

BRE Client Report

Wind Microclimate Assessment - No.1 Reading, 29-35 Station Road

Prepared for: Jonathan Heather
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BRE
Watford, Herts
WD25 9XX

Customer Services 0333 321 8811

From outside the UK:
T + 44 (0) 1923 664000
F + 44 (0) 1923 664010
E enquiries@bre.co.uk
www.bre.co.uk

Prepared for:
Jonathan Heather
K2 Consultancy
61-63 St. John Street
London
EC1M 4AN



Prepared by

Name Katarina Kosutova and Stephen Shanks

Position Consultant Wind Engineers

Date 22nd October 2018

Signature

A handwritten signature in blue ink, appearing to read 'K Kosutova'.

A handwritten signature in blue ink, appearing to read 'S Shanks'.

Authorised by

Name Dr Paul Blackmore

Position Associate Director

Date 22nd October 2018

Signature

A handwritten signature in blue ink, appearing to read 'P Blackmore'.

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Executive Summary

BRE were commissioned to undertake a wind tunnel study to assess the pedestrian level wind microclimate around the site of the proposed No. 1 Reading, 29-35 Station Road development. This report presents the results obtained from the wind tunnel study.

A 1:300 scale model of the site and the surrounding areas was tested in a BRE boundary layer wind tunnel. Measurements of wind speeds were taken around the existing site and the proposed development. These measurements were taken at 50 locations around the existing site and 55 locations around the proposed development. The wind conditions around the site were assessed against the Lawson Criteria.

This assessment considers the wind conditions around the site arising from the proposed development based on the intended pedestrian activities within the identified locations around the site in both scenarios

The following conclusions can be drawn from this study:

- The measurements taken around the proposed development showed that the wind conditions around the site will be suitable for pedestrian strolling throughout the year at all but one location in the test configuration with existing surrounds and at all locations in the test configuration with future surrounds. The wind conditions at the remaining location in the configuration with existing building is suitable for workers around buildings and business walking during the winter and pedestrian strolling during the summer. The intended pedestrian activity within this location business walking, thus the conditions are acceptable in all scenarios.
- Measurement locations were positioned around the proposed development to measure the wind conditions at known entrances. The wind conditions were shown to be suitable for entrance usage throughout the year at all of the known entrance locations to the proposed development with both existing and future surrounds.
- An assessment of road vehicle safety has been carried out for this study. It was found that there are no locations where the wind conditions exceeded the road vehicle safety criterion adopted by BRE.
- An assessment of the distress conditions has been carried out for this study. There were no locations with wind conditions exceeding the distress conditions.

In summary; the wind conditions around the proposed development will remain similar to those measured around the existing site. With the proposed development and existing surrounds there are three locations during the winter which become windier and two that become less windy. With the proposed development and future surrounds there are seven locations which become less windy during the winter and no locations which become windier. The impact on the wind microclimate of the proposed development with existing surrounds is therefore expected to be neutral and the impact with the future surrounds is expected to be minor beneficial. At all locations the wind conditions are expected to be suitable for the intended pedestrian activities.



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Introduction

The site of the proposed No. 1 Reading, 29-35 Station Road development is located in central Reading at the intersection of Station Road and Garrard Street. The proposed development, a mixed-use building, will be twenty-two storeys tall. The usage in the building will comprise of the following: hotel use (Class C1), office use (Class B1a) and flexible ground floor retail use (Classes A1, A2, A3 or A4 use) with associated servicing from Garrard Street.

The Building Research Establishment Ltd (BRE) was appointed under the instruction of K2 Consultancy to undertake wind tunnel tests to measure the pedestrian level wind speeds and to assess the wind microclimate around the proposed development.

The work was conducted by BRE as project P112007-1002.

This report describes the wind tunnel tests carried out and presents the results obtained.



The Model and the Atmospheric Boundary Layer Simulation

A wind tunnel model of the site was constructed for the purpose of this test by Model Products Limited. The model featured the proposed development and included nearby surrounding existing buildings.

The linear scale of the wind tunnel model was 1:300 and it was constructed on a circular baseboard of diameter 1.75m. The surrounding area was therefore represented up to a radius of approximately 263m in full-scale. The wind speed measurement reference height was 300mm above the wind tunnel floor, which corresponds with a full-scale height of 90m above the ground.

