Chapter 11:

MicroClimate

11.0 MICROCLIMATE

11.1 INTRODUCTION

Planning permission is being sought for the provision of 57 no. additional apartments, above the permitted podium car park, to the north west of the centre, as a Phase 2 residential development. It is also proposed to make alterations to the Phase 1 permission for 45 no. apartments (Reg. Ref.: D17A/0950 & ABP Ref.: 300745-18), from second to fourth floor levels of the rejuvenated Frascati Centre. The subject application therefore relates to a total of 102 no. residential units.

AWN were commissioned to prepare a desktop review of the Potential Risks of Elevated Wind speed (microclimate) associated with the proposed residential extension at the Frascati Shopping Centre. This chapter has been prepared by Dr Fergal Callaghan, Director with AWN Consulting, who holds a BSc in Industrial Chemistry and a PhD in Chemical Engineering.

The aim of the assessment was to determine if there was considered to be a risk of elevated wind speeds occurring at ground level as a result of the residential extension proposed as part of the re-development of the Frascati Centre. This assessment comprises the following:

- 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.

- Risk assessment of the potential for elevated wind speeds to occur at the Frascati Shopping Centre with the additional residential development in place.

11.2 STUDY METHODOLOGY

This study has been undertaken with reference to relevant guidance including:

- Sustainable Design and Construction, The London Plan Supplementary Planning Guidance, 2006, Mayor of London's Office,

- T.V. Lawson in Building Aerodynamics, Imperial College London, Imperial College Press, 2001,

- The UK Buildings Research Establishment (BRE Digest 520: Wind Microclimate Around Tall Buildings, BRE, 2011)

11.3 EXISTING RECEIVING ENVIRONMENT

Characterisation of the Current Frascati Site with Respect to the Beaufort Scale for Wind on Land

The Beaufort Scale for Wind on Land is which 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 13 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 11.1 below). For data collated during five representative years (2015-2019), the predominant wind direction is west/south-west with an average daily wind speed of approximately 5.3 m/s.

The Beaufort scale and its relationship to wind speed in metres/second is shown in Table 11.1 below. It can be seen that the site typically experiences Beaufort 3 (B3) wind conditions for much of the time.

