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MICROCLIMATE ASSESSMENT IN SUPPORT OF A PLANNING APPLICATION FOR RESIDENTIAL DEVELOPMENT ON LANDS AT KILMASHOGUE HOUSE AND COILL AVON HOUSE, WHITECHURCH ROAD, RATHFARNAM, DUBLIN 16

Report Prepared For

BCDK Limited and Coill Avon Limited

Technical Report Prepared By

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Our Reference

FC/21/12345WR01

Date Of Issue

09 March 2022

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EXECUTIVE SUMMARY

AWN were commissioned by BCDK Limited and Coill Avon Limited to undertake an assessment with regard to Microclimate Effects associated with the a proposed residential development on lands at Kilmashogue House and Coill Avon house, Whitechurch Road, Rathfarnham, Dublin 16. The aim of the assessment was to determine if there was considered to be potential microclimate effects with a particular focus on wind-speed impacts.

The site of the proposed development was characterised as a site which experiences average wind speeds of B3, which corresponds to gentle breeze on the Beaufort Scale.

Based on the analysis conducted it was concluded the proposed development would have no significant effects with regard to microclimate.

Document History

Document Reference		Original Issue Date	
FC_21_12345WR01		09 March2022	
Revision Level	Revision Date	Description	Sections Affected

Record of Approval

Details	Written by	Approved by
Signature		
Name	Fergal Callaghan	Chonaill Bradley
Title	Director	Principal Environmental Consultant
Date	09 March 2022	9 March 2022

CONTENTS

1.0 INTRODUCTION

AWN were commissioned by BCDK Limited and Coill Avon Limited to undertake an assessment with regard to Microclimate Effects associated with the proposed residential development on lands at Kilmashogue House and Coill Avon house, Whitechurch Road, Rathfarnham, Dublin 16.

The aim of the assessment was to determine if there was considered to be potential microclimate effects with a particular focus on wind-speed impacts.

- Determination from available data of the baseline (current) classification of the site with respect to The Beaufort Scale for Wind on Land.

- Examination of the proposed development and the potential for wind-speed amplification factors.

- Assessment of the impacts with regard to Microclimate

The description of the development is as follows:

The proposed development on a site that extends to 6.77 hectares includes the derelict Kilmashogue House (southern lands) and Coill Avon house (northern lands), adjacent roads in the control of South Dublin County and Dun Laoghaire Rathdown County Councils and consists of the following developments: -

- Demolition of Kilmashogue House and outbuildings and demolition of Coill Avon house and outbuildings;
- The refurbishment and re-use of 2 no. stone outbuildings for community use, to be incorporated into an area of public open space on the southern lands;
- The construction of a mixed-use development comprising neighbourhood centre and 178 no. residential units comprising 72 no. houses, 38 no. apartments and 68 no. duplex apartments;
- The 72 no. houses will comprise 2, 2.5 and 3-storey detached, semi-detached and terraced units to include:-
  - 6 no. 2-bed houses;
  - 45 no. 3-bed houses;
  - 21 no. 4-bed houses;