The Site corresponds to the 'Town' category terrain as defined in British Standard BS EN 1991-1-4 (Reference [1]). An appropriate suburban atmospheric boundary layer was simulated at the appropriate scale using rectangular plate roughness elements. The rectangular elements create a mean velocity profile, turbulence profile, and turbulence spectra appropriate to the area surrounding the site.

Measurements were taken at 50 locations around the existing site and at 55 locations around the proposed development. Measurements around the proposed development were taken at sensitive receptor locations, including footpaths, potential amenity areas, and entrances.

The model was constructed to allow the following three configurations to be tested:

- The existing site (the baseline configuration)
- The proposed development with existing surrounds
- The proposed development with future surrounds

Photographs of these three configurations are shown in Figures 1 through 3. Additional photographs of the model are included in Appendix A.



Figure 1. Model of the Existing Site in the BRE Wind Tunnel (Oriented towards North)

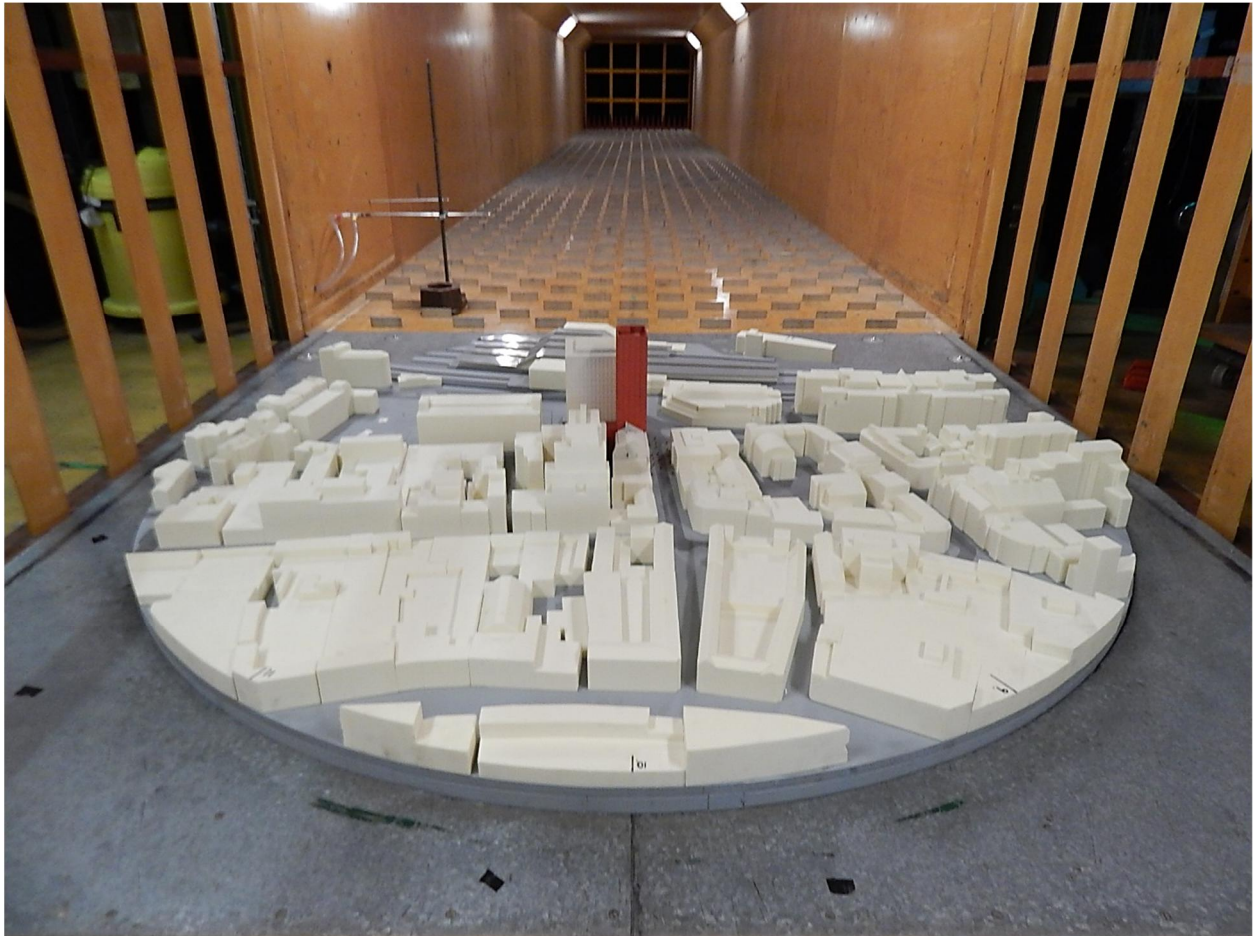


Figure 2. Model of the Proposed Development with Existing Surrounds (Oriented towards North)



Figure 3. Model of the Proposed Development (Oriented Towards North) with Future Surrounds



Method of Testing and Analysis

General

The windiness of a given location can be determined by combining measured results from an appropriate wind tunnel test with full-scale meteorological data. Combining long-term meteorological statistics with wind tunnel measurements enables the probability of a given wind speed occurring at a measurement location to be determined. However, this information does not, by itself, provide any information about how people perceive that windspeed. This is because such perception depends not only upon the magnitude of the wind, but upon what the person is doing at the time, and also upon that person's expectations of the wind environment. To accommodate these issues, 'user defined criteria' have been developed over a number of years.

Wind conditions are usually described in terms of the Beaufort Wind Scale. Windspeeds associated with this scale and descriptions of observable events that occur at such windspeeds are presented in Table 1.

