

BRE Client Report

Wind Microclimate Study – GA2 Application, Baldoyle, Dublin

Prepared for: Lismore Homes Ltd
Date: 11th January 2022
Report Number: P121579 -1003 Issue 3

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Executive Summary

BRE have been commissioned by Raymond O'Malley, Agent acting for Lismore Homes Ltd, 4 Westmoreland Street, Dublin 2, Ireland to undertake a desk study to consider potential pedestrian level wind effects around the proposed Baldoyle Growth Area 2 development in Dublin.

This study has been undertaken by BRE as project number P121579-1003 and is based upon BRE proposal number P121579.

This report is based upon information provided to BRE via email, which included images and drawings of the proposed development. Selected examples of these images have been incorporated as figures into this report for ease of reference. It contains professional opinions regarding the wind effects likely to be generated by the buildings and by their context.

The main conclusions are:

- The proposed Growth Area 2 development is generally well sheltered from the prevailing southwesterly winds and the graduated increase in building heights from south to north will further help to minimise adverse wind effects. Some parts of the development are exposed to northerly winds and to a lesser extent by south easterly winds, but these are infrequent and of low intensity at this site so exposure to northerly winds and south easterly winds is not expected to have a significant adverse impact on the pedestrian level wind microclimate.
- The ground level wind conditions around the proposed Growth Area 2 development are expected to be generally suitable for the intended pedestrian activities at all footpaths, walkways and public realm areas.
- The pedestrian entrances to the buildings of the proposed Growth Area 2 development generally face the courtyard areas and are expected to be sheltered and suitable for entrance usage.
- The wind conditions on nearby roads and existing surrounding areas are not expected to be adversely impacted by the proposed Growth Area 2 development.

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1 Introduction

Planning permission was previously granted (Reg. Ref. F11A/0290 and ABP PL 06F.239732 refer) for a residential scheme called Phase 5 at Baldoyle-Stapolin, which is part of the overall Coast Residential Development at Baldoyle, Dublin. A new Strategic Housing Development application on the former Phase 5 lands, now known as GA2, Baldoyle-Stapolin is being prepared for 1,007 no. residential units.

BRE have been commissioned by Raymond O'Malley, Agent acting for Lismore Homes Ltd, 4 Westmoreland Street, Dublin 2, Ireland to undertake a desk study to consider potential pedestrian level wind effects around the proposed Baldoyle Growth Area 2 development of this scheme..

This study has been undertaken by BRE as project number P121579 - 1003 and is based upon BRE proposal number P121579.

This study is based on the professional experience and opinion of BRE.

2 Methodology

This assessment is based upon the professional opinion of an experienced BRE wind engineering expert who is a Chartered Civil and Structural Engineer with over 35 years of experience in this field. It is recognised that this opinion is qualitative in nature although the assessment of wind speed conditions for the Site is based on measured meteorological data and is therefore quantitative. This approach is widely accepted by planners and developers as being an appropriate methodology to support planning applications.

The professional opinion is based upon the wind effects generated by the buildings themselves, and by their context (i.e. the surrounding buildings and the macro-scale wind environment). This assessment enables potential pedestrian level wind environment issues around the site to be identified.

The purpose of undertaking a desk study is to identify areas of potentially unpleasant winds. However, people perceive the wind differently depending upon what they are doing. For example, people sitting will tolerate less windy conditions than people walking with purpose between locations. This means that an area having unpleasant winds for sitting purposes can be completely suitable for walking.

It is not practical to evaluate every location around a scheme in terms of every pedestrian activity, and a typical activity must therefore be chosen as the basis for making an assessment. For this purpose, the activities of Sitting (in the residential amenity areas) and Strolling (leisure-walking) and Entrances at the main entrances to the buildings have been chosen as being the most appropriate benchmarks. This is discussed further in Section 6.

It is important to recognise that a location having the potential to have unpleasant wind is not the same as that location being unpleasantly windy. A desk study offers a professional opinion about the likely wind conditions and draws attention to any areas of concern; hence it is qualitative by nature. The behaviour of the wind and its interaction with buildings means that it is not possible to be certain about the actual wind conditions - conditions which could be measured by a quantitative wind tunnel study.

3 The Proposed Development and Surroundings

Planning permission was previously granted (Reg. Ref. F11A/0290 and ABP PL 06F.239732 refer) for a residential scheme called Phase 5 at Baldoyle-Stapolin, which is part of the overall Coast Residential Development at Baldoyle, Dublin. A new Strategic Housing Development application on the former Phase 5 lands, now known as GA2, Baldoyle-Stapolin is being prepared for 1,007 no. residential units.