- The 38 no. apartments and 68 no. duplex apartments are located across 7 no. buildings ranging in height from 3 to 5-storey consisting of 1 no. Block A/B, 1 no. Block C, 1 no. Block E, 1 no. Block S and 3 no. Blocks T-type as follows: -
  - **Block A/B:** 5-storey over basement and podium accommodating 10 no. 1-bed apartments, 16 no. 2-bed duplex apartments and 1 no. 3-bed duplex apartment with associated balconies/terraces;
  - **Block C:** 5-storey over basement accommodating 4 no. 1-bed apartments and 8 no. 2-bed duplex apartments with associated balconies/terraces;
  - **Block E:** 4-storey over basement accommodating 8 no. 1-bed apartments and 16 no. 2-bed duplex apartments with associated balconies/terraces;
  - **Block S:** 3-storey accommodating 2 no. 2-bed duplex apartments and 1 no. 3-bed apartment and 1 No. 3-bed duplex apartments with associated balconies/terraces;
  - **Block T:** 3no. 3-storey buildings accommodating 6 no. 1-bed apartments, 18 no. 2-bed duplex apartments, 9 no. 3-bed apartments and 6 no. 3-bed duplex apartments, all with associated balconies/terraces;
- Block A/B and Block C are arranged around a landscaped podium. The neighbourhood centre is located below this podium and accommodates a 2-level creche (313m²) at lower ground and ground floor level, and 3 no. retail/non-retail service/cafe units (470m^2) at ground level;
- The basement below Block A/B and Block C accommodates 50 no. car parking spaces, bicycle parking, bin stores, plant and staff service area (80m^2);
- The basement below Block E accommodates 35 no. car parking spaces, bicycle parking, bin store and plant;
- A section of link street with footpath and cycle path (approx. 438 linear metres) extending from the junction of Whitechurch Road and College Road on an alignment parallel to the M50, to provide access to the southern development lands and incorporating a bus turning circle;
- Upgrade works to College Road including a new two-way cycle track and relocated footpath from the Whitechurch Road junction to provide connectivity to the Slang River pedestrian/cycle Greenway;
- A new signalised crossroads junction to connect the proposed link street with Whitechurch Road and College Road;

- Upgrade to the existing vehicular access at the entrance to Coill Avon house on Whitechurch Road;
- Foul sewer drainage works along Whitechurch Road from the Kilmashogue junction to the existing junction at Glinbury housing estate;
- All landscaping, surface car parking, boundary treatments, infrastructure works, ESB substation, and associated site works and services.

The site location is shown in Figure 1.1 below.

