing etc.) for persons in the vicinity of the development shown in Section 4.0.

The analysis illustrated how conditions for pedestrians at ground level were predicted to be suitable for "Pedestrian Sitting/ Standing" across the majority of the area.

The proposed landscaping design, particularly strategically placed trees, aids in mitigating against any potentially higher wind speeds at ground level. Trees located in the north outdoor amenity space are predicted to be effective in reducing local microclimatic wind effects, resulting in conditions predominantly for "Pedestrian Standing/Sitting" in accordance with the Lawson Criteria methodology. Additionally, the regions of accelerated wind speeds at the south of the site yielded similar results of having improved wind microclimate conditions.

All balconies within the proposed development were also analysed and predicted to be suitable for "Outdoor Dining/Pedestrian Sitting", and therefore suitable to their intended use as private amenity spaces, without any wind mitigation measures.

All walkways are determined to be suitable for their intended use for "Pedestrian Walking" by the Lawson Criteria methodology utilised.

Therefore overall, as per the Urban Development and Building Heights Guidelines (2018), the analysis undertaken identified that the proposed development was determined to not unduly impact on the local wind microclimate, with no adverse wind effects such as down-draft effects predicted to be introduced to the receiving environment.

2.0 Methodology

2.1 Wind Analysis

In order to determine the predicted wind patterns around the proposed development, airflow simulations were undertaken using Computational Fluid Dynamics (CFD) software (Simscale). 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 existing buildings and their immediate surroundings was created, and simulations undertaken for 12 cardinal wind directions.

Wind Climate Data was taken from the Global Wind Atlas. This utilises a microscale modelling system, enabling localised wind data to be obtained for high resolution (250m grid) topography, such as hills, ridges, and land use, including urban environments.

Fig 2.1.1 illustrates Global Wind Atlas data for the general Dublin area, indicating average wind speed at 10m height. The relative sheltering of the Urban area can be seen, in contrast to Dublin Airport to the North, and Dublin/ Wicklow mountains to the South, and exposed coastal locations.

Recorded wind speeds for Dublin Airport are relatively high- in what is one of Europe’s windier meteorological weather station locations, however, the particular site location at Inchicore is identified, which is an area relatively sheltered on a macro level, in close proximity to the Dublin City area.

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 “Urban Terrain ($z_0=0.4m$ height)” was utilised, derived from GIS survey analysis¹.

Figures 2.1.2 and 2.1.3 indicates the long-term annual “Wind Rose” obtained from the Global Wind Atlas for the site at Emmet Road, Dublin 8. The rose diagrams illustrate the frequency that wind will be from a certain direction and at what speed. It can be seen how the prevailing Westerly/ South-Westerly winds entirely predominate due to the Atlantic gulf stream, with only lower occurrence from other directions.

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

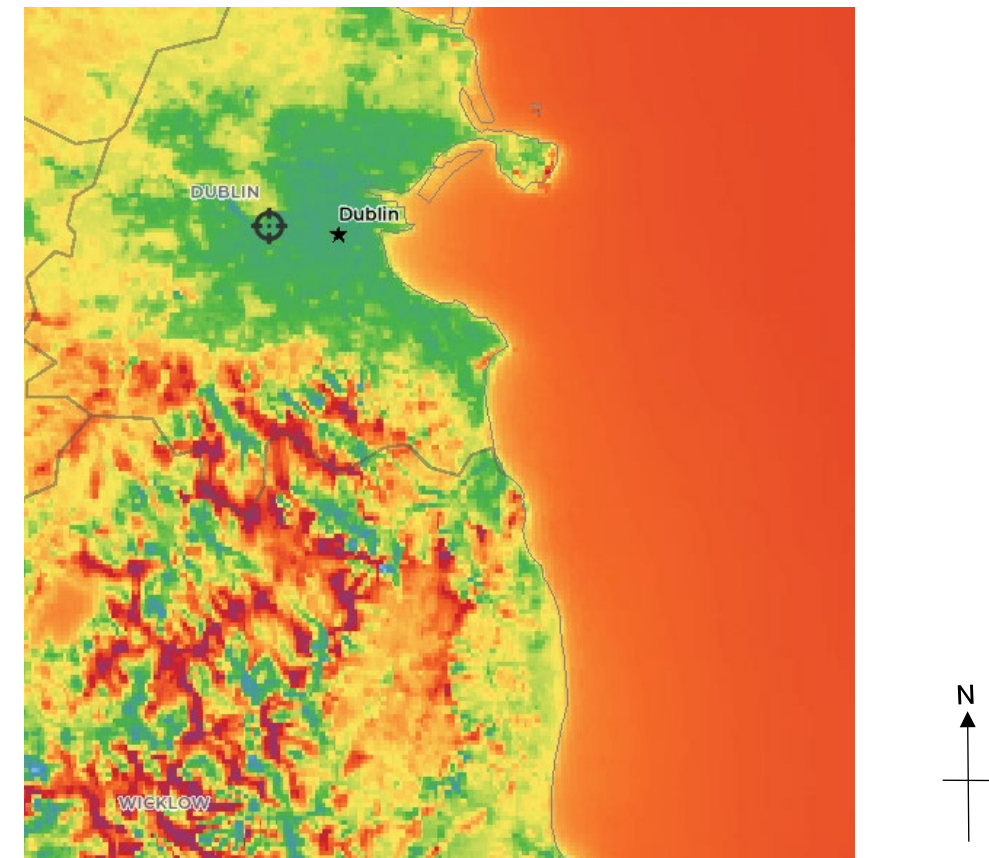


Fig 2.1.1 – Mean Wind Speeds across Dublin – Global Wind Atlas

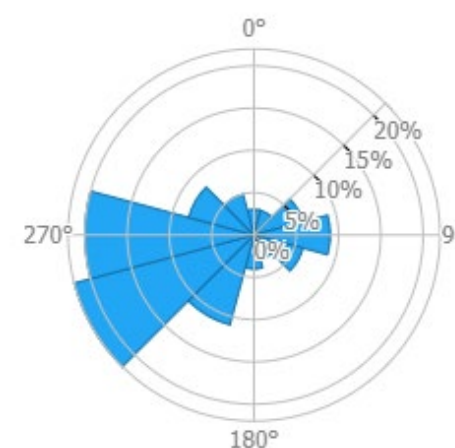


Fig 2.1.2 – Wind Frequency Rose for Emmet Road – Global Wind Atlas

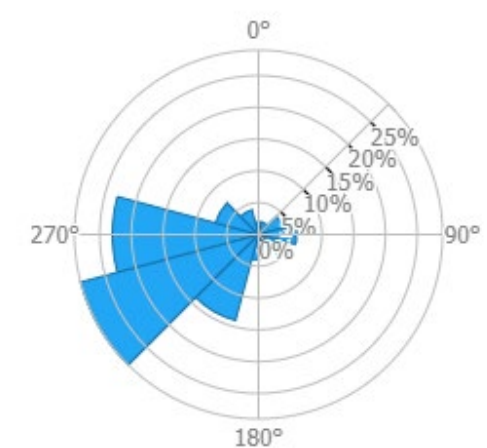


Fig 2.1.3 – Wind Speed Rose for Emmet Road – Global Wind Atlas

2.0 Methodology

2.1 Wind Analysis (Cont'd)

As per Fig 2.1.4, 3D representational model of the proposed development and its surroundings was created, and simulations undertaken for 12 cardinal wind directions.

The CFD simulations form the basis of the Pedestrian Wind Comfort Analysis undertaken, which is described in detail in Section 2.2 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 SW 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, as described in detail below, 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)). There are currently no Irish or European Standards for Pedestrian Comfort.

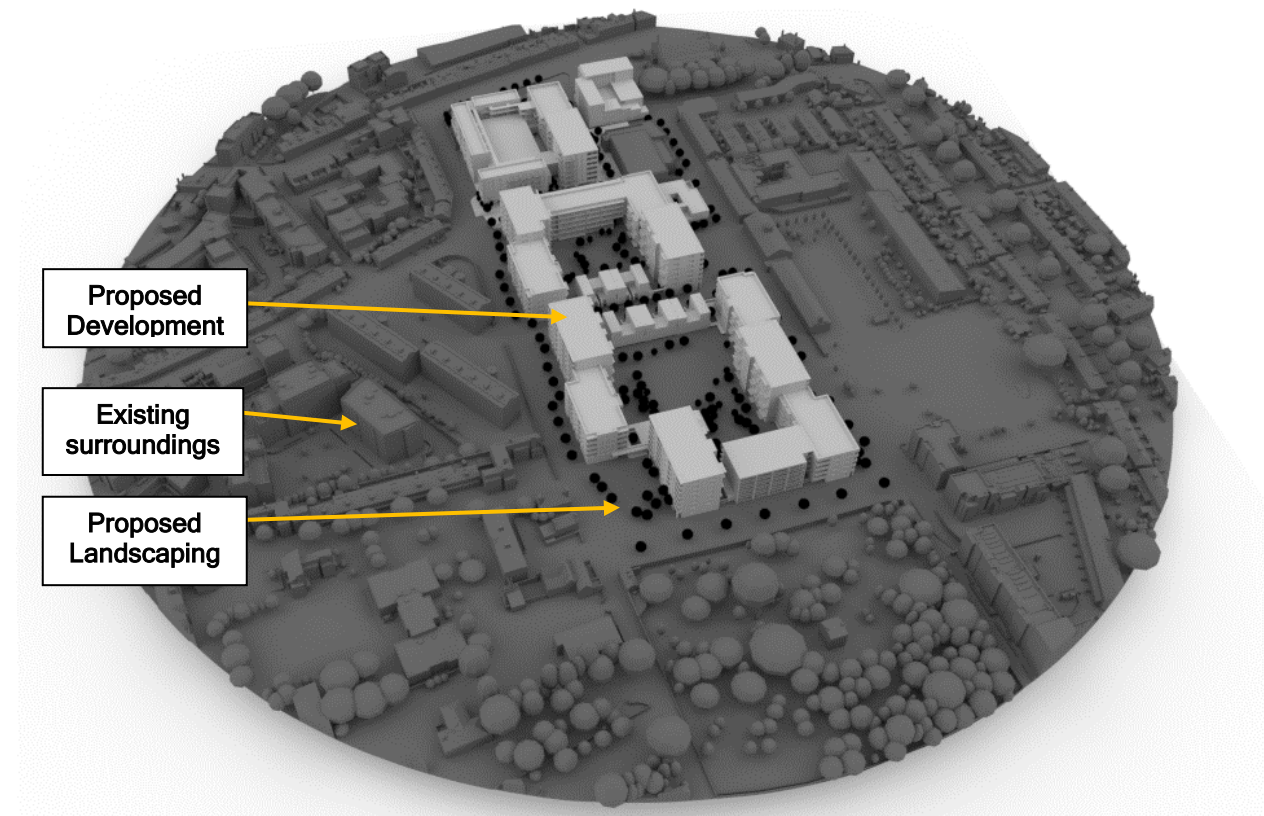


Fig 2.1.4 – 3D Model of Proposed Emmet Road Development and Neighbouring buildings

2.0 Methodology

2.2 Pedestrian Comfort

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 forms and landscaping effects.

The original 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 2.2.1.

Figure 2.2.2 illustrates the Lawson Criteria scale, as developed and implemented to the City of London Guidelines as utilised and assessed within the report, which ranges from areas deemed suitable for long-term sitting through to regions uncomfortable for pedestrian comfort. “Pedestrian Walking” areas, for example, are defined as areas that would not experience wind velocities in excess of 8m/s for more than 5% of the year, whereas uncomfortable areas would experience averaged wind velocities greater than 10m/s for more than 5% of the year.

The assessment identifies area where potential wind occurrence, based on probability of wind direction and speed, would either be mitigated (Outdoor Dining/ Pedestrian Sitting and Standing) or exacerbated (Business Walking/ 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.