The proposed development is divided into three sectors (Sectors 6, 7 and 8) comprising 16 buildings with heights varying from four to 12 storeys, including basement and surface level car parking, secure bicycle parking, landscaping, water supply connection at Red Arches Road, and all ancillary site development works.

Figure 1 shows an aerial view of the development site and Figure 2 shows a plan view of the proposed development with the buildings colour coded by building height.



Figure 1 Aerial view of the area showing the site boundary (shown by the red line)



Figure 2 Plan view of the proposed development

The site is currently undeveloped and is located on the southern fringes of Fingal County Council administrative area, approximately 8km north-east of Dublin city centre. The site is located northwest of Baldoyle village, and approximately 7km from Dublin airport. The site is located approximately 500 metres from the Baldoyle Estuary area, the River Mayne lies approximately 300 metre to the north.

To the southeast of the proposed development is the Red Arches Park residential development with buildings of between three and five storeys tall. To the southwest is the proposed Growth Area 1 residential development and to the west is the proposed Growth Area 3 residential development. To the north, northeast and east of the proposed development is the Proposed Racecourse Regional Park that is before An Bord Pleanála for a decision in March 2022 (see JP06F.311315).

To the south of the site (outside of the site boundary) is a large rectangular area of open grassland and woodland; in the centre of the area's north perimeter is an existing pumping station. This area is known as the "Haggard".

The proposed buildings are arranged in courtyard blocks. The lowest height blocks, of four and five storeys are generally along the southern edge of the development with the tallest blocks, of between 10 and 12 storeys along the northern boundary. This height gradient is also reflected in the individual courtyard blocks. Figures 3 to 6 show aerial schematic views of the proposed development and local surroundings.



Figure 3 Aerial view of the proposed development from the southwest



Figure 4 Aerial view of the proposed development from the northwest



Figure 5 Aerial view of the proposed development from the northeast



Figure 6 Aerial view of the proposed development from the southeast

4 Meteorological Data

Meteorological data were purchased by BRE from the Irish Met Office for the meteorological station at Dublin Airport. This met station, which is approximately 7km from the to the northwest of the site, has been identified as being the most appropriate for the Baldoyle development and the wind conditions measured at this met site will be representative of those at the Baldoyle site.

The wind rose from the Dublin Airport met site for the year as a whole is shown in Figure 7. This wind rose shows that the prevailing wind direction is south westerly with little wind from the north, south or easterly sectors.

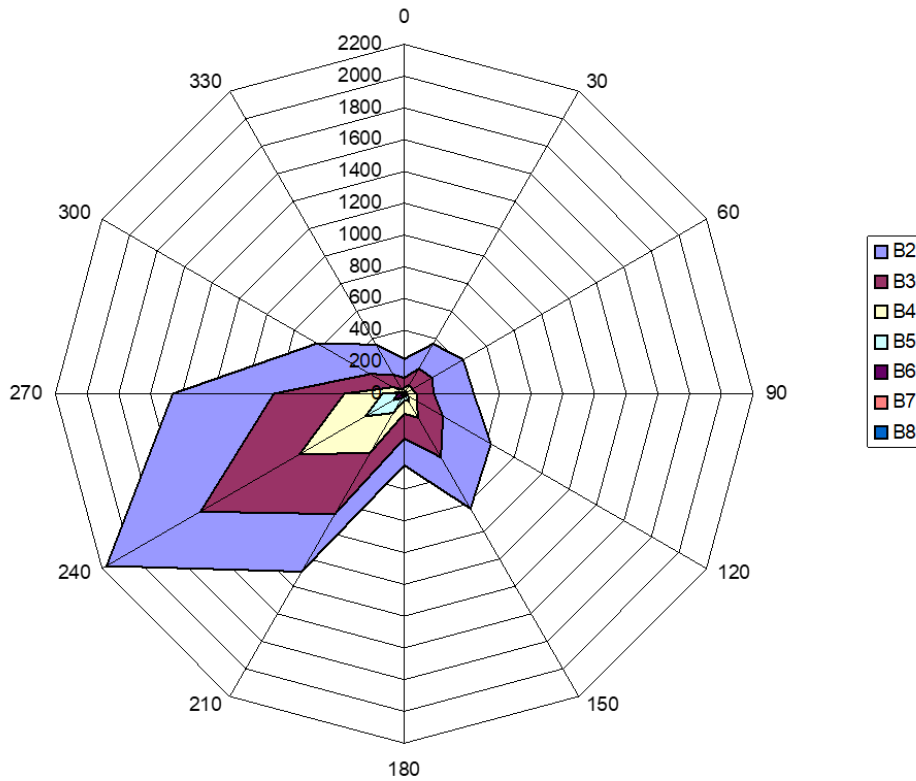


Figure 7 Wind rose for the Dublin Airport meteorological station (this plot show the number of hours per year exceeding the given Beaufort range thresholds)

5 Comfort Criteria

Wind conditions for pedestrian comfort are generally based on the Beaufort wind scale which describes wind effects on land for a range of mean wind speeds. Table 1 shows the Beaufort wind scale and describes the effects attributable to each wind speed range¹.