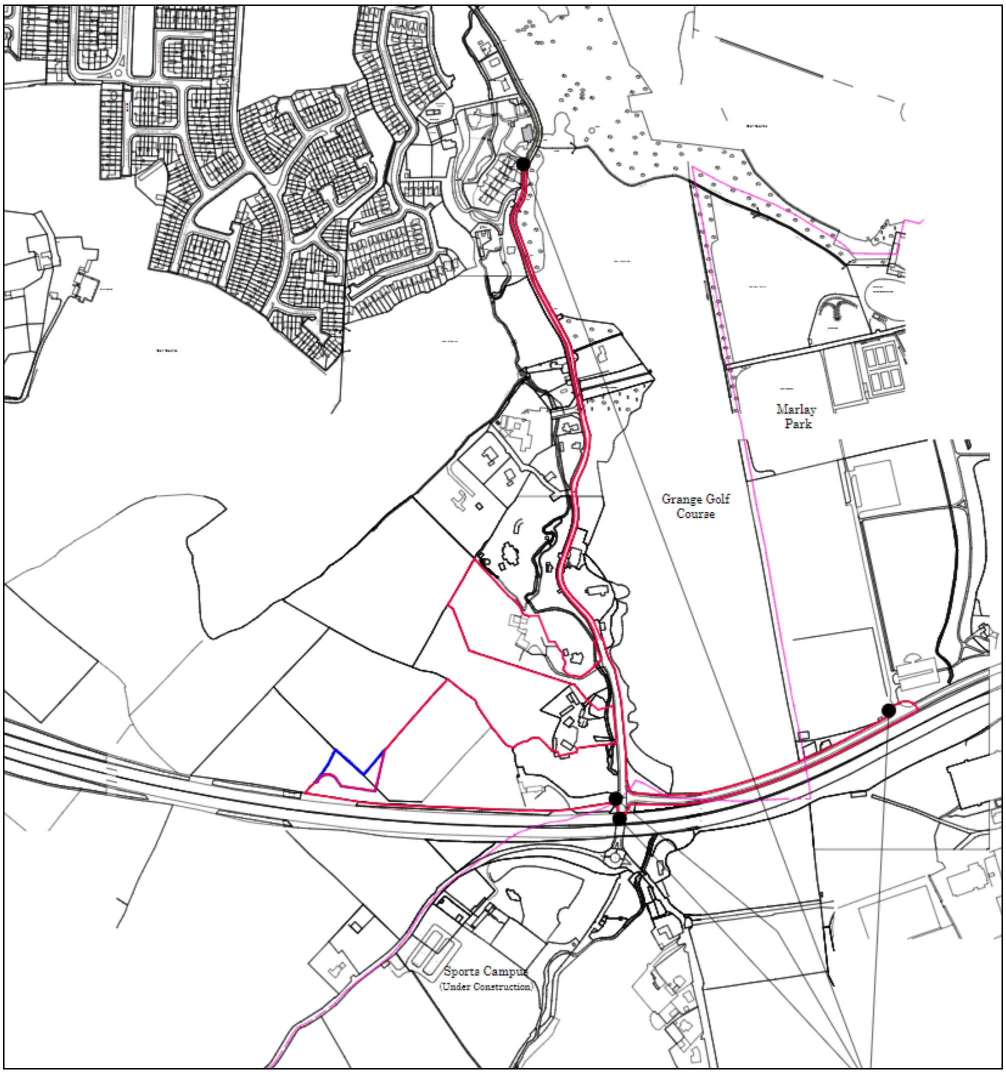

Figure 1.1 Site Location

The building ground floor layout is shown below.