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

Fig 2.2.1 Beaufort Scale

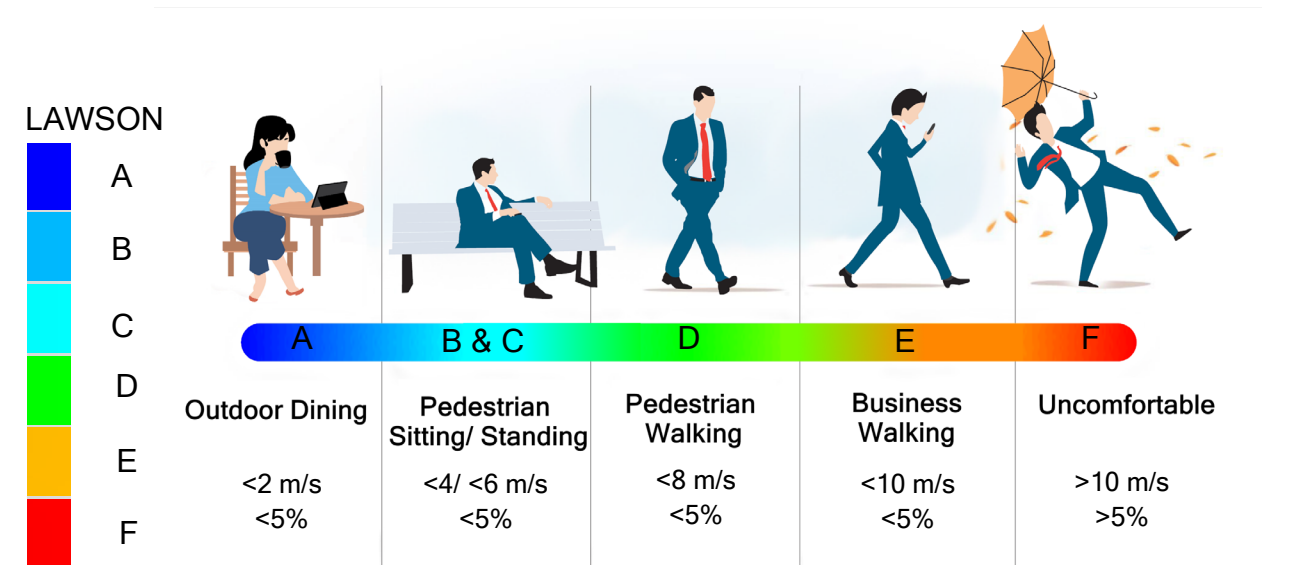


Fig 2.2.2 Lawson Scale

3.0 Wind Analysis

3.1 Wind Analysis Results

Figure 3.1 illustrates predicted wind velocities across the development under prevailing SW wind conditions, at 10m above ground level.

The wind analysis demonstrates that under prevailing SW wind conditions, the massing of the proposed development is predicted to decrease wind speeds in its wake (to the east of the site) when compared against the existing site, which is open parkland. Therefore, the development is determined to positively impact on its receiving wind microclimate and neighbouring developments.

While some higher wind speeds are predicted to the north of the site along Emmet Rd, these can be mitigated against through the considered use of trees and landscaping, as detailed in Section 3.2 and 4.2.

The CFD simulations form the basis of the Pedestrian Comfort Analysis undertaken, which is described in detail in Section 4.0 below.

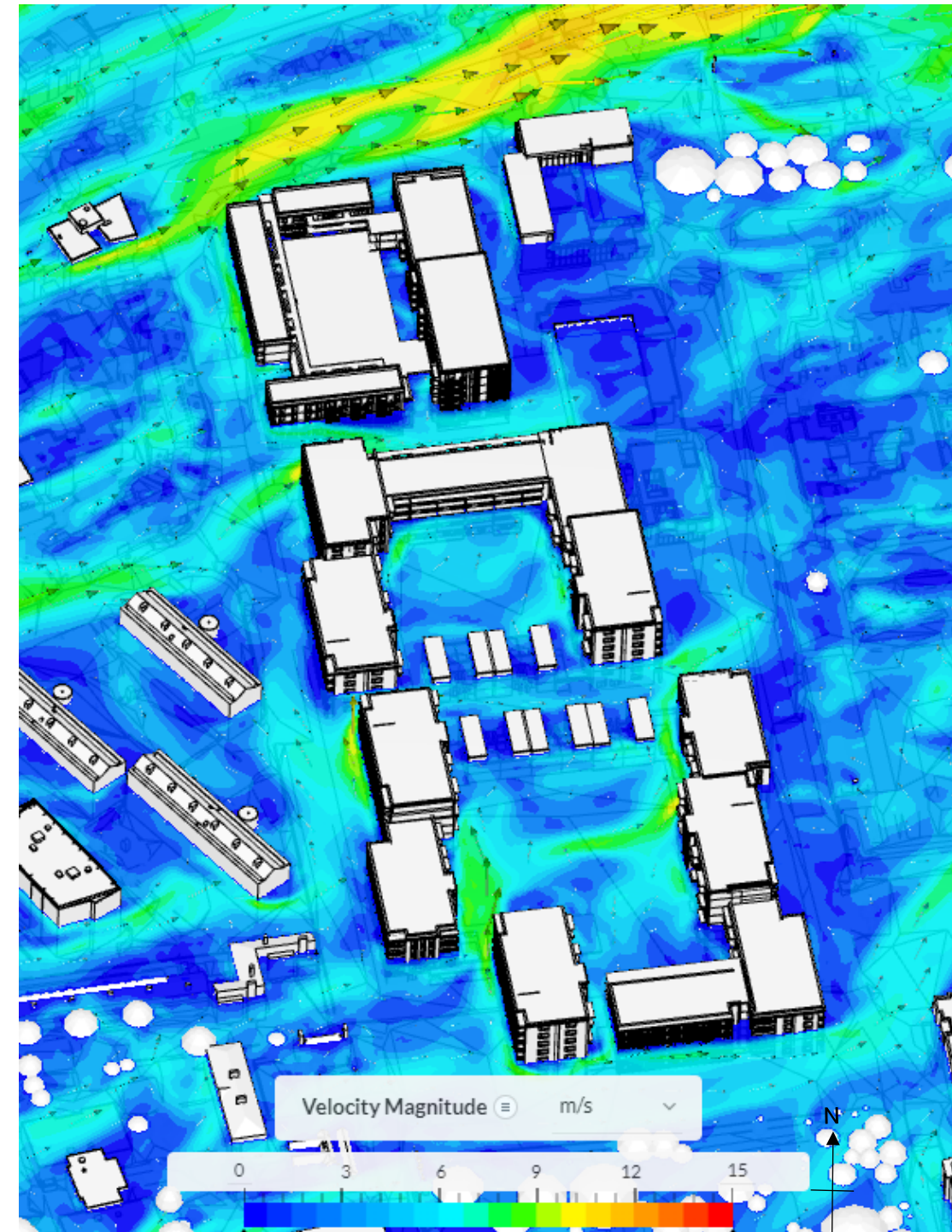


Fig. 3.1 - Wind Velocity at 10m above Ground Level

3.0 Wind Analysis

3.2 Wind Analysis Results - Proposed Landscaping Design

Figure 3.2.1 illustrates predicted wind velocities across the development under prevailing SW wind conditions, at 4m above ground level in the North section of the site, adjacent to the existing sports centre.

In the outdoor amenity space to the north of the proposed development along Emmet Rd, there is a localised region of high wind speeds as the prevailing SW wind accelerates the corner of the building. This is highlighted in Figure 3.2.1. This high wind speed could potentially cause discomfort in that region.

Figure 3.2.2 illustrates the simulated changes in the wind velocities with the inclusion of the proposed landscaping, to mitigate against these higher wind speeds within the outdoor amenity area.

The outdoor amenity space shows predicted reduced wind velocities in the region as compared to without proposed landscaping. The proposed landscaping prevents the direct prevailing winds to accelerate in that corner and mitigate the potential discomfort.

Winds are predicted to be deflected away from the amenity area and towards the roadway (where there is no pedestrian activity) by the proposed landscaping. However, as detailed in Section 4.2, this is determined to not result in pedestrian discomfort on the roadway.

The CFD simulations form the basis of the Pedestrian Comfort Analysis undertaken, which is described in detail in Section 4.0 below.

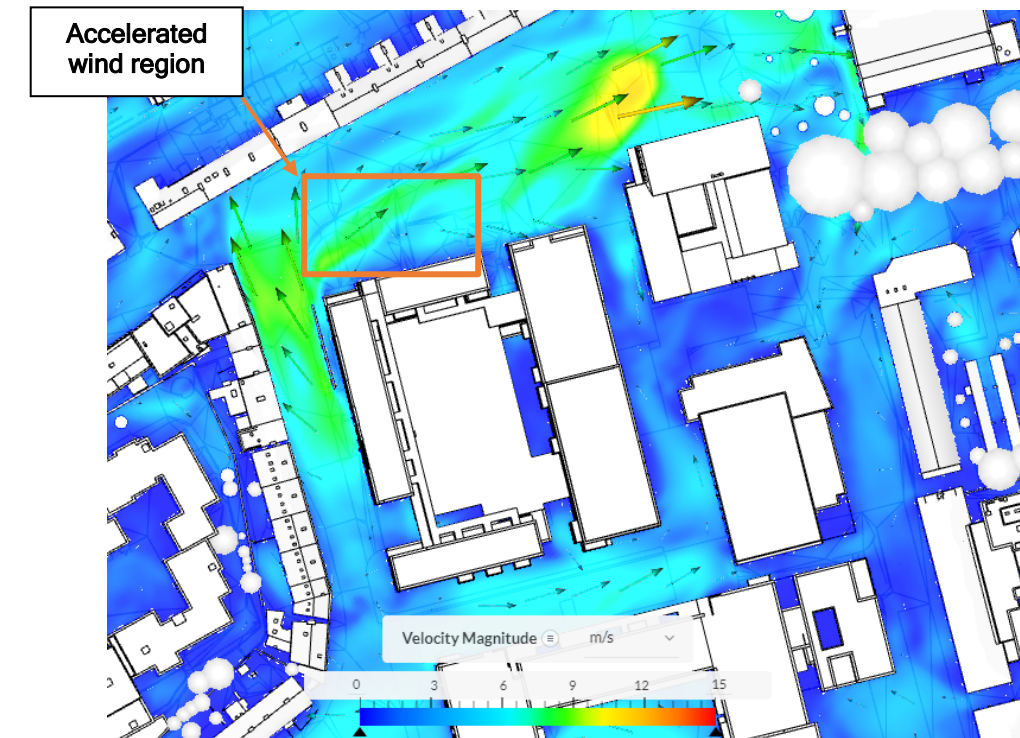


Fig. 3.2.1 - Wind Velocity at 4m above Ground Level

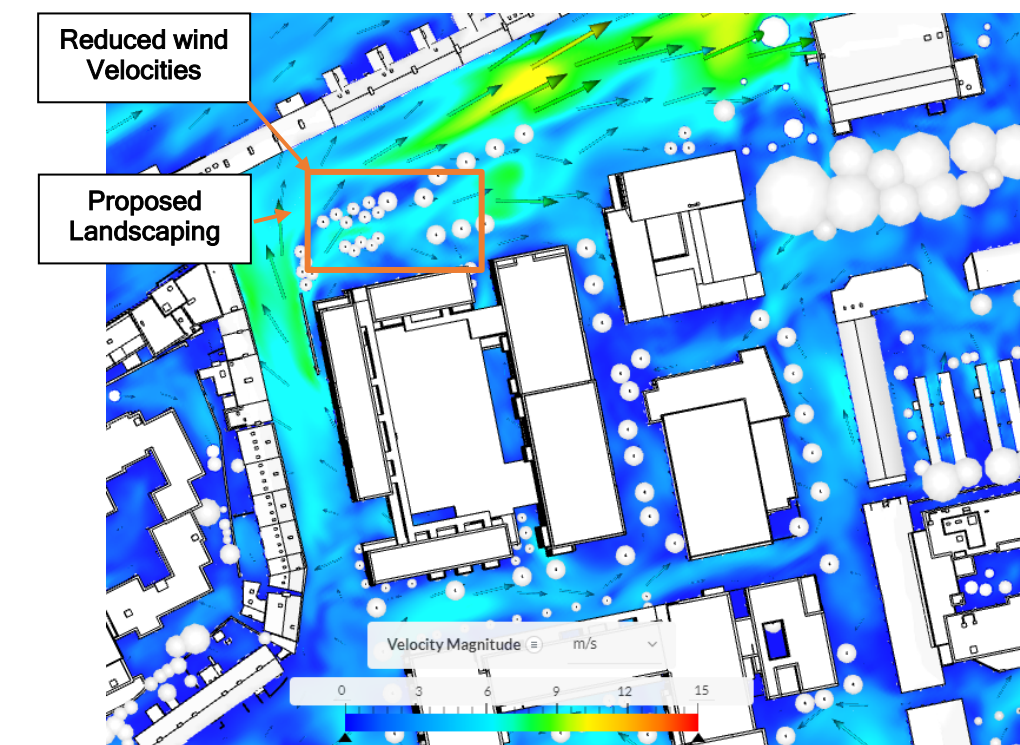


Fig. 3.2.2 - Wind Velocity at 4m above Ground Level

4.0 Pedestrian Comfort – Emmet Rd

4.1 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.

