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MICROCLIMATE ASSESSMENT IN SUPPORT OF A PLANNING APPLICATION FOR THE BANCROFT VIEW SHD

Report Prepared For

Greenhills Living Ltd

Prepared By

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EXECUTIVE SUMMARY

AWN were commissioned by Greenhills Living Ltd to undertake an assessment with regard to Microclimate Effects associated with the proposed residential development on the Bancroft SHD site at Greenhills in Dublin. 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/B4, which corresponds to gentle to light 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

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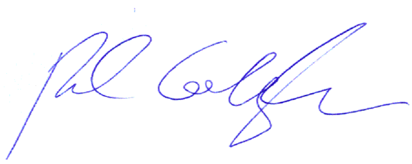
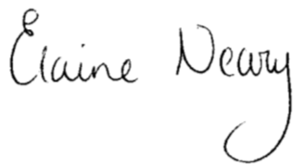
Signature		
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Date	12 May 2022	12 May 2022

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1.0 INTRODUCTION

AWN were commissioned by Greenhills Living Ltd to undertake an assessment with regard to Microclimate Effects associated with the proposed residential development on a site at Greenhills in Dublin. 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 proposed development will consist of:

(i)demolition of existing substation and removal of existing advertisement structure on site;

(ii)construction of a residential development of 197 no. apartments (79 no. one-bedroom, 105 no. two-bedroom and 13 no. three-bedroom) in 4 no. blocks (ranging in height from seven to eight storeys with eighth floor level roof garden) as follows:
-Block A containing 41 no. apartments (6 no. one bedroom, 34 no. two bedroom and 1 no. three-bedroom) and measuring eight storeys in height (with eighth floor roof garden);
-Block B containing 79 no. apartments (33 no. one bedroom, 34 no. two bedroom and 12 no. three bedroom) and measuring eight storeys in height;
-Block C containing 42 no. apartments (24 no. one bedroom and 18 no. two bedroom) and measuring seven storeys in height; and,
-Block D containing 35 no. apartments (16. no one bedroom and 19 no. two bedroom) and measuring seven storeys in height.

(iii)all apartments will have direct access to an area of private amenity space, in the form of a balcony, and will have shared access to internal communal amenities including 2 no. resident lounges (114.7sq.m), gym (98sq.m) external communal amenity space (1,490.8sq.m) and public open space (1,667sq.m);

(iv)provision of 78 no. vehicular parking spaces (including 3 no. car-share parking spaces, 4 no. mobility parking spaces, and 8 no. electric vehicle parking spaces), 4 no. set-down vehicular parking spaces (including 1 no. mobility parking space) and 448 no. bicycle parking spaces (including 100 no. visitor parking spaces) at ground floor/ground level accessible via new vehicular entrance gate off access road off Greenhills Road;

(v)provision of 4 no. commercial units (871.5sq.m total) and 1 no. childcare facility (329.7sq.m) with associated external amenity space (168.8sq.m) located at ground floor level; and,

(vi) all ancillary works including public realm/footpath improvements, landscaping, boundary treatments, internal footpaths/access roadways, bin storage, foul and surface water drainage, green roofs, removable solar panels, ESB substation and all site services, site infrastructure and associated site development works necessary to facilitate the development.

The site location and site layout is shown in Figures 1.1 and Figure 1.2 below.