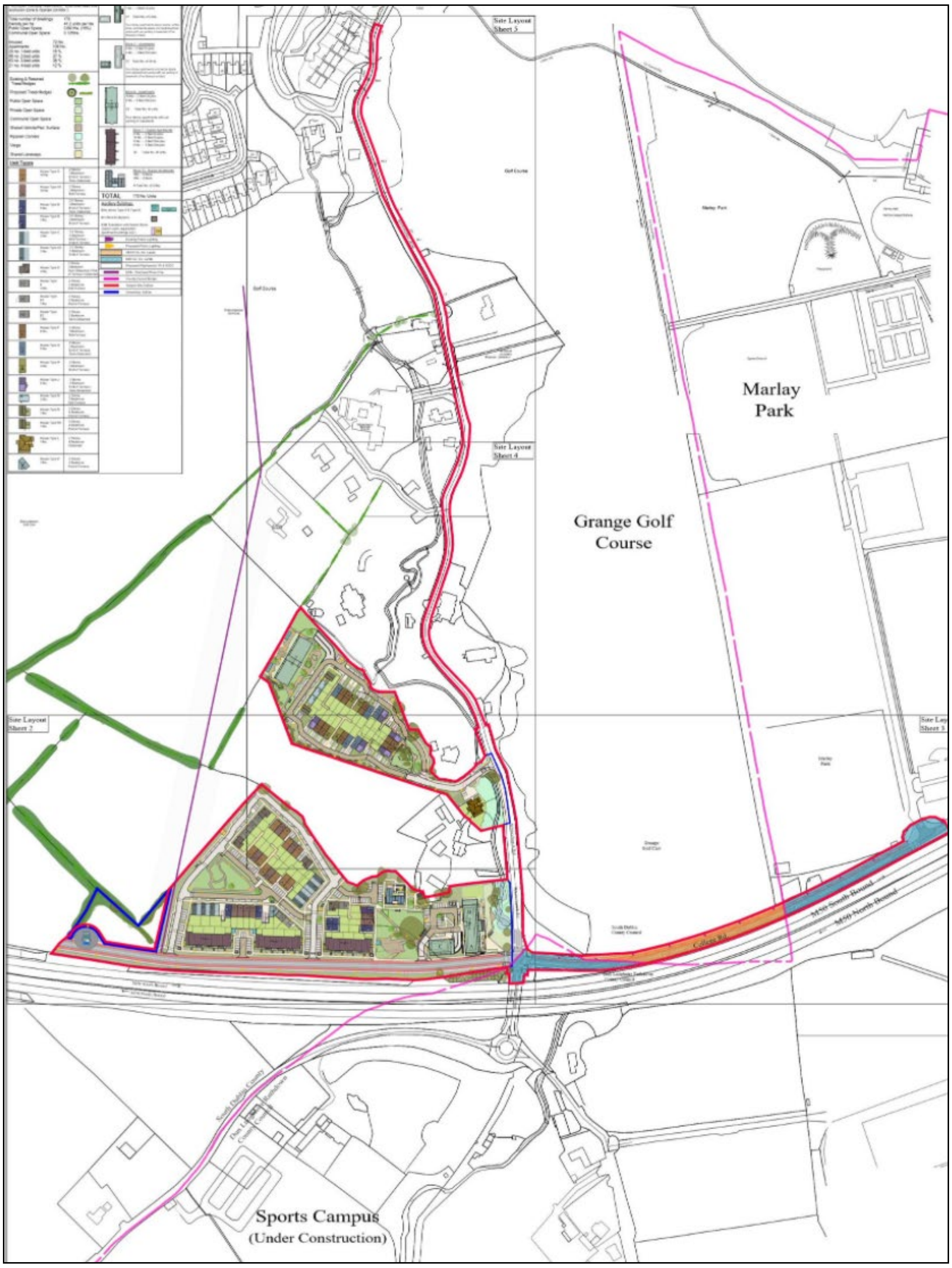

Figure 1.2 Ground Floor Layout

A selection of Apartment block elevations which illustrate the different heights of apartment blocks present are shown in Figures 1.3 to 1.6 below.

Figure 1.3 Apartment Block Elevations

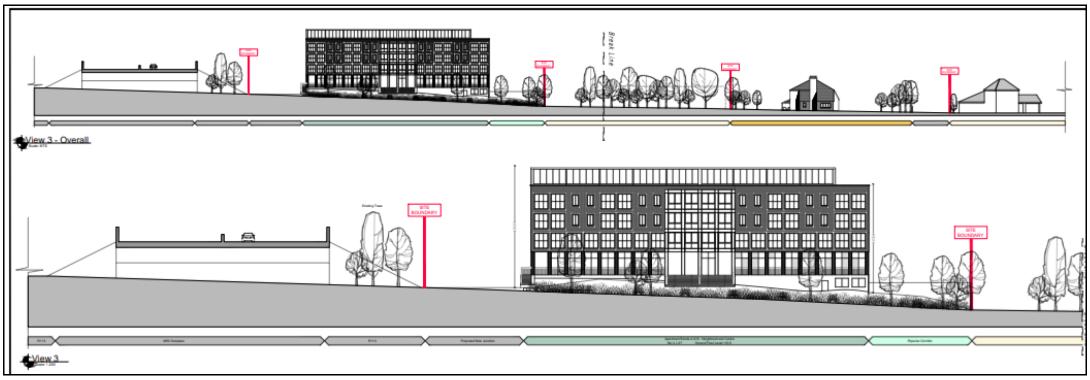

Figure 1.4 Apartment Block Elevations

Figure 1.5 Apartment Block Elevations

Figure 1.6 Apartment Block Elevations

The apartment blocks are shown in plan layout as follows:

Figure 1.7 Blocks A, B and C (5 storey blocks)

Figure 1.8 Block E (4 storey block)