The scale in Fig 4.1.1 outlines the Lawson Criteria Scale utilised. Blue contours illustrate the most sheltered regions, areas deemed “Suitable for Outdoor Dining”. Light Blue/Cyan contours indicate regions “Suitable for Pedestrian Sitting” and “Pedestrian Standing” respectively. Green contours indicate areas “Suitable for Pedestrian Walking”, with orange illustrative of being “Suitable for Business Walking”. Red areas highlight zones as “Uncomfortable”.

As per Fig. 4.1.1, the majority of the proposed development site is suitable for “Outdoor Dining/Pedestrian Sitting”. The outer regions such as roads which tends to be the path of the prevailing winds are shown to be suitable for “Pedestrian Standing”.

However, the highlighted regions in Figure 4.1.2 show that some places are suitable for “Pedestrian Walking” which seem slightly high and better comfort can be obtained. Therefore, in section 4.2 the CFD analysis includes the Pedestrian Comfort with proposed landscaping for the development.

A	2 m/s	< 5%	Outdoor Dining
B	4 m/s	< 5%	Pedestrian Sitting
C	6 m/s	< 5%	Pedestrian Standing
D	8 m/s	< 5%	Pedestrian Walking
E	10 m/s	< 5%	Business Walking
U	10 m/s	> 5%	Uncomfortable

Fig. 4.1.1 – Lawson Criteria



Fig. 4.1.2 – Lawson Criteria Results at 1.5m Above Ground Level Across Proposed Development

4.0 Pedestrian Comfort – Emmet Rd

4.2 Ground level with Proposed Landscaping Design

Figure 4.2.2 illustrates the change in therefore pedestrian comfort brought by the inclusion of proposed landscaping trees.

Compared to Figure 4.1.2, the highlighted regions to the north, centre and south of the proposed development have reduced wind acceleration from “Pedestrian Walking” to mainly “Pedestrian Standing”.

At the outdoor amenity space to the north of the site, the proposed landscape has led to sheltered wind conditions suitable for “Pedestrian Standing/Pedestrian Sitting” and therefore suitable for its intended use as a public amenity space.

A	2 m/s	< 5%	Outdoor Dining
B	4 m/s	< 5%	Pedestrian Sitting
C	6 m/s	< 5%	Pedestrian Standing
D	8 m/s	< 5%	Pedestrian Walking
E	10 m/s	< 5%	Business Walking
U	10 m/s	> 5%	Uncomfortable

Fig. 4.2.1 – Lawson Criteria

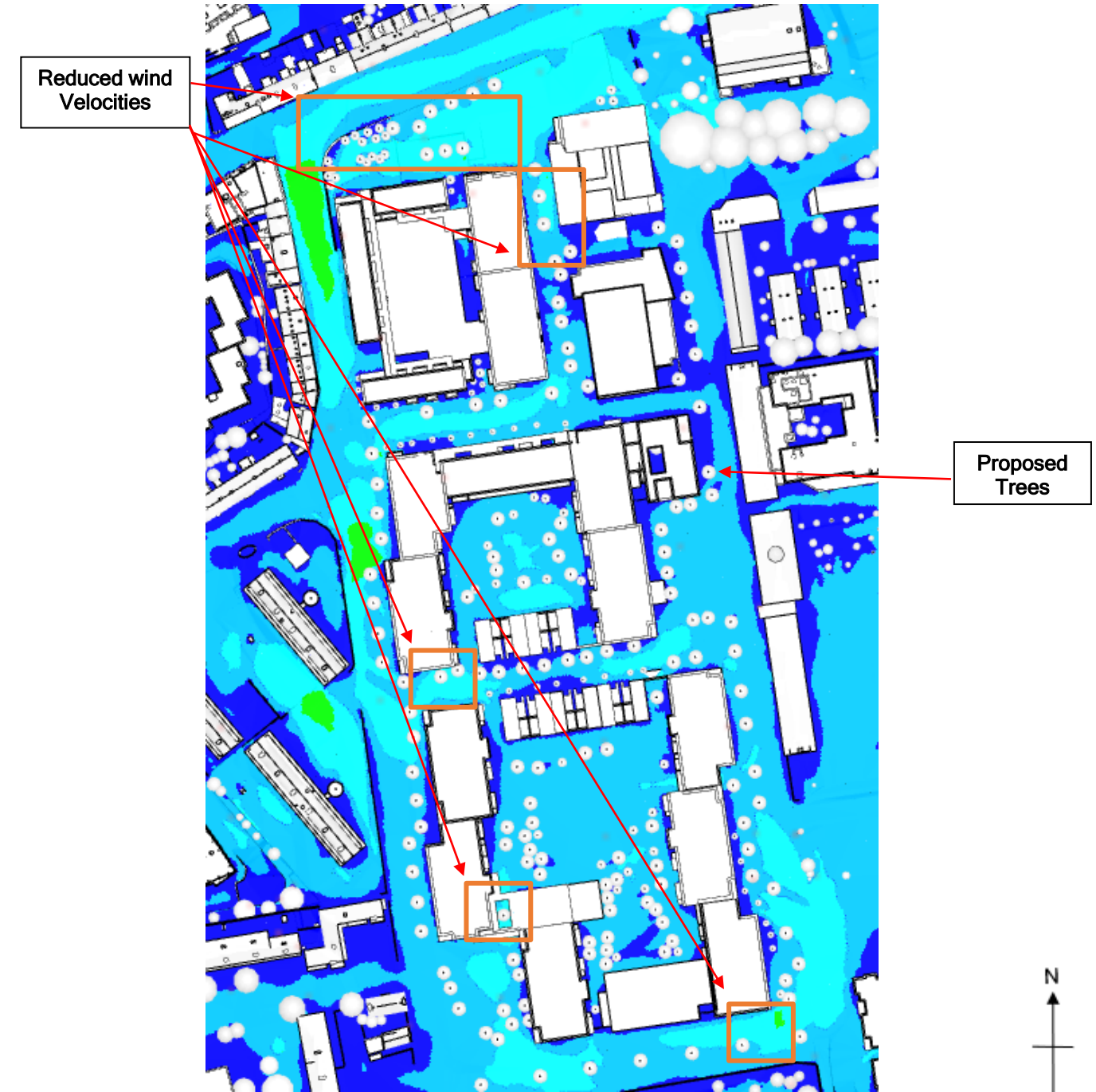


Fig. 4.2.2 – Lawson Criteria Results across Emmet Road with Proposed Landscaping

4.0 Pedestrian Comfort – Emmet Rd

4.3 Balconies

All balcony amenity spaces across the proposed development were assessed for pedestrian comfort by predicting Lawson Criteria values at 1.5m above each balcony.

The scale in Fig 4.3.2 outlines the Lawson Criteria Scale utilised. Blue contours illustrate the most sheltered regions, areas deemed “Suitable for Outdoor Dining”. Light Blue/Cyan contours indicate regions “Suitable for Pedestrian Sitting” and “Pedestrian Standing” respectively.

Balconies across the proposed development were determined to be predominantly suitable for “Outdoor Dining/Pedestrian Sitting” and therefore well suited to their intended use as private amenity spaces. Fig 4.3.3 illustrates results for balconies while Figure 4.3.1 shows the direction and location of the balconies.

A	2 m/s	< 5%	Outdoor Dining
B	4 m/s	< 5%	Pedestrian Sitting
C	6 m/s	< 5%	Pedestrian Standing
D	8 m/s	< 5%	Pedestrian Walking
E	10 m/s	< 5%	Business Walking
U	10 m/s	> 5%	Uncomfortable

Fig. 4.3.2 – Lawson Criteria

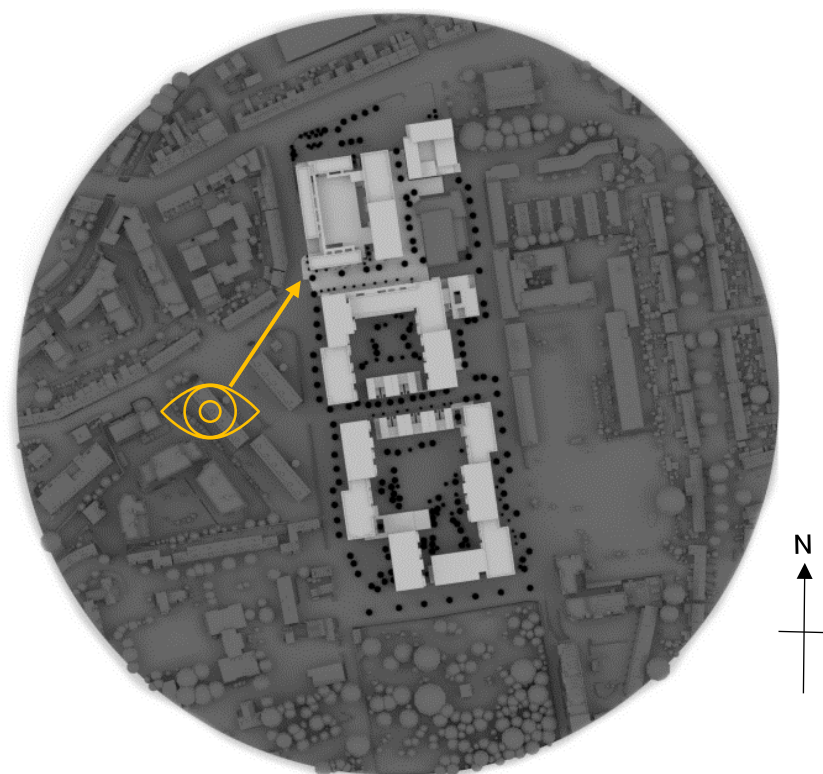


Fig. 4.3.1 – View Key for Balcony Image Direction

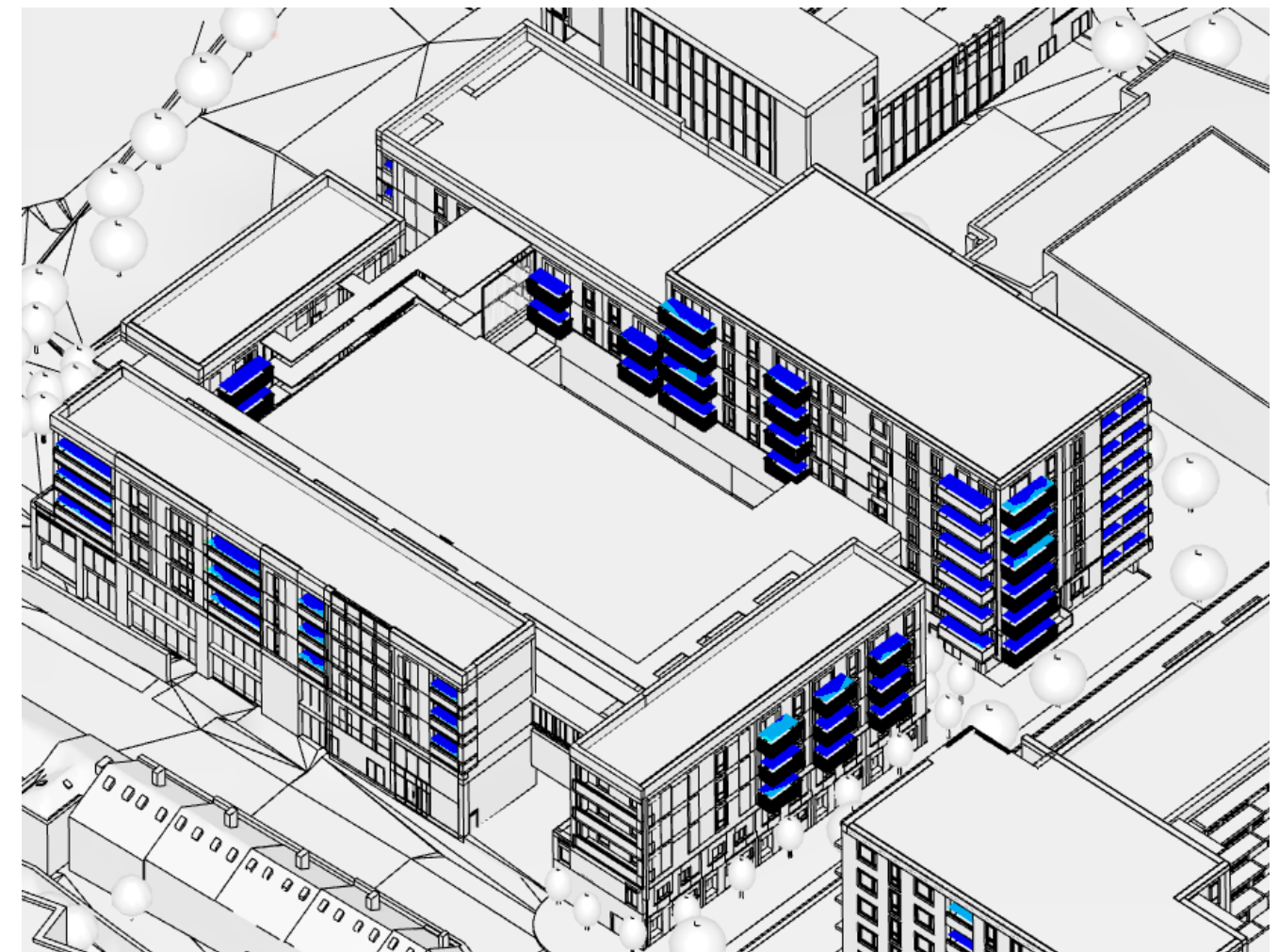


Fig. 4.3.3 – Lawson Criteria Results for Balconies

4.0 Pedestrian Comfort – Emmet Rd

4.4 Balconies

All balcony amenity spaces across the proposed development were assessed for pedestrian comfort by predicting Lawson Criteria values at 1.5m above each balcony.