Figure 11.1: Dublin Airport Windspeeds

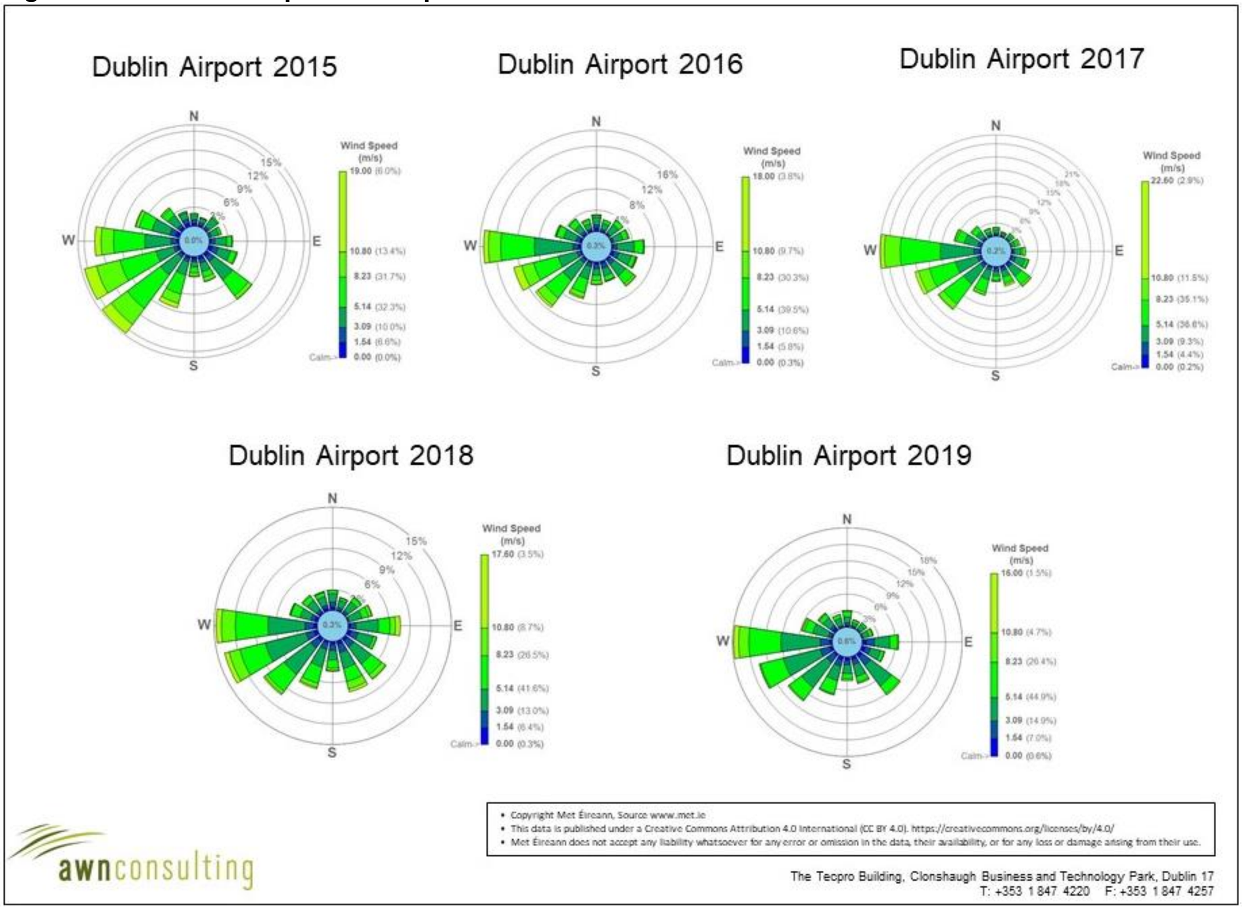

Table 11.1 Beaufort Scale and Wind speed

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

The site of the current Frascati Shopping Centre (and hence the site of the proposed residential development) can be characterised as a site which experiences average wind speeds of B3, which corresponds to gentle breeze on the Beaufort Scale.

11.4 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

The proposed development relates to the provision of 57 no. additional apartments, above the permitted podium car park, to the north west of the centre, as a Phase 2 residential development. It is also proposed to make alterations to the Phase 1 permission for 45 no. apartments (Reg. Ref.: D17A/0950 & ABP Ref.: 300745-18), from second to fourth floor levels of the rejuvenated Frascati Centre. The subject application therefore relates to a total of 102 no. residential units.

11.5 POTENTIAL IMPACT OF THE PROPOSED DEVELOPMENT

Construction phase

There are no construction microclimate impacts of significance.

Operational Phase

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. When the wind strikes a building, it will generate positive pressures on the windward face and suctions 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. 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.

Circular or multi-faceted buildings provide a more aerodynamic profile to the wind and so tend to cause less downwash because more air is spilled around the sides.

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. Emplacement of barriers and landscaping ensure these impacts are minimised.

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 at Frascati comprises 6 no. blocks, which are shaped into two separate "U" shapes. The first "U" shape is composed of 3 no. blocks, with two of the buildings (Block A and C) facing each other, while Block B faces an open area. The second "U" shape is composed of 3 no. blocks, with two of the buildings (Block D and F) facing each other, while Block E faces an open area. Blocks D, E and F blocks sits north east of Blocks A, B and C.

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 two main points, either at ground level in the space behind a lower building and in front of a tall 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.

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 is 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.

Block A has a height to top of parapet of 21m above ground, and a street width to Block C of 62m. The height of Block A is relatively low (well below 10 storeys) and the distance from Block A to Block C is such that no elevated windspeeds are likely in the space between Block A and Block C.