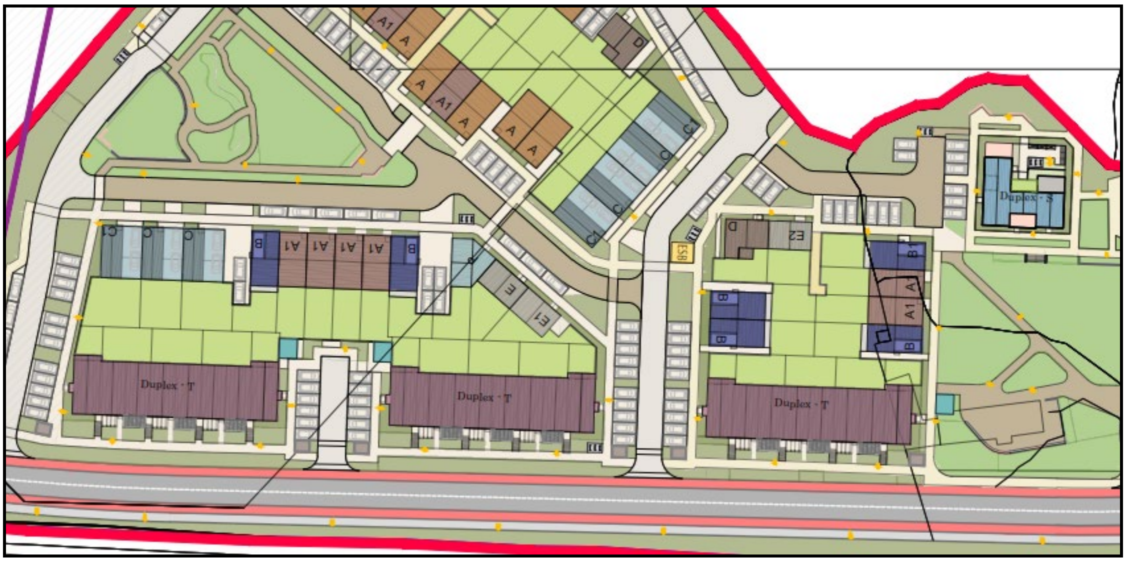

Figure 1.9 Blocks T and S (3 storey blocks)

2.0 CHARACTERISATION OF THE SITE

The Beaufort Scale for Wind on Land is used to express the wind speed velocity recorded as a value which can be related to possible wind related impacts such as tree movement or building damage.

The nearest representative weather station collating detailed weather records is Dublin Airport, which is located approximately17 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 2.1 below). For data collated during five representative years (2016-2020), the predominant wind direction is south-westerly with an average wind speed of approximately 3-5 m/s, measured at a height of 10m above ground.

The Beaufort scale and its relationship to wind speed in metres/second is shown in Table 2.1 below. It can be seen that the site typically experiences Beaufort 3 (B3) wind conditions for much of the time.

Beaufort Scale	Wind speed(m/s)
0	<0.3
1	0.3-1.5
2	1.6-3.3
3	3.4-5.4
4	5.5-7.9
5	8.0-10.7
6	10.8-13.8
7	13.9-17.1
8	17.2-20.7
9	20.8-24.4
10	24.5-28.4
11	28.5-32.6
12	>32.7

Table 2.1 Beaufort Scale and Wind speed

The site of the proposed development can therefore be characterised as a site which experiences average wind speeds of B3, which corresponds to gentle breeze on the Beaufort Scale.