The scale in Fig 4.4.2 outlines the Lawson Criteria Scale utilised. Blue contours illustrate the most sheltered regions, areas deemed “Suitable for Outdoor Dining”. Light Blue/Cyan contours indicate regions “Suitable for Pedestrian Sitting” and “Pedestrian Standing” respectively.

Balconies across the proposed development were determined to be predominantly suitable for “Outdoor Dining/Pedestrian Sitting” and therefore well suited to their intended use as private amenity spaces. Fig 4.4.3 illustrates results for balconies while Figure 4.4.1 shows the direction and location of the balconies.

A	2 m/s	< 5%	Outdoor Dining
B	4 m/s	< 5%	Pedestrian Sitting
C	6 m/s	< 5%	Pedestrian Standing
D	8 m/s	< 5%	Pedestrian Walking
E	10 m/s	< 5%	Business Walking
U	10 m/s	> 5%	Uncomfortable

Fig. 4.4.2 – Lawson Criteria

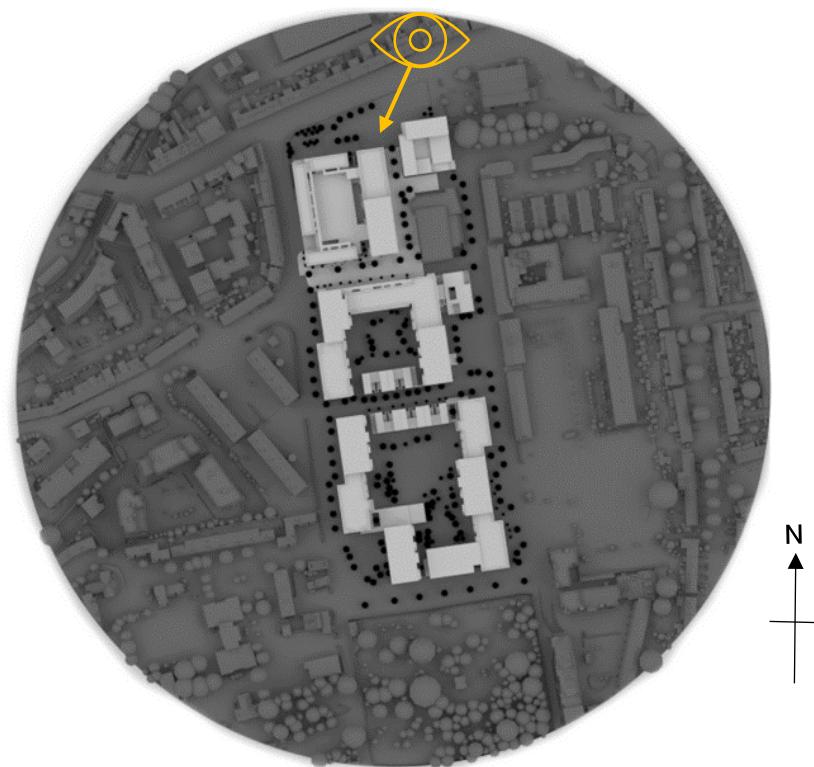


Fig. 4.4.1 – View Key for Balcony Image Direction

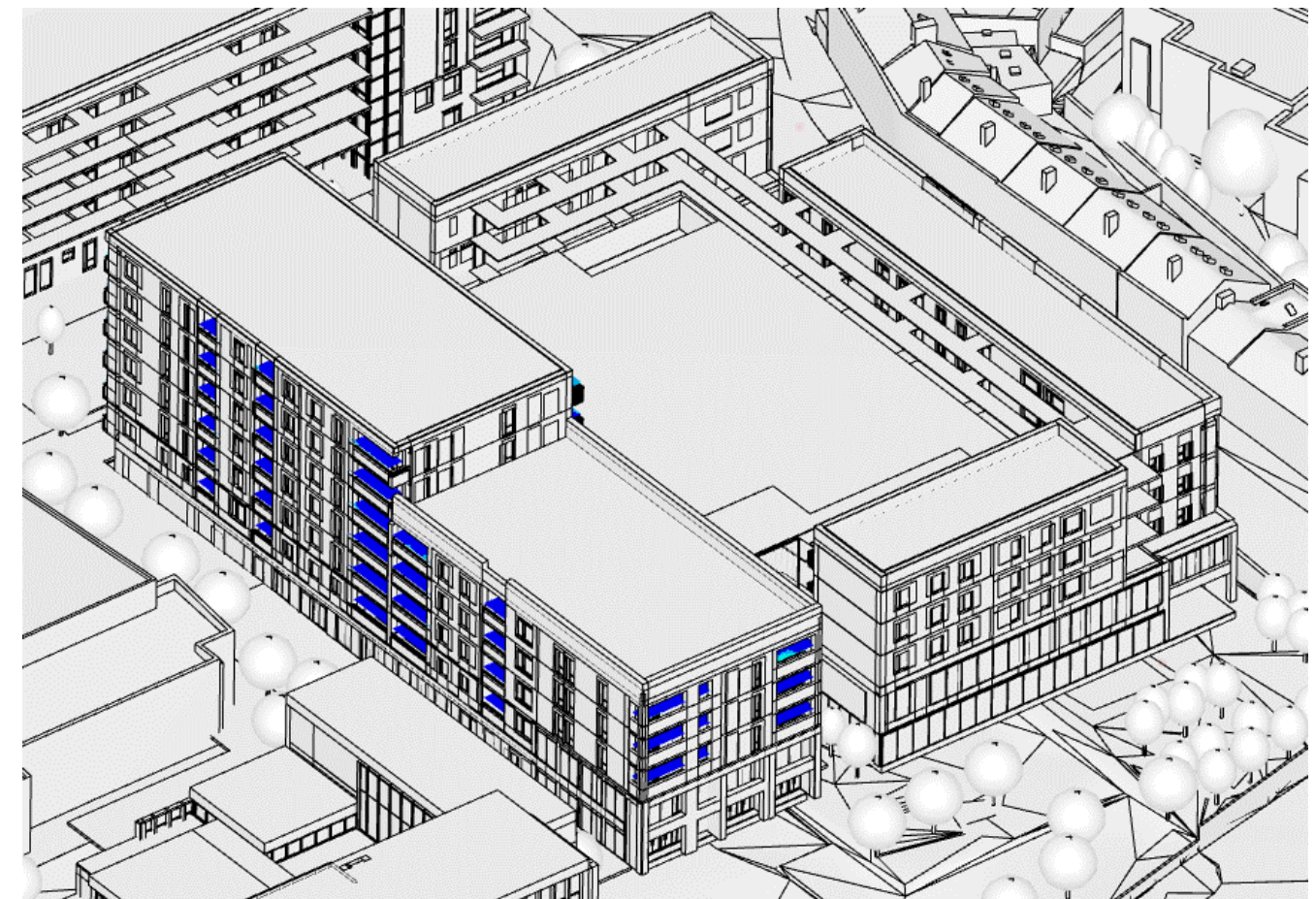


Fig. 4.4.3 – Lawson Criteria Results for Balconies

4.0 Pedestrian Comfort – Emmet Rd

4.5 Balconies

All balcony amenity spaces across the proposed development were assessed for pedestrian comfort by predicting Lawson Criteria values at 1.5m above each balcony.

The scale in Fig 4.5.2 outlines the Lawson Criteria Scale utilised. Blue contours illustrate the most sheltered regions, areas deemed “Suitable for Outdoor Dining”. Light Blue/Cyan contours indicate regions “Suitable for Pedestrian Sitting” and “Pedestrian Standing” respectively.

Balconies across the proposed development were determined to be predominantly suitable for “Outdoor Dining/Pedestrian Sitting” and therefore well suited to their intended use as private amenity spaces. Fig 4.5.3 illustrates results for balconies while Figure 4.5.1 shows the direction and location of the balconies.

A	2 m/s	< 5%	Outdoor Dining
B	4 m/s	< 5%	Pedestrian Sitting
C	6 m/s	< 5%	Pedestrian Standing
D	8 m/s	< 5%	Pedestrian Walking
E	10 m/s	< 5%	Business Walking
U	10 m/s	> 5%	Uncomfortable

Fig. 4.5.2 – Lawson Criteria

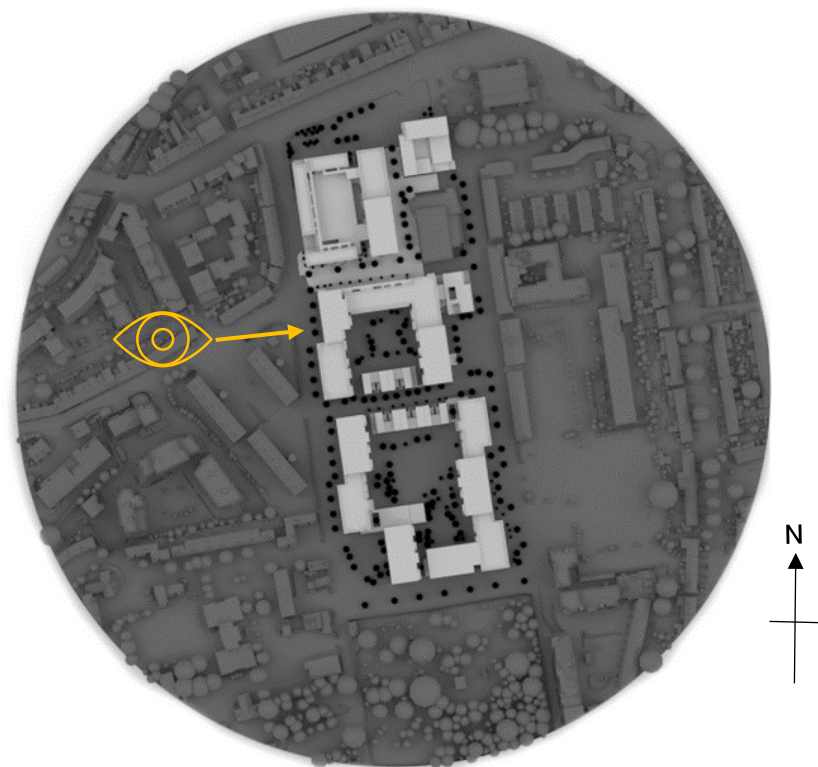


Fig. 4.5.1 – View Key for Balcony Image Direction



Fig. 4.5.3 – Lawson Criteria Results for Balconies

4.0 Pedestrian Comfort – Emmet Rd

4.6 Balconies

All balcony amenity spaces across the proposed development were assessed for pedestrian comfort by predicting Lawson Criteria values at 1.5m above each balcony.

The scale in Fig 4.6.2 outlines the Lawson Criteria Scale utilised. Blue contours illustrate the most sheltered regions, areas deemed “Suitable for Outdoor Dining”. Light Blue/Cyan contours indicate regions “Suitable for Pedestrian Sitting” and “Pedestrian Standing” respectively.

Balconies across the proposed development were determined to be predominantly suitable for “Outdoor Dining/Pedestrian Sitting” and therefore well suited to their intended use as private amenity spaces. Fig 4.6.3 illustrates results for balconies while Figure 4.6.1 shows the direction and location of the balconies.