Block B has a height to top of parapet of 22 m above ground, and a street width to Block C of 2.2m. The H to W ratio is therefore 10, well above 0.7 and therefore Skimming Flow Regime will be expected to predominate, with little in the way of wind flow down to the street.

Block A has a height to top of parapet of 21m above ground, and a street width to Block B of 3.3m. The H to W ratio is therefore 6.7, well above 0.7 and therefore Skimming Flow Regime will be expected to predominate, with little in the way of wind flow down to the street.

Block D has a height to top of parapet of 25.4m above ground, and a street width to Block F of 22m. The H to W ratio is therefore 1.2, well above 0.7 and therefore Skimming Flow Regime will be expected to predominate, with little in the way of wind flow down to the street.

Block D has a height to top of parapet of 25.4m above ground, and a street width to Block E of 5.4m. The H to W ratio is therefore 4, well above 0.7 and therefore Skimming Flow Regime will be expected to predominate, with little in the way of wind flow down to the street.

Block E has a height to top of parapet of 21.7m above ground, and a street width to Block F of 10.6m. The H to W ratio is therefore 1.8, well above 0.7 and therefore Skimming Flow Regime will be expected to predominate, with little in the way of wind flow down to the street.

Based on this preliminary desktop assessment it was apparent that risk of elevated windspeeds being generated at ground level as a result of the proposed development is considered to be low due to the relatively low building heights and the spacing between buildings. It was therefore concluded that a modelling study was not required in this instance in order to determine likely wind-speed effects and that the desk-top exercise described in this assessment was sufficient.

In summary, it was concluded that the building heights of the proposed residential development at the Frascati Centre will be relatively low which minimises the risk of excessive windspeeds being generated and that in addition it can be expected that a skimming regime will predominate, with little in the way of wind flow down to the open areas between the blocks.

11.6 DO NOTHING IMPACT

The Do Nothing scenario includes the completion of the permitted Phase 1 residential development, i.e. without the alterations now proposed, above the rejuvenated Frascati Centre which is substantially complete, without the proposed Phase 2 residential development. The wind assessment of the Rejuvenation Scheme and the Phase 1 residential extension found that the impact to microclimate would be negligible. Therefore, the microclimate at the site will remain as per the baseline.

11.7 AVOIDANCE, REMEDIAL AND MITIGATION MEASURES

Construction Phase

No mitigation measures required

Operational Phase

The impact of the proposed development on microclimate will be imperceptible. Thus, no site-specific mitigation measures are required.

11.8 PREDICTED IMPACTS OF THE PROPOSED DEVELOPMENT

Construction Phase

No impacts will occur.

Operational Phase

The impact on microclimate for the operational stage is ***imperceptible*** and ***not significant*** for the long and short term.

Cumulative Impacts

The overall cumulative impact associated with the Frascati development under construction and the proposed residential development is considered ***imperceptible***, ***long-term*** and ***not significant***.

The construction of the structural elements of the permitted Phase 1 residential development commenced in March 2020. These works are expected to be largely complete prior to construction commencing for the Phase 2 residential element. No cumulative effects are predicted when Phase 1 and Phase 2 buildings are complete.

The permitted upgrade works to Blackrock Shopping Centre (Planning Reg. Ref.: D17A/0644) are at an advanced stage and are expected to be largely complete once Phase 2 residential development commences on site. There are no significant cumulative impacts associated with this development,

Construction of the five-storey office development at Enterprise House, opposite Frascati Shopping Centre, (Ref.: D16A/0418 and ABP PL06D.247702, as amended under Reg. Ref.: D18A/0211) is nearing completion with remaining construction works largely associated with internal fit out elements. There is no predicted impact associated with the Phase 2 residential element that has potential to result in cumulative impacts with regard to microclimate.

11.9 MONITORING

No monitoring is required.

11.10 REINSTATEMENT

Not Applicable

11.11 INTERACTIONS

There are no interactions of concern.

11.12 DIFFICULTIES ENCOUNTERED IN COMPILING

No difficulties were encountered in the course of this assessment.