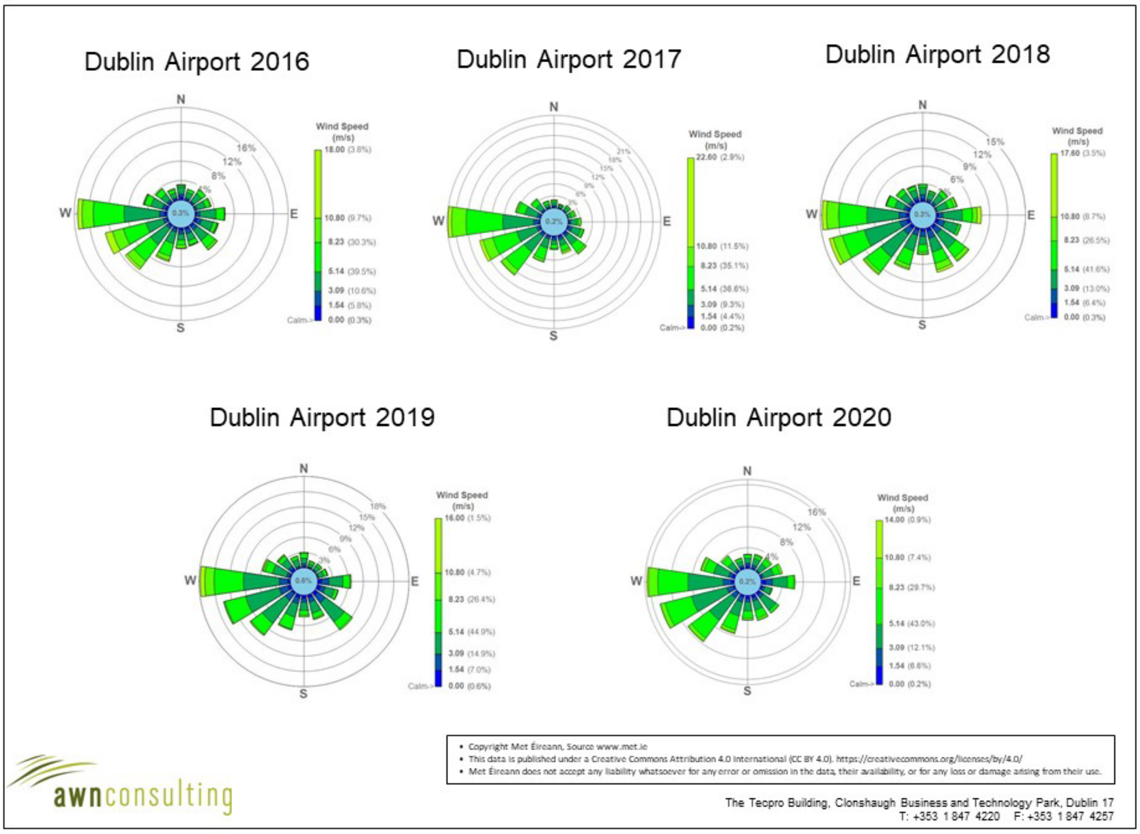

Figure 2.1 Wind-Rose Data

3.0 THE PROPOSED DEVELOPMENT AND MICROCLIMATE IMPACTS

Wind is normally described by its speed, either as a mean or gust speed. However, people sense the effect of the wind force, which is what we can feel, see and hear during windy conditions. Wind force is proportional to wind speed squared, therefore a relatively small increase in the wind speed can have a large effect on pedestrian comfort.

All buildings obstruct the free flow of the wind, causing it to be deflected and accelerated, resulting in very complex flow patterns. When the wind strikes the front face of a building, it will produce positive pressures that reach a maximum value at a point between about two thirds and three-quarters of the building height.

Below this height the wind will tend to be deflected down the front face towards the ground, often called ‘downwash’, and accelerated around the corners at ground level potentially producing areas of high wind speed and strong negative pressure. Above this height the wind will be deflected upwards and accelerated over the roof, again causing areas of high wind speed and increased turbulence. This can be a concern for roof gardens and roof terraces. A significant proportion of the wind will also spill around the side faces. Downwind, the flows around the building will recombine into a region of negative pressure known as the ‘wake’.

Wind speed increases with height above ground; it follows, therefore, that the taller a building the higher the wind speeds acting on it. However, not all tall (where tall is greater than 10 storeys) buildings cause wind problems; what is important is the relative height of the building compared with that of neighbouring buildings.

A tall building in a group of tall buildings might not cause problems whereas a mid-rise building can cause unacceptable conditions if it is adjacent to an open area or has features or openings at ground level which can accelerate wind speed. When the wind strikes a building, it will generate positive pressures on the windward face and suction on the side, roof and leeward faces.

The wind will flow in the direction of decreasing pressure gradient, that is, from areas of high pressure to areas of lower pressure. As noted above, this causes wind flow down the front face, which brings high-speed wind from higher levels down to ground level. This can significantly increase ground-level wind speeds. The downwash on the windward face will tend to 'roll up' in front of a building, creating a windward vortex. The highest wind speed-up will occur near the centre of the face a short distance in front of the building, where the wind speed-up factor, S, can vary between about 1.2 and 2.0 depending on the building height. The flow then accelerates around the sides towards the low-pressure area in the wake. The S factor can reach 2.0 to 2.5 close to the corners of tall buildings, although values closer to 1.5 are likely for mid-rise buildings.