A	2 m/s	< 5%	Outdoor Dining
B	4 m/s	< 5%	Pedestrian Sitting
C	6 m/s	< 5%	Pedestrian Standing
D	8 m/s	< 5%	Pedestrian Walking
E	10 m/s	< 5%	Business Walking
U	10 m/s	> 5%	Uncomfortable

Fig. 4.6.2 – Lawson Criteria

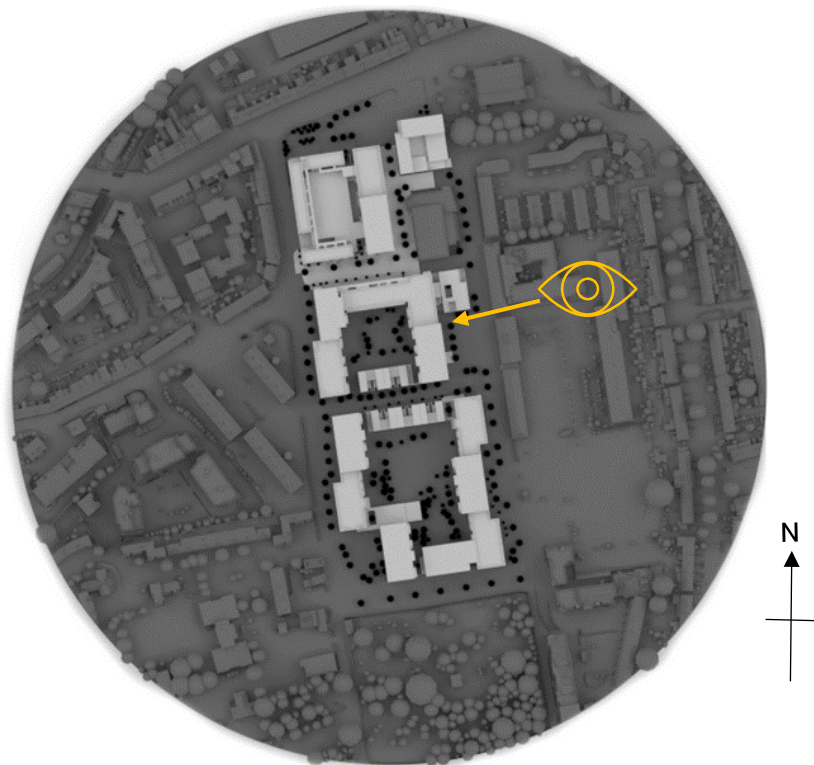


Fig. 4.6.1 – View Key for Balcony Image Direction

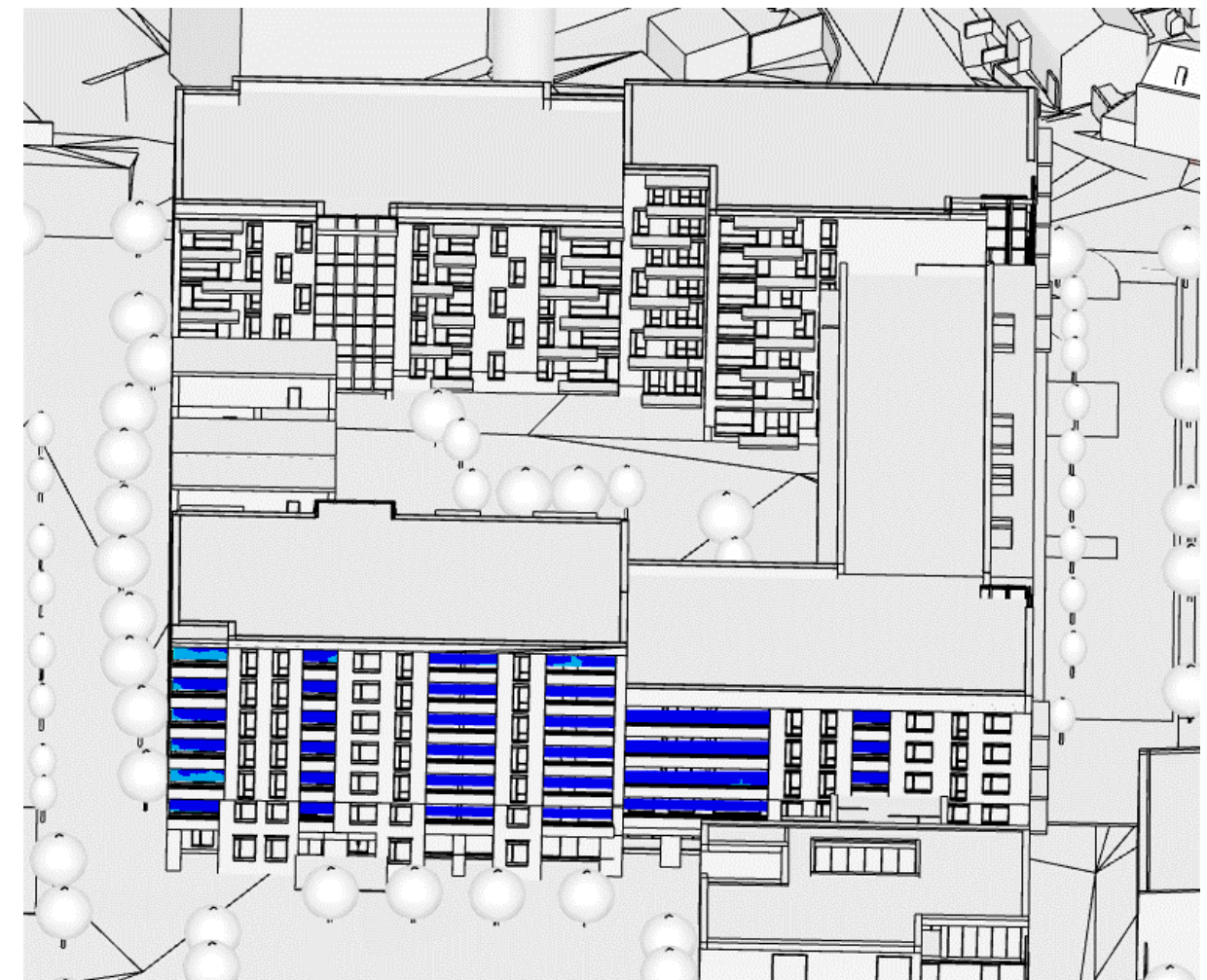


Fig. 4.6.3 – Lawson Criteria Results for Balconies

4.0 Pedestrian Comfort – Emmet Rd

4.7 Balconies

All balcony amenity spaces across the proposed development were assessed for pedestrian comfort by predicting Lawson Criteria values at 1.5m above each balcony.

The scale in Fig 4.7.2 outlines the Lawson Criteria Scale utilised. Blue contours illustrate the most sheltered regions, areas deemed “Suitable for Outdoor Dining”. Light Blue/Cyan contours indicate regions “Suitable for Pedestrian Sitting” and “Pedestrian Standing” respectively.

Balconies across the proposed development were determined to be predominantly suitable for “Outdoor Dining/Pedestrian Sitting” and therefore well suited to their intended use as private amenity spaces. Fig 4.7.3 illustrates results for balconies while Figure 4.7.1 shows the direction and location of the balconies.

A	2 m/s	< 5%	Outdoor Dining
B	4 m/s	< 5%	Pedestrian Sitting
C	6 m/s	< 5%	Pedestrian Standing
D	8 m/s	< 5%	Pedestrian Walking
E	10 m/s	< 5%	Business Walking
U	10 m/s	> 5%	Uncomfortable

Fig. 4.7.2 – Lawson Criteria

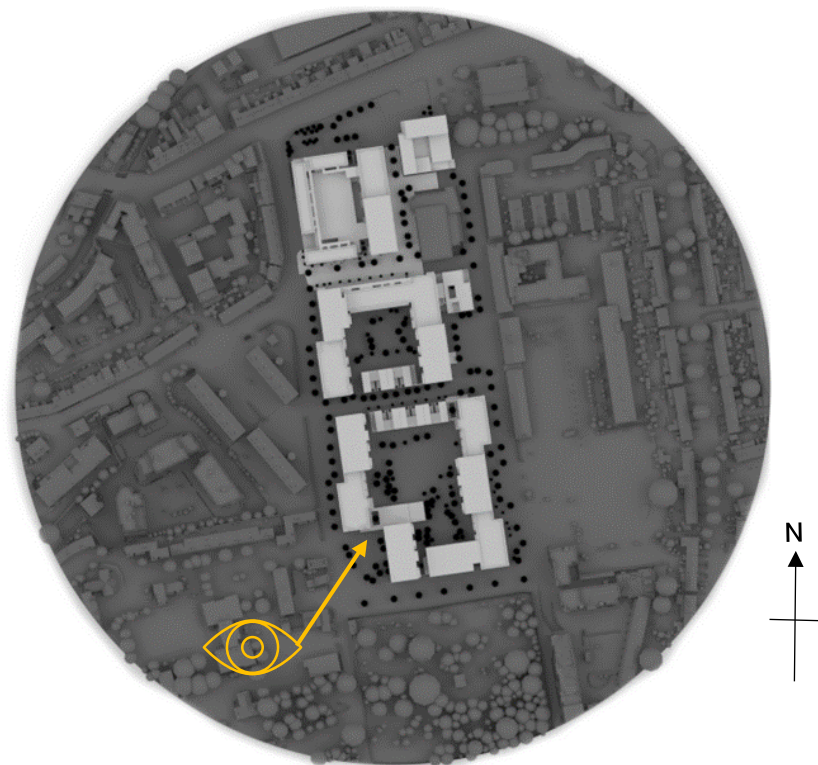


Fig. 4.7.1 – View Key for Balcony Image Direction



Fig. 4.7.3 – Lawson Criteria Results for Balconies

4.0 Pedestrian Comfort – Emmet Rd

4.8 Balconies

All balcony amenity spaces across the proposed development were assessed for pedestrian comfort by predicting Lawson Criteria values at 1.5m above each balcony.

The scale in Fig 4.8.2 outlines the Lawson Criteria Scale utilised. Blue contours illustrate the most sheltered regions, areas deemed “Suitable for Outdoor Dining”. Light Blue/Cyan contours indicate regions “Suitable for Pedestrian Sitting” and “Pedestrian Standing” respectively.

Balconies across the proposed development were determined to be predominantly suitable for “Outdoor Dining/Pedestrian Sitting” and therefore well suited to their intended use as private amenity spaces. Fig 4.8.3 illustrates results for balconies while Figure 4.8.1 shows the direction and location of the balconies.