Beaufort scale	Description	Mean wind speed range		Effects
		(m/s)	(mph)	
B0	Calm	0–0.2	0–0.5	No noticeable wind, smoke rises vertically
B1	Light air	0.3–1.5	0.7–3.4	Direction of wind shown by smoke drift but not wind vanes
B2	Light breeze	1.6–3.3	3.6–7.4	Wind felt on face, leaves rustle
B3	Gentle breeze	3.4–5.4	7.6–12.1	Wind extends light flag, leaves in constant motion
B4	Moderate breeze	5.5–7.9	12.3–17.7	Raises dust and loose paper; hair disarranged, clothing flaps
B5	Fresh breeze	8.0–10.7	17.9–24.0	Small trees in leaf begin to sway; limit of agreeable wind on land
B6	Strong breeze	10.8–13.8	24.2–30.9	Umbrellas used with difficulty; force of the wind felt on the body; wind noisy, frequent blinking
B7	Near gale	13.9–17.1	31.1–38.3	Inconvenience felt when walking; difficult to walk steadily; hair blown straight
B8	Gale	17.2–20.7	38.5–46.4	Generally impedes progress; walking difficult to control; great difficulty with balance in gusts
B9	Strong gale	20.8–24.4	46.6–54.7	People blown over by gusts; slight structural damage
B10	Storm	24.5–28.4	54.9–63.6	Seldom experienced inland; trees uprooted, significant structural damage
B11	Violent storm	28.5–32.2	63.8–72.1	Very rarely experienced; accompanied by widespread structural damage
B12	Hurricane	> 32.3	> 72.4	Countryside devastated; winds of this force only occur in hurricanes and tornadoes

Table 1 The Beaufort scale of wind effects on land

The wind microclimate assessment in this study is based upon a set of comfort criteria developed by Lawson with respect to people's perception of the suitability of the wind conditions for a range of activities from 'long-term sitting' (for example at open-air cafés), through 'standing' and 'strolling' and finally to 'business walking'. The more sedentary the activity, the lower the acceptable comfort threshold will be. Table 2¹ gives a description of the Lawson comfort criteria and the threshold wind speeds. The use of the Lawson comfort criteria has been shown to represent good standards of Irish environmental practice and is widely accepted by Local Planning Departments. The conditions have also been assessed for safety using the Lawson 'distress criteria' which have been developed for use in assessing the onset of wind-induced 'distress'. These are based on a probability of exceedance of 0.025% of a given threshold windspeed per year, or 0.040% exceedance per month and equate to approximately one exceedance per year or per month. The threshold mean windspeeds used are Beaufort 7 (15m/s) for frail people and cyclists and Beaufort 8 (20m/s) for the general public in areas where frail people or cyclist would not normally be expected.

¹ P Blackmore, BRE Digest 520, Wind Microclimate Around Buildings, May 2011

It should be recognised that the full Lawson comfort assessment can only be carried out with quantitative measurements of pedestrian level mean and gust wind speeds obtained from a wind tunnel study. The wind microclimate assessment carried out in this study uses expert judgement and experience to qualitatively apply the Lawson comfort criteria to the pedestrian microclimate around the development.

Activity	Lawson comfort criteria	
	Unacceptable	Tolerable
Roads and car parks, business walking, fast walking from A to B	10.7 m/s (B5) > 6%	10.7 m/s (B5) > 2%
People at work, workers around buildings	10.7 m/s (B5) > 2%	7.9 m/s (B4) > 2%
Pedestrian strolling, slow walking with occasional stops, shopping, short-term standing eg at bus stops	7.9 m/s (B4) > 4%	5.4 m/s (B3) > 6%
Long-term sitting – in open-air cafes, parks, etc. for periods of more than about 10 min	5.4 m/s (B3) > 6%	3.3 m/s (B2) > 6%
Entrances and exits of buildings or areas where there is a risk of sudden exposure to wind	5.4 m/s (B3) > 6%	3.3 m/s (B2) > 4%
Covered areas – pedestrian seating areas under cover, places of high cultural significance	5.4 m/s (B3) > 1%	3.3 m/s (B2) > 4%

Table 2 The Lawson comfort criteria and threshold mean wind speeds

6 Expected Wind Conditions Around the Proposed Development

6.1 Behaviour of the Wind

Wind fundamentally consists of the motion of air. It is the amount of air motion and how this motion is perceived that affects how windy a place is judged to be. A property of air is that it has inertia. This means that air does not move unless a force acts upon it. In layman's terms, air can be thought of as being 'lazy' and, given the choice, will always take the easiest path around a building. Understanding this issue is important when desk studies such as this are undertaken. This is because comments about wind conditions around a site can only be based upon a judgement about the likely routes that air will take. These judgements are tempered by experience of similar projects, and by knowledge of potential wind problems that might be encountered.