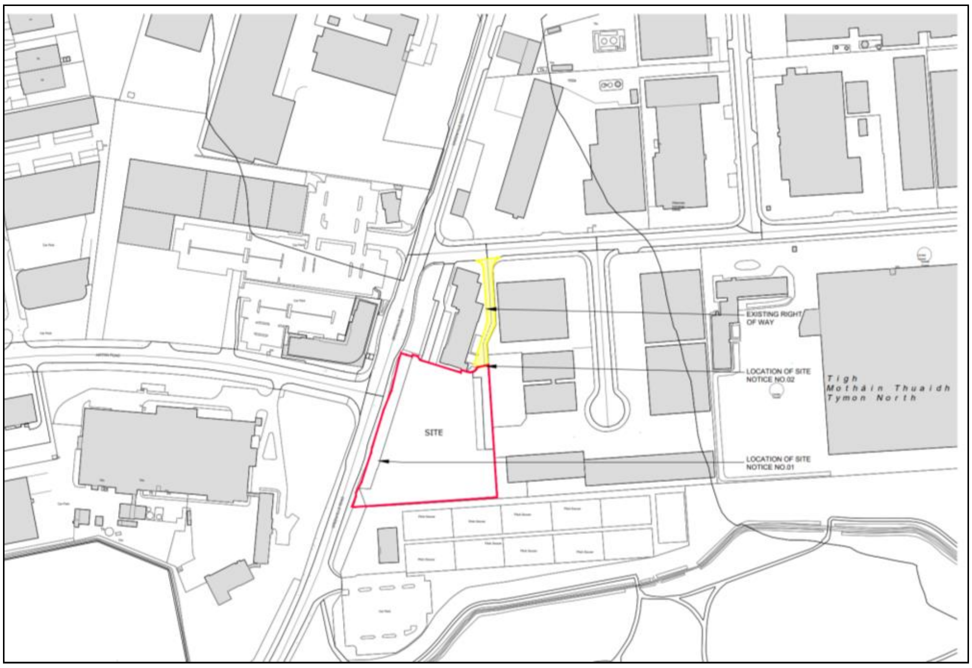

Figure 1.1 Site Location

Figure 1.2 Site Layout

The site elevations are shown in Figure 1.3 to 1.7

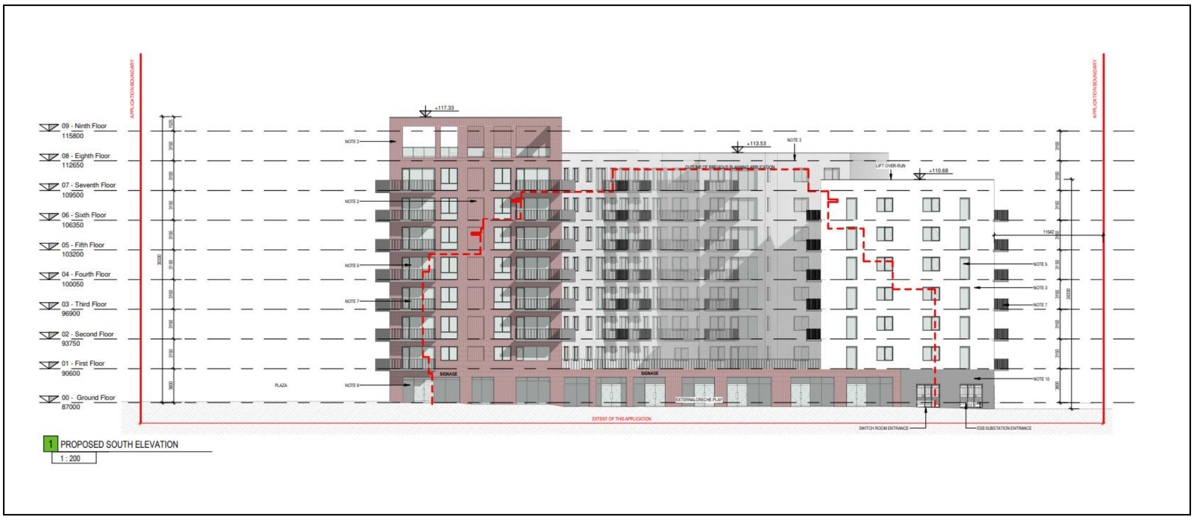

Figure 1.3 South Elevation

Figure 1.4 East Elevation

Figure 1.5 North East Elevation

Figure 1.6 South East Elevation

Figure 1.7 West Elevation

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 approximately 10km north-east 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 (2017-2021), 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 / Beaufort 4 (B3/B4) 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/B4, which corresponds to gentle to light breeze on the Beaufort Scale.