A	2 m/s	< 5%	Outdoor Dining
B	4 m/s	< 5%	Pedestrian Sitting
C	6 m/s	< 5%	Pedestrian Standing
D	8 m/s	< 5%	Pedestrian Walking
E	10 m/s	< 5%	Business Walking
U	10 m/s	> 5%	Uncomfortable

Fig. 4.8.2 – Lawson Criteria

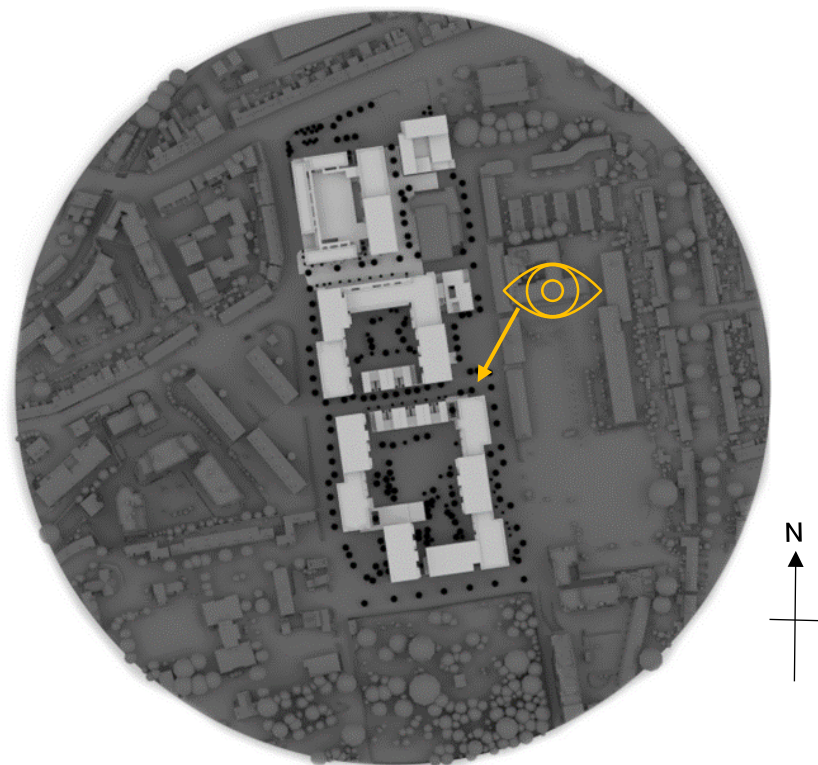


Fig. 4.8.1 – View Key for Balcony Image Direction

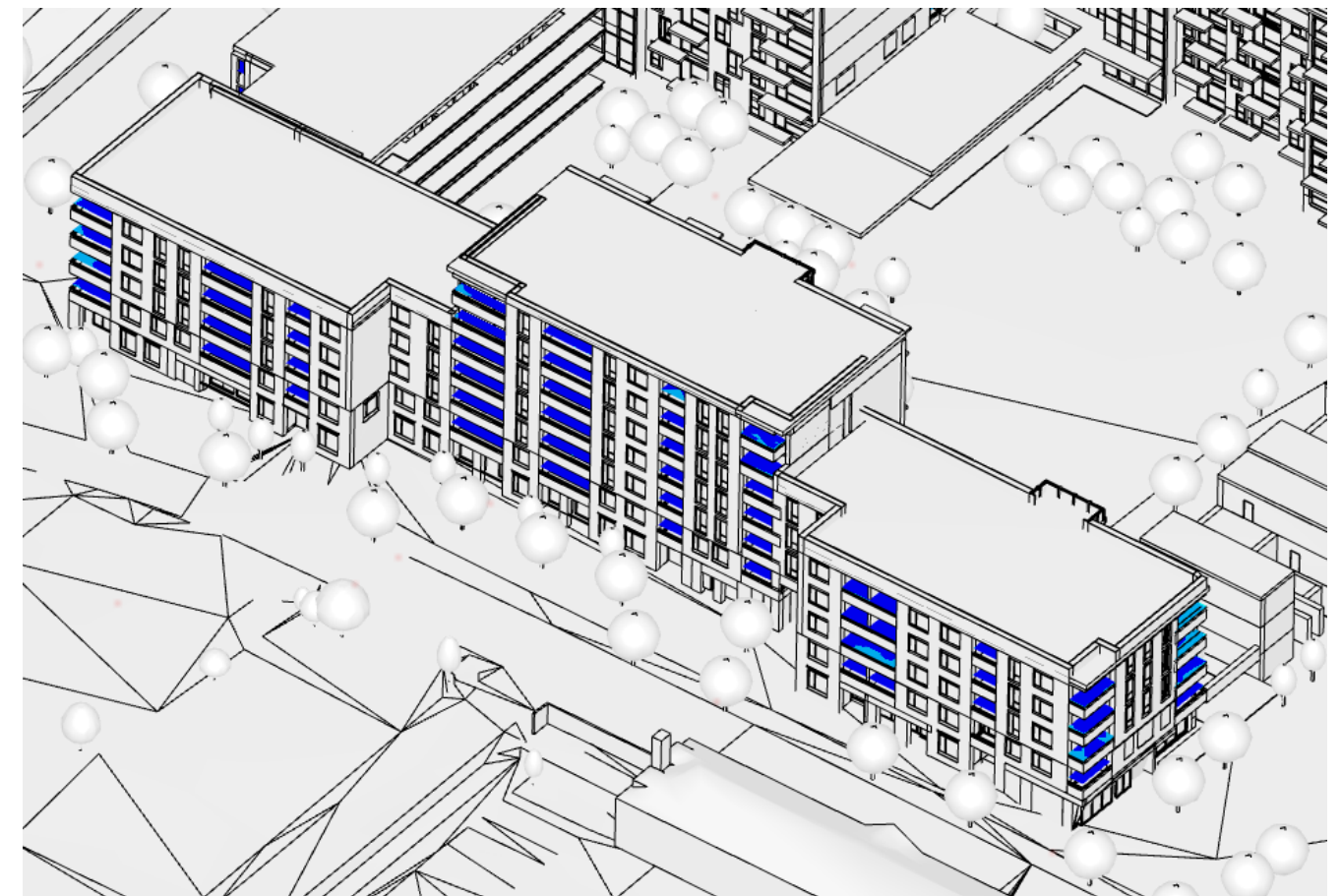


Fig. 4.8.3 – Lawson Criteria Results for Balconies

4.0 Pedestrian Comfort – Emmet Rd

4.9 Walkways

All walkway spaces across the proposed development were assessed and determined to be suitable for their intended use for “Pedestrian Walking” by the Lawson Criteria methodology utilised.

Figure 4.9.1 displays the location of the walkway shown in Figure 4.9.3.

It should be noted that railings around walkways are not included in the CFD model. From a CFD perspective, the railings are greater than 70% porosity and will therefore act as effectively open, providing little or no wind sheltering. However, railings are intended to be included in the design for safety and accessibility purposes, etc. Please see architectural package by BMCEA Architects for details.

A	2 m/s	< 5%	Outdoor Dining
B	4 m/s	< 5%	Pedestrian Sitting
C	6 m/s	< 5%	Pedestrian Standing
D	8 m/s	< 5%	Pedestrian Walking
E	10 m/s	< 5%	Business Walking
U	10 m/s	> 5%	Uncomfortable

Fig. 4.9.2 – Lawson Criteria

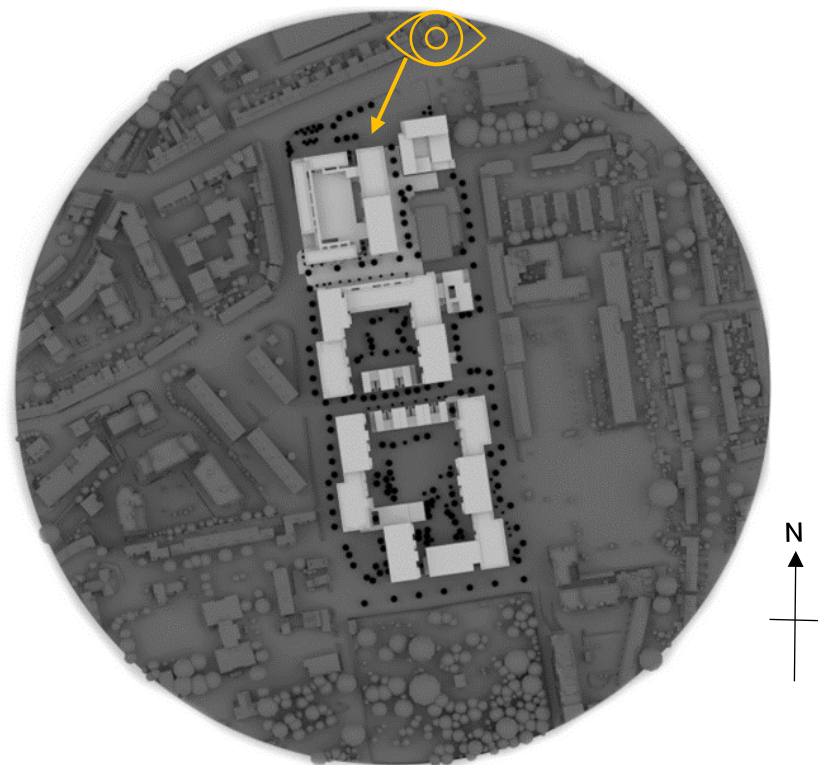


Fig. 4.9.1 – View Key for Walkway Image Direction

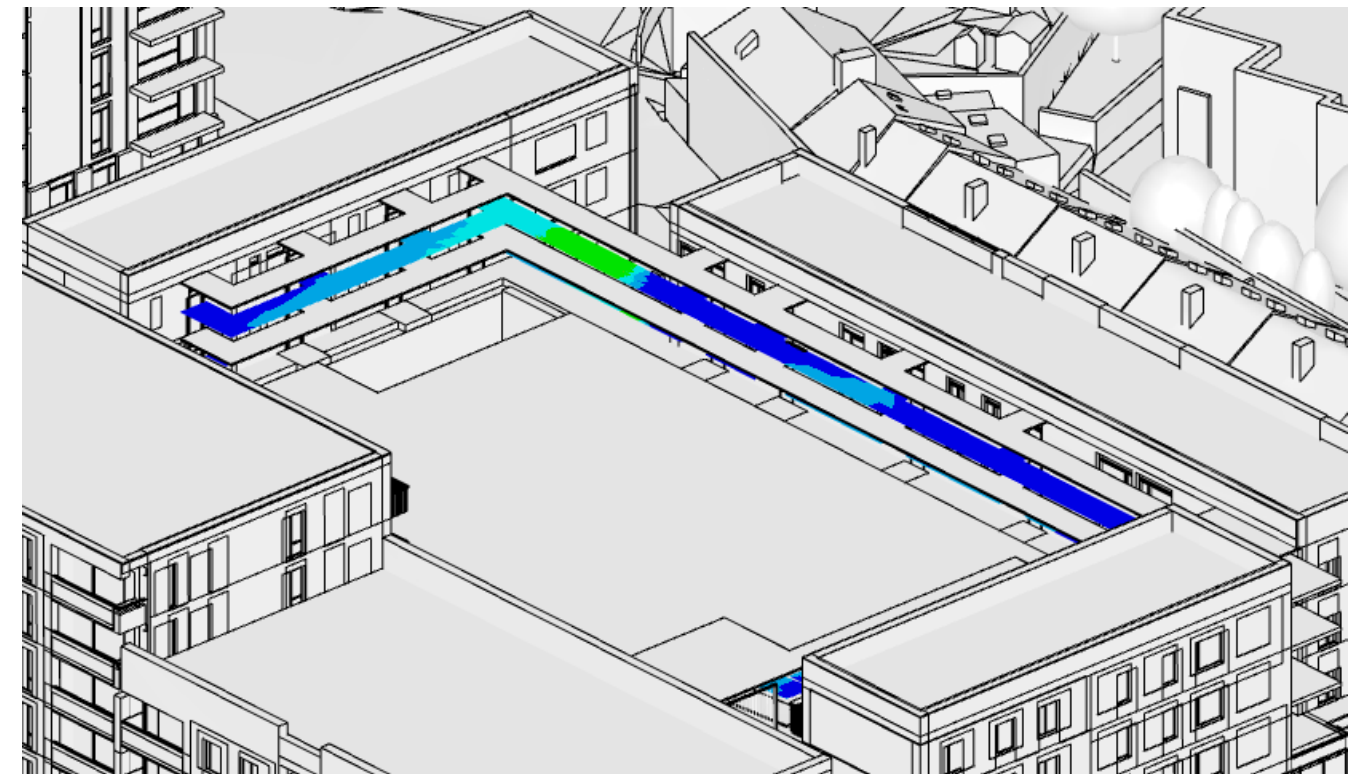


Fig. 4.9.3 – Lawson Criteria Results for Walkways

4.0 Pedestrian Comfort – Emmet Rd

4.10 Walkways

All walkway spaces across the proposed development were assessed and determined to be suitable for their intended use for “Pedestrian Walking” by the Lawson Criteria methodology utilised.

Figure 4.10.1 displays the location of the walkway shown in Figure 4.10.3.

It should be noted that railings around walkways are not included in the CFD model. From a CFD perspective, the railings are greater than 70% porosity and will therefore act as effectively open, providing little or no wind sheltering. However, railings are intended to be included in the design for safety and accessibility purposes, etc. Please see architectural package by BMCEA Architects for details.