High-speed winds are usually produced by the passage of large-scale weather systems. These weather systems are created by the convective circulation pattern that results from differential heating of the earth's surface at the poles and the equator. This convective pattern combines with the effects of the earth's rotation to produce prevailing south-westerly winds across Ireland and the UK. Such winds not only come from this direction more often than any other, but they also tend to be the strongest winds that can occur. It is however important to consult wind records from a meteorological station close to the site of any proposed development in order to confirm the local prevailing wind direction before undertaking a desk study such as this. A site's proximity to the coast or topological features, such as mountains or lakes, can mean that winds may blow from alternative directions to the typical south-westerly.

Nearer to the ground, effects of surface roughness associated with buildings, trees and other obstructions influence certain aspects of the behaviour and properties of the wind. The ground level winds experienced by the public are influenced strongly by the geometry of nearby buildings. In general, the nearer the building is to a given location; the more strongly its influence is felt. Thus, although the local pedestrian level wind conditions (both the relative strength and gustiness of the wind and its direction) are influenced by nearby buildings, the frequency of occurrences of such winds, and the mean wind strength itself, are determined by wind conditions far above the earth's surface.

6.2 Overview of wind effects and their impact on pedestrian activities

Windward vortices are a phenomenon common to many tall buildings, especially those which rise above their surroundings and provide a significant frontage to the prevailing wind. High-speed winds from higher levels above the ground may be deflected downwards by the windward building façade, which can cause significant nuisance and/or distress to pedestrians in the vicinity. Entrances to buildings are particular areas of concern.

Another potentially problematic pedestrian level wind phenomenon occurs when winds (including perhaps those deflected to ground level by a windward vortex) accelerate around the windward corners of buildings. Such conditions can be particularly uncomfortable for pedestrians passing from a sheltered area with calm wind conditions immediately into a windy location as they step past the corner of an affected building.

Entrance doors can be wind-sensitive locations because people walking out from a windless conditioned indoor environment to outdoors are immediately confronted with the effects of the wind and can perceive the wind to be stronger than it actually is. For this reason, particular attention should be paid to the wind conditions around doorway locations. Entrances located at unprotected corners of buildings where winds tend to 'whip' around from one façade to the next can be particularly problematic.

The target Lawson pedestrian comfort criterion for this development, as defined in Table 2, are considered to be:

- i) 'Long-term Sitting' in the residential amenity areas,
- ii) 'Strolling' (often referred to as leisure-walking) on the pedestrian routes through and around the development, and
- iii) 'Entrances' at the main entrances to the buildings.

These criteria have been chosen as being the most appropriate benchmarks for the High Street development.

The following assessments consider the wind effects around Sectors 6, 7 and 8 (shown respectively in Figures 8, 9 and 11) of the proposed GA2 development. It is our understanding that planning consent has been granted for the adjacent Growth Area 1 (GA1) and Growth Area 3 (GA3) developments so the assessment of the wind microclimate around the GA2 development assumes that the buildings of the GA1 and GA3 developments will be in place.

6.3 Sector 6

Sector 6 is at the southwest corner of the proposed GA2 development. This Sector comprises of six blocks arranged around a courtyard with the seventh block in the centre of the courtyard, as shown in Figure 7. The blocks around the periphery of the courtyard are all five storeys tall, with the exception of Blocks 3 and 7 on the eastern edge of the Sector which both include a six storey element. The central block, Block 6, is also six storeys high.

Sector 6 is surrounded on all sides by existing or proposed surrounding buildings and existing or proposed trees. To the south and west are the buildings of the GA1 and GA3 developments respectively, see Figures 3 and 4. The buildings of the GA1 development are two storeys (www.shoreline1shd.ie) and those of the GA3 development which are between five and 11 storeys (www.shoreline2shd.ie). To the north are the buildings of Sector 7 and to the northeast the Sector 8C buildings which are all of similar height or taller than the Sector 6 buildings, and to the east is the Haggard beyond which are the buildings of Sectors 8A and Sectors 8B see Figure 5. To the southeast are the buildings of the existing buildings of the Red Arches Park buildings, see Figure 6.

6.3.1 Potential Impact on Pedestrian-level Winds

The buildings surrounding Sector 6 are all generally of similar height or taller than the Sector 6 buildings and will provide good shelter from the prevailing south westerly wind. To the east there is less local shelter which is provided by the rows of existing and proposed trees on the Haggard and further afield by the proposed Sector 8A and 8B buildings. There are relatively narrow gaps between the Sector 6 buildings but accelerated wind flow through these gaps is not expected to occur because of the ground level shelter provided by surrounding buildings.