In general, tall, rectangular, sharp-edged buildings will generate the highest local ground-level wind speeds and the largest 'footprint' area of unpleasant wind speeds.

The UK Buildings Research Establishment (BRE DG 520: Wind Microclimate Around Buildings) has noted that wind speeds in the vortex between a tall building and a lower building (this occurs in the space in front of a tall building behind the lower building) can be up to 1.5 times the free wind speed (free wind speed being that measured in an open area with no buildings).

Wind speeds in the corner streams around either side of a tall building can be up to 2.5 times the free wind speed.

A useful document on wind speeds and tall buildings notes that tall buildings are generally taken to mean buildings more than 10 storeys high, "Sustainable Design and Construction, The London Plan Supplementary Planning Guidance, 2006, Mayor of London's Office". Section 2.4.5 notes that a wind environment assessment should be carried out for every tall building (e.g. a building over 10 storeys)". *Sustainable Design and Construction, Supplementary Planning Guidance, April 2014*" published by the Mayor of London's office provides further guidance in this regard.

The apartment blocks comprise 7 no. buildings ranging in height from 3 to 5-storey and are therefore not classed as tall buildings however it is considered appropriate to examine the wind effects with regard to microclimate as a precautionary measure.

It is acknowledged that the construction of new buildings can lead to changes to the local wind environment around the building. Generally elevated wind speeds around tall buildings are generated at three main points, either at ground level in the space behind a lower building and in front of a tall building, at an opening within the building envelope at ground level such as a tunnel or mall through the building or at building corners. Elevated wind speed can also be generated where a street runs between two tall buildings, leading to a “canyon effect”.

T.V. Lawson in Building Aerodynamics, Imperial College London, Imperial College Press, 2001, has noted that when wind approaches a built-up area it is displaced upwards to roof level and generally flows across landscape at roof level, with gusts down to street level that are a function of the relative height to width of the street canyon.

It will be noted from the wind-rose presented as Figure 2.1 that as the predominant wind directions are from the west and from the south west, wind striking the proposed development will therefore already have travelled across the built-up landscape of the southern and western central environs of Dublin City and therefore wind-flow across the landscape will be tend to be at 2-storey roof level – the 3 storey blocks will therefore tend to have little interaction with wind-flow across the site and no elevated wind-speeds at ground level are expected downwind of these blocks.

The only area where wind speed amplification could be of note is the corridor between Blocks A, B which are down-wind of Block C, which are all 5 storey blocks, this corridor is 10 metres wide.

Oke (T.R. Oke, Boundary Layer Climates, Routledge, 1987) has noted when the Height to Width Ratio is greater than 0.7, the Skimming Flow Regime tends to predominate, with little in the way of wind flow down to street level.

When the H to W ratio drops to 0.4 or less, the wind speed at ground level tends to increase and the street behaves more as if it were in open country, with much more of the wind now gusting down into the street.

Similarly, the BRE DG 520 document notes that H to W ratio of > 0.65 should be a target to minimise any wind related impacts.

The proposed building height for Block C is circa 18 metres above ground. The distance to the nearest downwind façade (Block A and B) is 10 metres, the H to W ratio is therefore is circa (18/10) = 1.8 which is greater than 0.4 and 0.65 and the skimming regime can be expected to dominate.

Based on the H to W ratios derived above it can be expected that the skimming regime will dominate, with little in the way of wind flow down to street level and therefore the proposed development is not expected to lead to elevated windspeeds at street level.

4.0 CONCLUSION

It was concluded that:

The existing environment experiences B3 conditions for much of the time which correspond to a gentle breeze.

Based on the analysis conducted it was concluded the proposed development would have no significant effects with regard to microclimate.

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