A	2 m/s	< 5%	Outdoor Dining
B	4 m/s	< 5%	Pedestrian Sitting
C	6 m/s	< 5%	Pedestrian Standing
D	8 m/s	< 5%	Pedestrian Walking
E	10 m/s	< 5%	Business Walking
U	10 m/s	> 5%	Uncomfortable

Fig. 4.10.2 – Lawson Criteria

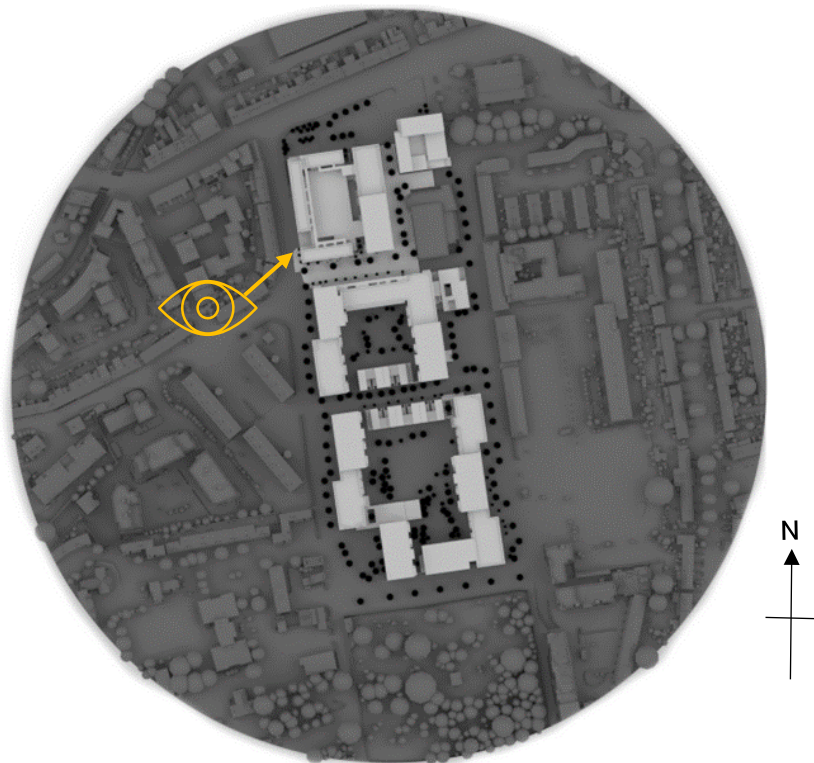


Fig. 4.10.1 – View Key for Walkway Image Direction

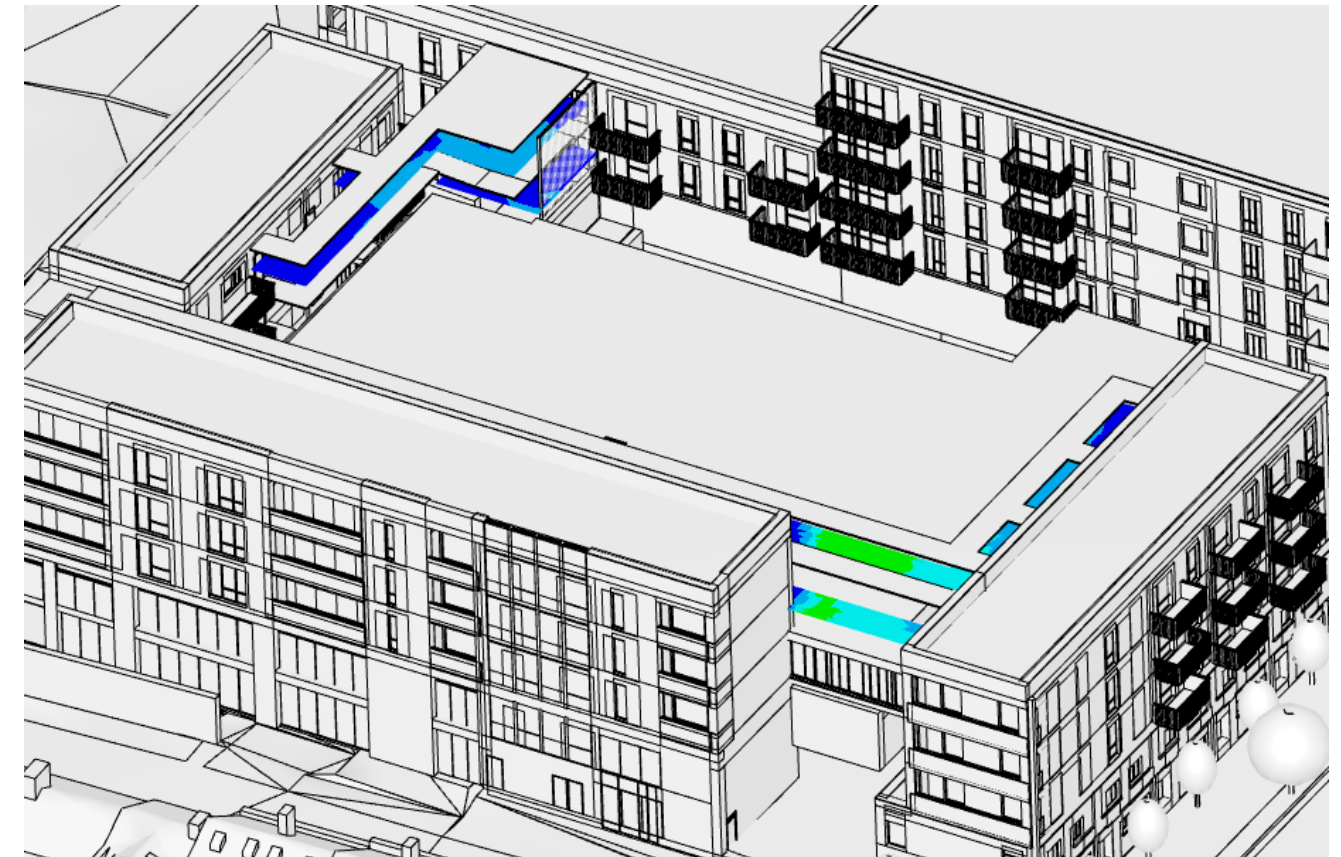


Fig. 4.10.3 – Lawson Criteria Results for Walkways

4.0 Pedestrian Comfort – Emmet Rd

4.11 Walkways

All walkway spaces across the proposed development were assessed and determined to be suitable for their intended use for “Pedestrian Walking” by the Lawson Criteria methodology utilised.

Figure 4.11.1 displays the location of the walkway shown in Figure 4.11.3.

It should be noted that railings around walkways are not included in the CFD model. From a CFD perspective, the railings are greater than 70% porosity and will therefore act as effectively open, providing little or no wind sheltering. However, railings are intended to be included in the design for safety and accessibility purposes, etc. Please see architectural package by BMCEA Architects for details.

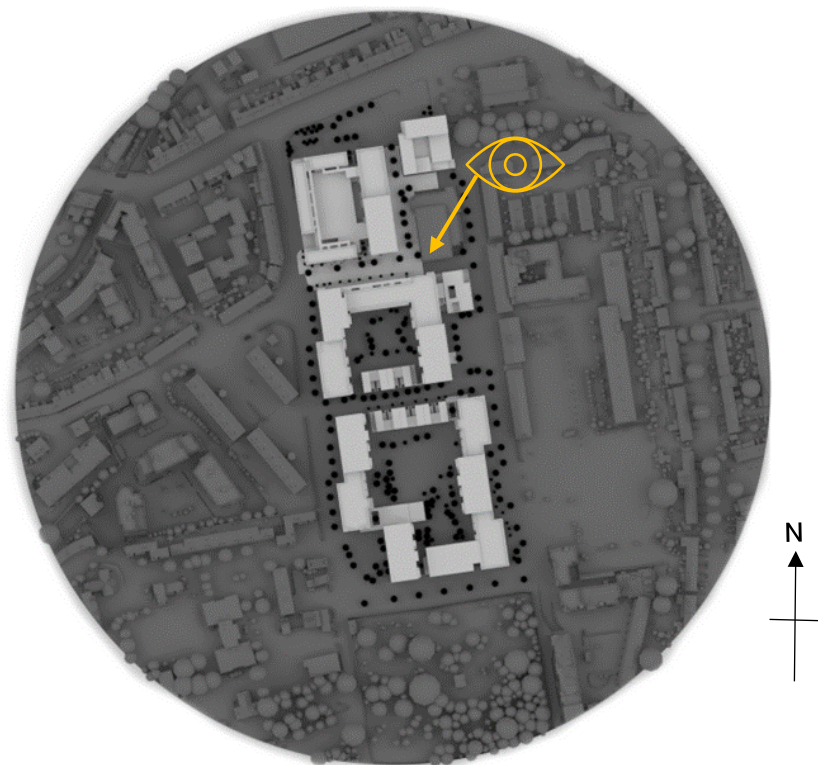


Fig. 4.11.1 – View Key for Walkway Image Direction

A	2 m/s	< 5%	Outdoor Dining
B	4 m/s	< 5%	Pedestrian Sitting
C	6 m/s	< 5%	Pedestrian Standing
D	8 m/s	< 5%	Pedestrian Walking
E	10 m/s	< 5%	Business Walking
U	10 m/s	> 5%	Uncomfortable

Fig. 4.11.2 – Lawson Criteria

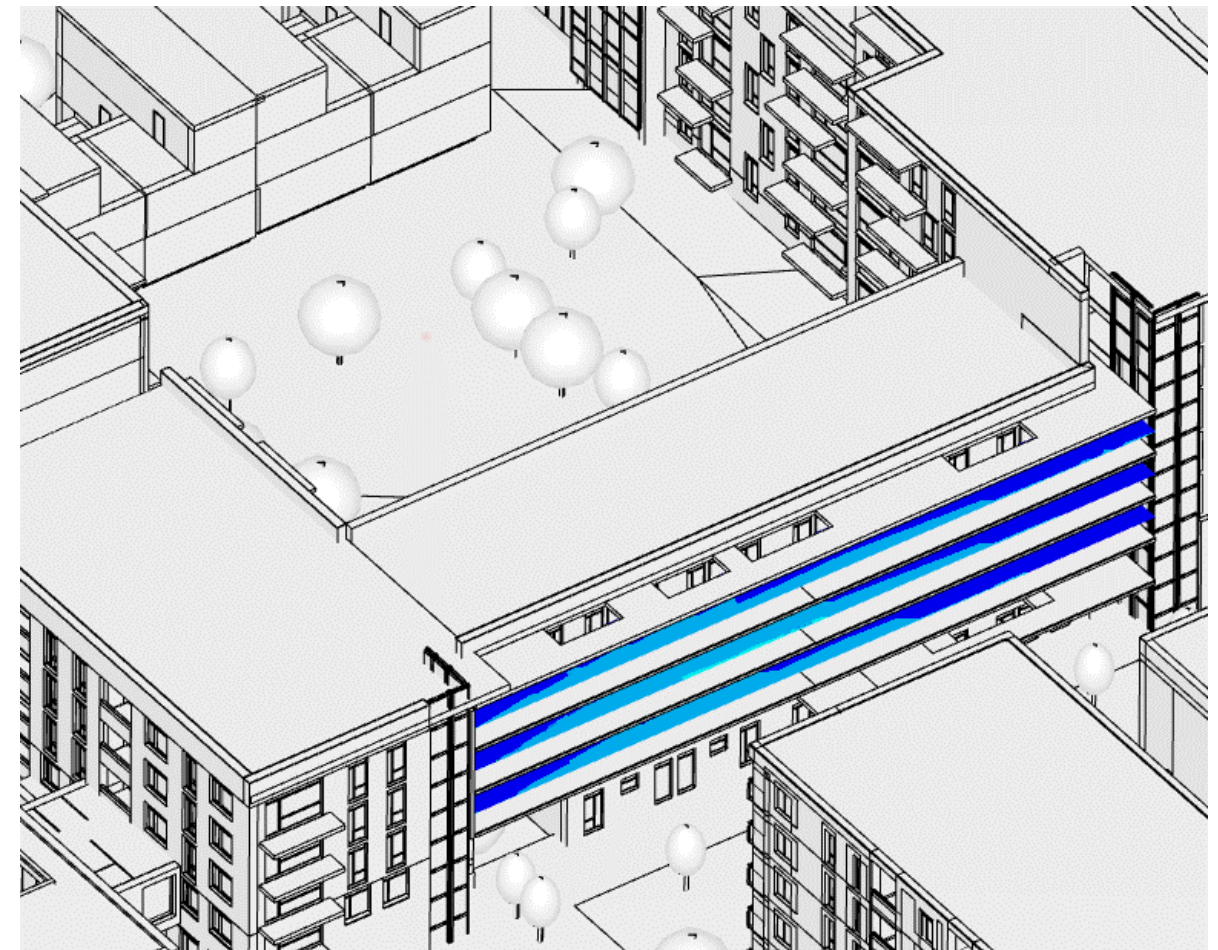


Fig. 4.11.3 – Lawson Criteria Results for Walkways

4.0 Pedestrian Comfort – Emmet Rd

4.12 Walkways

All walkway spaces across the proposed development were assessed and determined to be suitable for their intended use for “Pedestrian Walking” by the Lawson Criteria methodology utilised.

Figure 4.12.1 displays the location of the walkway shown in Figure 4.12.3.