The main pedestrian activities throughout the year around this Sector are likely to be Strolling on the footpaths and walkways and Entrances at the main entrances to the buildings and Long-term sitting during the summer in the courtyard amenity areas. Sector 6 is well sheltered from the prevailing south westerly winds. There is less shelter from easterly winds, but these are expected to be relatively infrequent. It is therefore expected that the wind conditions at all locations around the Sector 6 buildings will be suitable for the intended pedestrian activities and there are not expected to be any adverse impacts on pedestrian comfort around the Sector 6 buildings.

There are not expected to be any locations around Sector 6 where the distress threshold wind speeds will be exceeded.



Figure 8 Plan view of the Sector 6 blocks

6.4 Sector 7

This Sector comprises of three 'I' shaped finger blocks (Blocks 1 to 3) the spines of which are orientated approximately north-south. The blocks create two courtyards open at the west and east ends, see Figure 8. Each block increases in height from the southern to northern end. At the southern end the blocks are five or six storeys high stepping up in height to a maximum height of 11 storeys (Block 1), 12 storeys (Block 2) and ten storeys (Block 3).

For southerly winds the orientation of the finger blocks and the increasing height from south to north minimises large, exposed faces and will tend to cause the wind to blow up and over the blocks thereby minimising downwash and adverse impacts from the prevailing wind direction. However, with regards to the ground level winds around the bases of these Sector buildings, these beneficial geometrical features are not present for northerly winds.

To the south of Sector 7 is Sector 6 and to the west are the proposed GA3 buildings which are between five and eleven storeys, see Figure 3. The northern ends of the three Sector 7 buildings are exposed and will have no shelter from northerly winds. To the east, Sector 7 will be largely sheltered by the buildings of Sector 8A, see Figure 6.