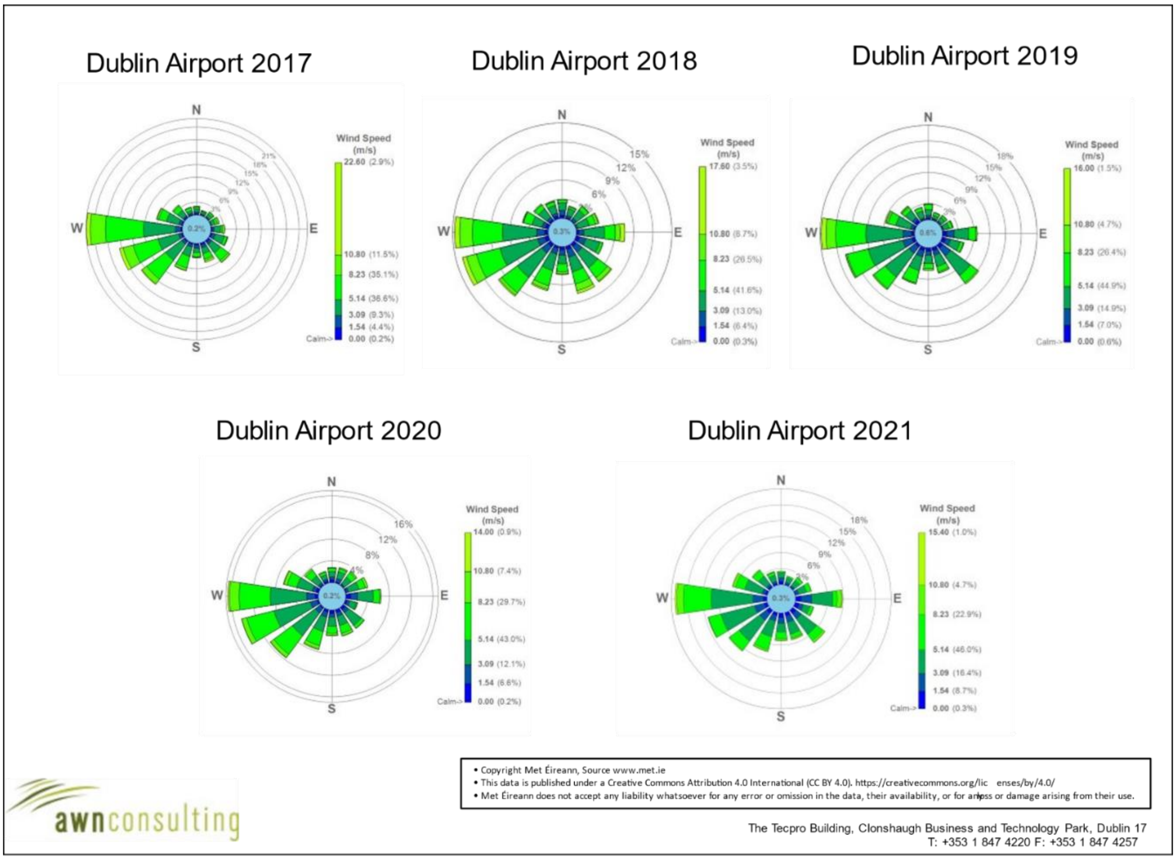

Figure 2.1 Wind-Rose Data

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 (greater than 10-storey), 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 proposed development comprises four blocks from seven to eight storeys in height as follows (so none of the buildings are classed as "tall buildings"):

-Block A containing 41 no. apartments (6 no. one bedroom, 34 no. two bedroom and 1 no. three-bedroom) and measuring eight storeys in height (with eighth floor roof garden);

-Block B containing 79 no. apartments (33 no. one bedroom, 34 no. two bedroom and 12 no. three bedroom) and measuring eight storeys in height;

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-Block D containing 35 no. apartments (16. no one bedroom and 19 no. two bedroom) and measuring seven storeys in height

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 windrose 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 western environs of Dublin City and therefore wind-flow across the landscape will be tend to be predominantly at 2-storey roof level. It will be noted that the western façade

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 area immediately downwind of the proposed development is dominated by mostly 2-storey commercial buildings .

The proposed building height is up to 28 metres above ground. The landscaped and open area between the buildings is some 27 metres wide and down-wind of the western facing block of the development. The H to W ratio is therefore 1.03, well above 0.65 and therefore the skimming regime is expected to dominate with little in the way of wind-flow down to ground level and therefore elevated wind-speeds are not expected to occur at ground level in the open areas between the buildings and therefore the proposed development is not expected to lead to elevated windspeeds at ground level.

The potential for elevated wind-speeds to be experienced on balconies has also been assessed. The Danish Wind Industry Association Online windspeed calculator http://xn--drmstrre-64ad.dk/wp-content/wind/miller/windpower%20web/en/ indicates that for a Roughness Class 3 landscape (a landscape defined by low rise buildings as opposed to a city scape defined by tall buildings) a windspeed range of 3-5 m/sec at 10m above ground will be a windspeed of circa. 4.5 to 6.5 m/second at *circa.* 28m above ground – the approximate height above ground of the top floor balcony. This corresponds to Beaufort B4/B5 (Moderate Breeze to Fresh Breeze, will raise dust and papers and move small branches on trees to causing small trees in leaf to sway) – it is therefore considered that this is a relatively minor increase in wind-speed likely to be experienced and it is considered to be acceptable with regard to the proposed balcony use.

4.0 CONCLUSION

It was concluded that:

The existing environment experiences B3/B4 conditions for much of the time which correspond to a gentle to light 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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