It should be noted that railings around walkways are not included in the CFD model. From a CFD perspective, the railings are greater than 70% porosity and will therefore act as effectively open, providing little or no wind sheltering. However, railings are intended to be included in the design for safety and accessibility purposes, etc. Please see architectural package by BMCEA Architects for details.

A	2 m/s	< 5%	Outdoor Dining
B	4 m/s	< 5%	Pedestrian Sitting
C	6 m/s	< 5%	Pedestrian Standing
D	8 m/s	< 5%	Pedestrian Walking
E	10 m/s	< 5%	Business Walking
U	10 m/s	> 5%	Uncomfortable

Fig. 4.12.2 – Lawson Criteria

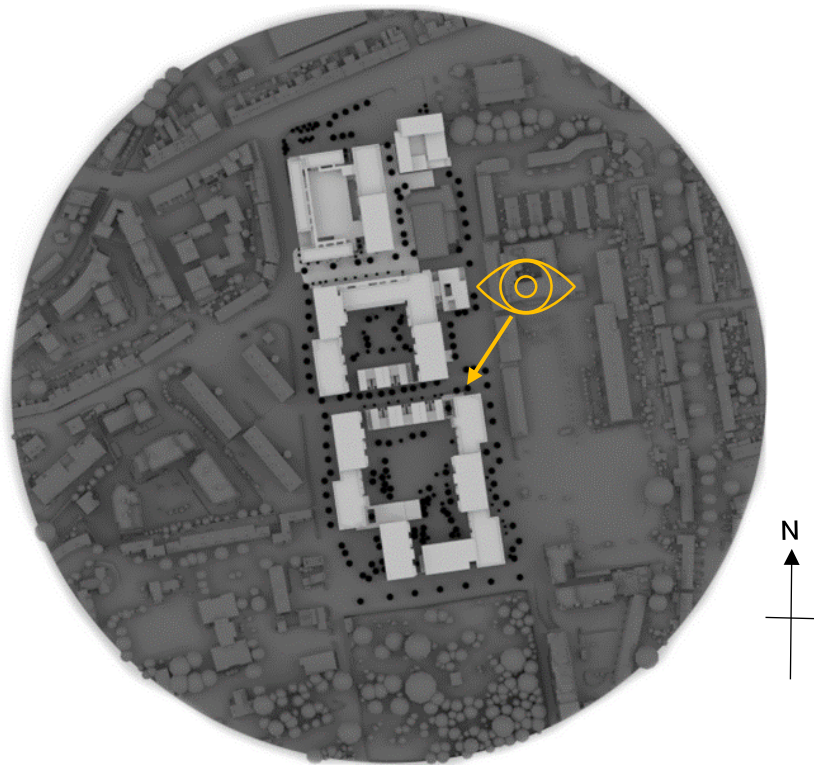


Fig. 4.12.1 – View Key for Walkway Image Direction

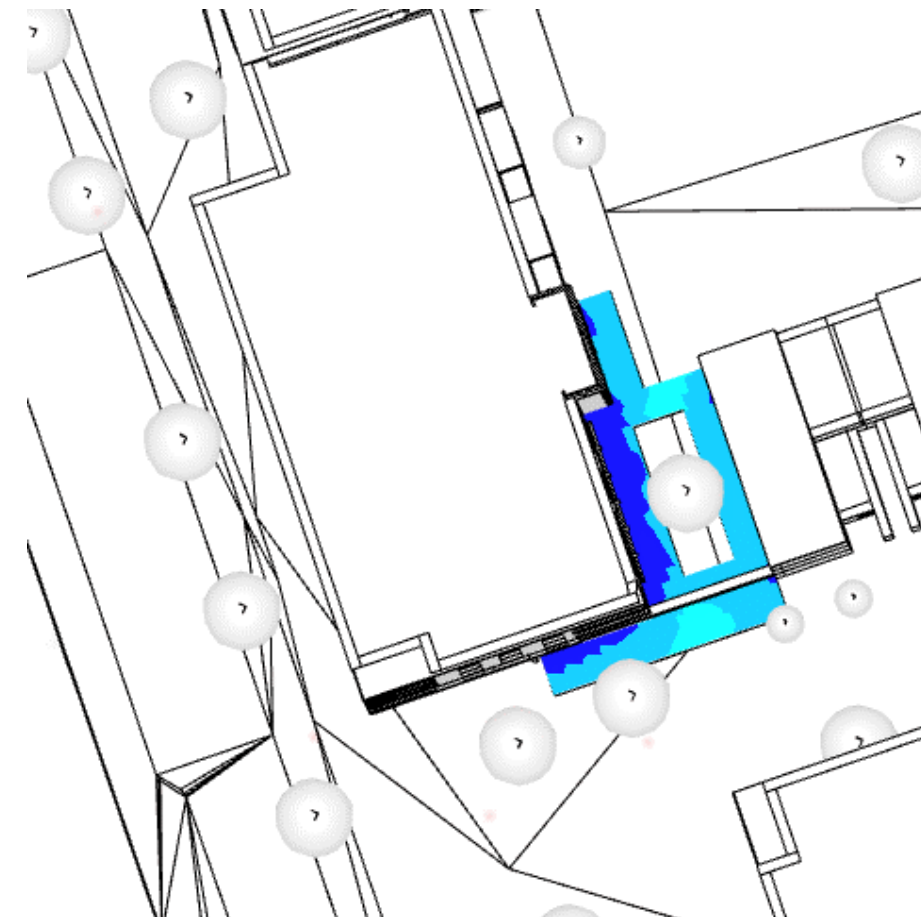


Fig. 4.12.3 – Lawson Criteria Results for Walkways

4.0 Pedestrian Comfort – Emmet Rd

4.13 Walkways

All walkway spaces across the proposed development were assessed and determined to be suitable for their intended use for “Pedestrian Walking” by the Lawson Criteria methodology utilised.

Figure 4.13.1 displays the location of the walkway shown in Figure 4.13.3.

It should be noted that railings around walkways are not included in the CFD model. From a CFD perspective, the railings are greater than 70% porosity and will therefore act as effectively open, providing little or no wind sheltering. However, railings are intended to be included in the design for safety and accessibility purposes, etc. Please see architectural package by BMCEA Architects for details.

A	2 m/s	< 5%	Outdoor Dining
B	4 m/s	< 5%	Pedestrian Sitting
C	6 m/s	< 5%	Pedestrian Standing
D	8 m/s	< 5%	Pedestrian Walking
E	10 m/s	< 5%	Business Walking
U	10 m/s	> 5%	Uncomfortable

Fig. 4.13.2 – Lawson Criteria

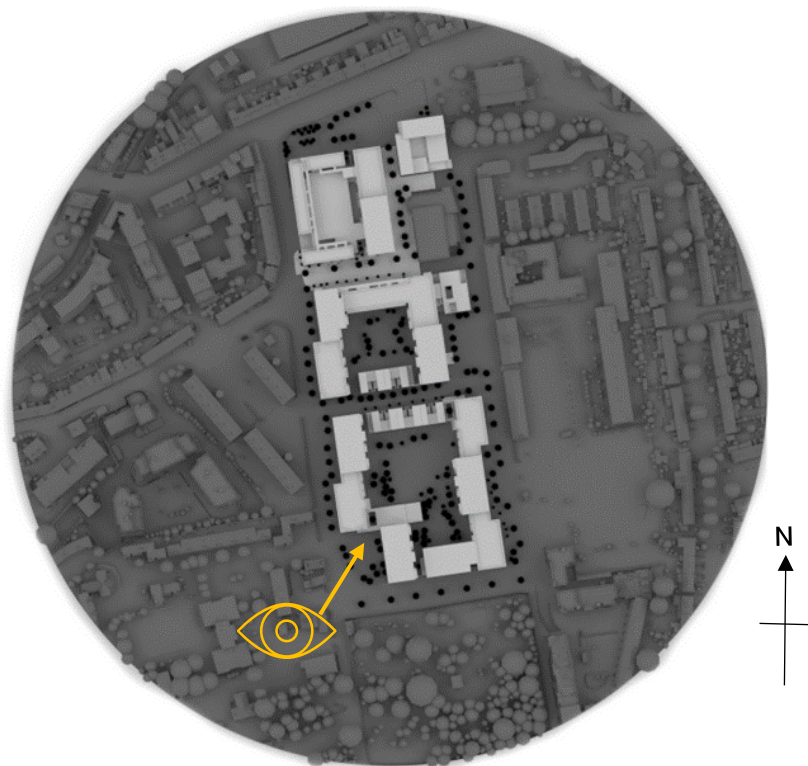


Fig. 4.13.1 – View Key for Walkway Image Direction

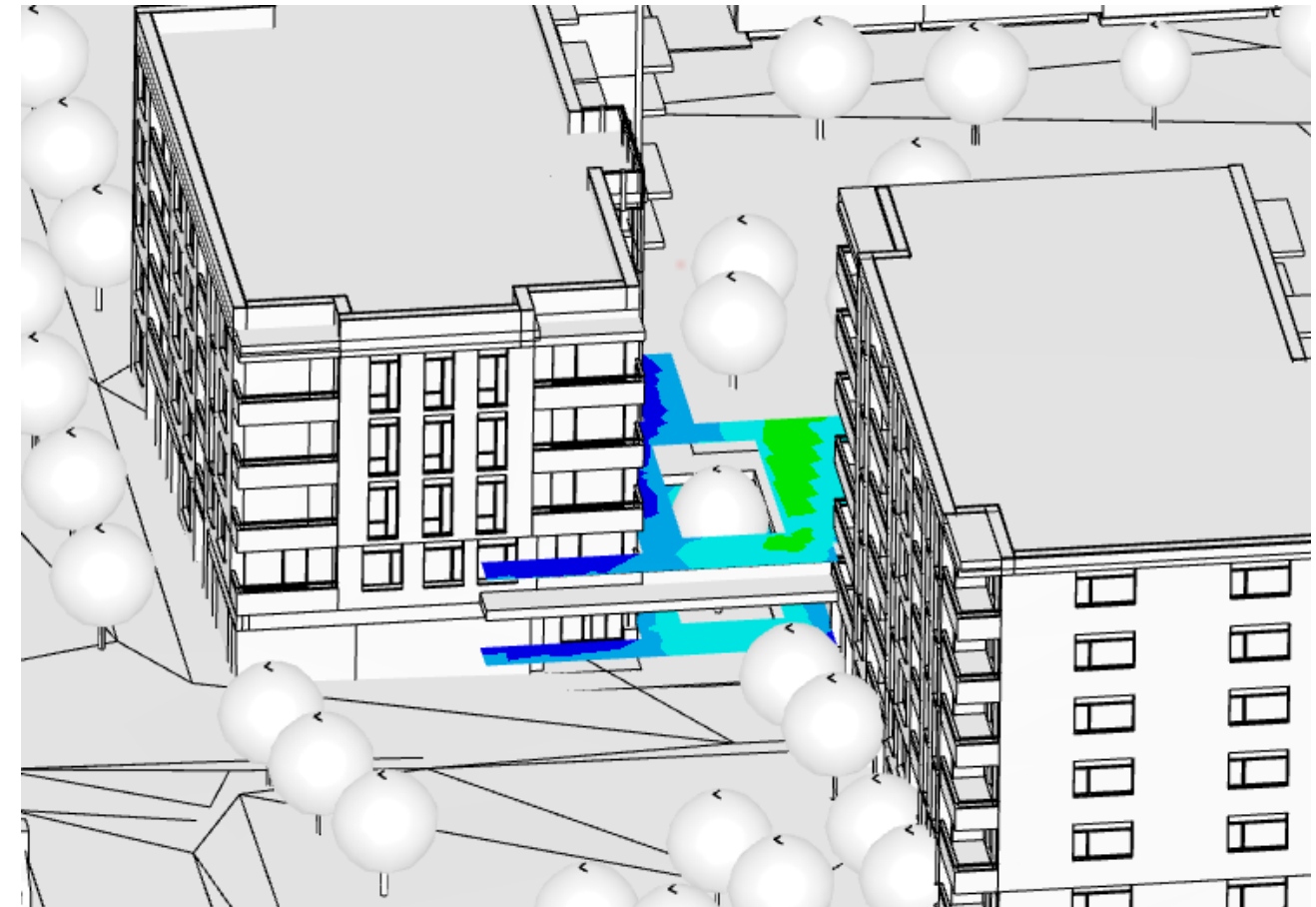


Fig. 4.13.3 – Lawson Criteria Results for Walkways



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