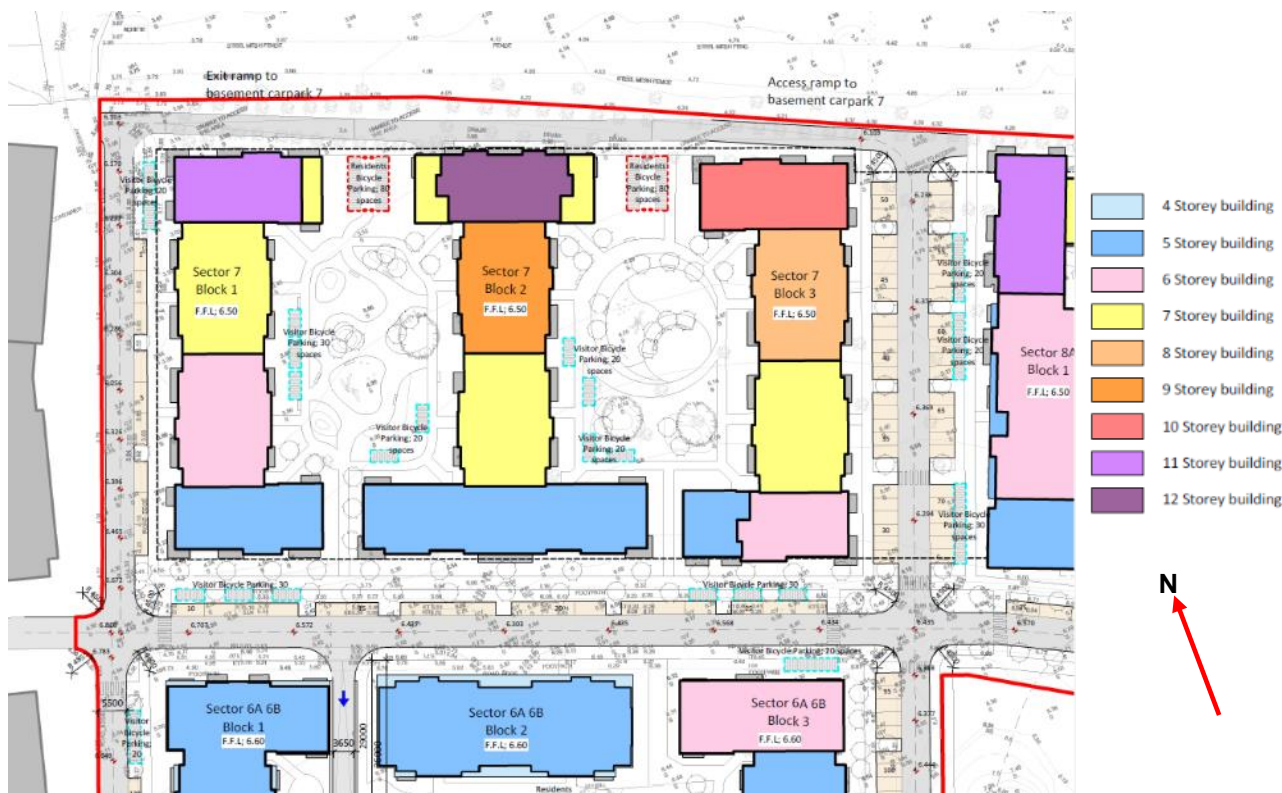


Figure 9 Plan view of the Sector 7 buildings

6.4.1 Potential Impact on Pedestrian-level Winds

Sector 7 is well sheltered from the prevailing southwesterly winds by Sector 6 and the proposed GA3 buildings. The tallest elements of the Sector 7 building will protrude above the average height of the surrounding buildings however there is unlikely to be significant downwash from the prevailing southwesterly winds. This is because of the north/south and east/west building orientations which mean that these winds do not blow directly towards the building facades. The Sector 7 buildings are also reasonably well sheltered from south easterly winds, which are relatively infrequent and light, by the Sector 8 buildings and the wooded areas of the Haggard. The Haggard includes several existing tall mature retained and protected trees, and many more new trees will be planted, see Figure 9. This wooded area will disperse the south easterly wind and create shelter at ground level. There are also rows of trees proposed along the south elevations of the Sector 7 buildings which will provide additional local shelter from south easterly winds. So no adverse wind effects are expected in or around Sector 7 from south westerly or south easterly wind directions.

However, there will be little shelter from northerly winds. It is therefore likely that northerly winds will create windward vortices on the exposed northern ends of the three Sector 7 blocks buildings. This will cause increased wind flow down the northern elevations of Blocks 1, 2 and 3 and will increase the ground level wind speeds. This effect will be worse close to the corners of the windward elevations and entrance

doors or footpaths should not be sited close to these corners. The drawings of the Sector 7 buildings show that there are no entrance doors or exits on the northern elevations of Blocks 1, 2 or 3 and there are no designated pedestrian walkways close to the corners.



Figure 10 The Haggard showing the proposed and existing trees

Northerly winds are likely to blow through the gaps between Blocks 1 and 2 and between Blocks 2 and 3 potentially causing accelerated wind flow and increasing ground level wind speeds. The areas in the gaps between the north end of these blocks will be used for resident’s bicycle storage. Further to the south in the courtyards the areas will be used for more sedentary activities such as strolling and sitting during the summer months.

Northerly winds are relatively infrequent, see the wind rose in Figure 7, and will generally have a lower strength than the prevailing south westerly winds. Given the low frequency of occurrence of northerly winds it is expected that the areas around the bicycle stores and in and around the courtyards will be suitable for Pedestrian strolling throughout the year and suitable for more sedentary activities during the summer months.

For the year as a whole it is expected that the wind conditions at all locations around the Sector 7 buildings will be suitable for the intended pedestrian activities and there are not expected to be any adverse impacts on pedestrian comfort around the Sector 7 buildings.

There are not expected to be any locations around Sector 7 where the distress threshold wind speeds will be exceeded.

6.5 Sector 8

This Sector comprises of three elements. Sector 8A has two buildings, one with heights of between five and 11 storeys and the other of five storeys. Sector 8B comprises of two buildings, one with heights between five and 11 storeys and the other with heights of six and seven storeys. Sector 8C comprises of two buildings, one with heights of four, five and eight stories and the other with heights of four and five storeys. Figure 11 shows the Sector 8 buildings.

The heights of the buildings in all three elements of this Sector increase from south to north thereby minimising large faces exposed to the prevailing southwesterly wind. Southwesterly winds approaching the Sector 8A, 8B and 8C buildings will therefore tend to blow up and over the blocks minimising downwash effects.

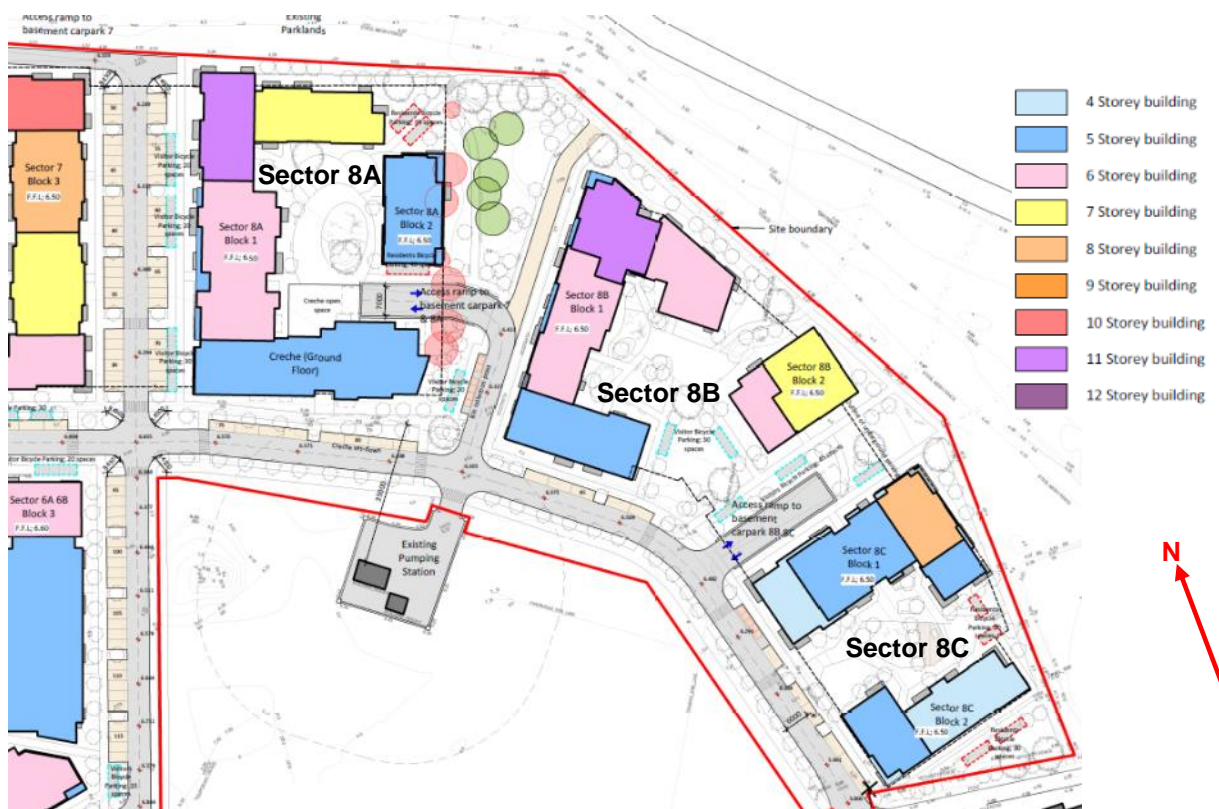


Figure 11 Plan view of the Sector 8 buildings

Immediately adjacent to the south or southwest of the Sector 8 buildings is the wooded area of the Haggard. This area includes a row of trees along the southwest side of Sector 8, see Figures 3 and 11. Beyond the Haggard (to the south) are the buildings of the Red Arches Park development which range between three and five storeys. To the west are the Sector 6 and 7 buildings which will provide shelter to the west and southern ends of Sector 8, but the northern facades of the Sector 8 buildings will be exposed, see Figure 4. The northeast-facing facades of the Sector 8 buildings are exposed to northeast winds, with no shelter from existing or proposed buildings. The southeast corner of Sector 8 will be partially sheltered by the buildings of Red Arches Park, and the wooded areas of the Haggard, see Figures 6 and 10.

6.5.1 Potential Impact on Pedestrian-level Winds

Local shelter to all three elements of the Sector 8 buildings is provided from the prevailing south westerly winds by the wooded areas of the Haggard and the proposed rows of new trees along the adjacent roads. Beyond the Haggard are the buildings of the proposed GA1 buildings. Sector 8A will also be partly sheltered by the Sector 6 buildings. The graduated increase in height from south to north will also help to minimise the wind impact. However, the maximum height of the Sector 8A and 8B buildings is 11 storeys. In both cases there will be a five storey step height from the adjoining six storey block. This is the largest step height between buildings in the whole development and it is possible that windward vortices could develop and create downwash on the protruding five storey part of the building. This is likely to increase the wind speeds on the roof of the adjoining six storey buildings. However, there are no roof terraces or public amenity areas on these roofs. The downwash around these building will be convected downstream and dissipated and is not expected to reach down to ground level.

The courtyard of Sector 8A is mainly enclosed and protected from southwesterly winds so is expected to have wind conditions suitable for strolling throughout the year and for long-term sitting during the summer. The courtyard areas of Sectors 8B and 8C are more exposed to southwesterly winds. In Sector 8B there are some scattered trees in the entrance and inside of the courtyard and a row of trees along the access road which will provide local shelter. The wind conditions within the courtyard are likely to be suitable for strolling but it is recommended that seating areas are not located close to Block 2 because the wind conditions here could be unsuitable for long-term sitting. The entrance to the Sector 8C courtyard is sheltered by the proposed row of trees along the access road. There are also trees within the courtyard and especially in front of the seating area which will provide local shelter to the seating area. Based on the tree layout indicated on the drawing it is expected that the wind conditions within the Sector 8C courtyard will be suitable for strolling throughout the year and for long-term sitting during the summer.

For south easterly winds, Sector 8C will be sheltered by the nearby five storey buildings along Red Arches Road. Sector 8B will be sheltered by the Sector 8C buildings and the Sector 8A buildings will be partly sheltered by the Sector 8B and 8C buildings and by the wooded areas of the Haggard. There are no entrances on the exposed southern facades of the Sector 8 buildings. South easterly winds are relatively infrequent so it is expected that for this wind direction the ground level wind microclimate will be suitable for the intended pedestrian activities throughout the year.

The northern and north-east elevations of the Sector 8 buildings will be fully exposed to northerly winds. The tallest elements of Sector 8 are all on the northern edge and range in height from eight to 11 stories. Because there is no shelter from northerly winds it is likely that windward vortices will be developed on the northern elevations of the Sector 8B and Sector 8C buildings. This will cause increased wind speeds at ground level, which will be mitigated to a minor extent by the trees close to the northern facades. Northerly winds will create increased wind speeds close to windward corners along the north side of the Sector 8 buildings. The drawings of the Sector 8A, 8B and 8C buildings show that there are no entrance doors or exits on the northern elevations of any of the Blocks and there are trees/shrubs close to the potentially windy corners to prevent pedestrian access to these areas.

The courtyards of Sectors 8B and 8C have gaps in the northern facades which will be exposed to northerly winds. North easterly winds are likely to blow through the gaps between Sector 8B Blocks 1 and 2 and between Sector 8C Blocks 1 and 2 and into the courtyard areas.

North easterly winds are infrequent, see the wind rose in Figure 7, and have a lower intensity than the prevailing southwesterly winds. Therefore given the low frequency of northerly winds it is expected that the area in and around the courtyards will meet the Lawson criteria for Pedestrian strolling for northerly winds.

For the year as a whole it is expected that the wind conditions at all locations around the Sector 8 buildings will be suitable for the intended pedestrian activities and there are not expected to be any adverse impacts on pedestrian comfort around the Sector 8 buildings.

There are not expected to be any locations around Sector 8 where the distress threshold wind speeds will be exceeded.

7 Pedestrian Microclimate Amelioration Measures

It is important to recognise that a location having a potential to have unpleasant wind is not the same as that location being unpleasantly windy. A desk study offers a professional opinion about the likely wind conditions and draws attention to any areas of concern; hence it is qualitative by nature. The behaviour of the wind and its interaction with buildings means that it is not possible to be certain about the actual wind conditions. Hence in this situation, all of the areas of concern around a site need to be identified. This approach tends by its nature to be conservative. Wind tunnel testing gives a qualitative approach and will provide details of the actual extent and magnitude of windy areas and may possibly show that an area of concern identified in a desk study is either too large, or that this area is actually suitable for its intended activity. Nevertheless, experience has shown that the findings of a desk study are usually borne out by the results obtained by subsequent wind tunnel testing.

In summary, the wind conditions around the proposed GA2 development are expected to be suitable for the intended pedestrian activities. Therefore no wind mitigation is expected to be required.

8 Conclusion and Recommendations

This wind microclimate desk study has shown that the proposed Growth Area 2 development is generally well sheltered from the prevailing southwesterly winds and the graduated increase in building heights from south to north will further help to minimise adverse wind effects. Some parts of the development are exposed to northerly winds and to a lesser extent to south easterly winds, but winds from these directions are infrequent and of low intensity at this site so the exposure to northerly and south easterly winds is not expected to have a significant adverse impact on the pedestrian level wind microclimate.

The specific conclusions from this assessment are:

- The proposed Growth Area 2 development is generally well sheltered from the prevailing southwesterly winds and the graduated increase in building heights from south to north will further help to minimise adverse wind effects. Some parts of the development are exposed to northerly winds and to a lesser extent by south easterly winds, but these are infrequent and of low intensity at this site so exposure to northerly winds and south easterly winds is not expected to have a significant adverse impact on the pedestrian level wind microclimate.
- The ground level wind conditions around the proposed Growth Area 2 development are expected to be generally suitable for the intended pedestrian activities at all footpaths, walkways and public realm areas.
- The pedestrian entrances to the buildings of the proposed Growth Area 2 development generally face the courtyard areas and are expected to be sheltered and suitable for entrance usage.
- The wind conditions on nearby roads and existing surrounding areas are not expected to be adversely impacted by the proposed Growth Area 2 development.

9 References

Blackmore P, BRE Digest 520. Wind Microclimate around Buildings. May 2011