Comfort criteria have been developed for the assessment of pedestrian wind comfort that can be used in conjunction with the results from wind tunnel investigations. The standard criteria are the Lawson Criteria (Reference [2]). These criteria are based on the percentage of time that the windspeed at a location exceeds the Beaufort values shown in Table 1. The Lawson Criteria allow the wind conditions to be assessed as 'unacceptable', 'tolerable' or 'acceptable' for a given activity where these terms are defined as:

- Unacceptable - Unpleasant conditions for the given activity which should not normally be allowed to occur.
- Tolerable - Conditions which might be described by a member of the public as 'windy', but which would be tolerated for the given activity.
- Acceptable - Conditions that will elicit no adverse comments about the wind.

A location that is rated as unacceptable for a given activity could well be tolerable or even acceptable for another activity. For example, a location that is unacceptable for Long-term Sitting may well be tolerable or acceptable for Strolling or Business Walking. Table 2 shows the criterion numbers and Table 3 shows the threshold windspeeds (in terms of the Beaufort Wind Scale) of unacceptable and tolerable wind conditions for people undertaking generic activities. Acceptable conditions are defined as those which fall below the tolerable threshold.

These comfort criteria give a physical description of how the average person will react to the wind conditions present at that location. Different groups of people will however have different tolerance levels; the very young or old for example may be more susceptible to the effects of the wind.



	Description	Mean wind speed range(m/s) at 10m	Effects of the wind
B0	Calm	0 - 0.2	None.
B1	Light air	0.3 - 1.5	No noticeable wind.
B2	Light breeze	1.6 - 3.3	Wind felt on face.
B3	Gentle breeze	3.4 - 5.4	Wind extends light flag.
B4	Moderate breeze	5.5 - 7.9	Raises dust and loose paper. Hair disarranged, clothing flaps.
B5	Fresh breeze	8.0 - 10.7	Limit of agreeable wind on land.
B6	Strong breeze	10.8 - 13.8	Umbrellas used with difficulty. Force of the wind felt on the body. Wind noisy, frequent blinking.
B7	Near gale	13.9 - 17.1	Inconvenience felt when walking; difficult to walk steadily. Hair blown straight.
B8	Gale	17.2 - 20.7	Generally impedes progress; walking difficult to control. Great difficulty with balance in gusts.
B9	Strong gale	20.8 - 24.4	People blown over by gusts.
B10	Storm	24.5 - 28.4	Seldom experienced inland.

Table 1: The Beaufort Wind Scale

Activity	Lawson Comfort Criteria	
	Unacceptable	Tolerable
Business Walking (<i>fast walking from point A to B</i>)	10	9
Workers around Buildings (<i>maintenance and deliveries</i>)	9	7
Strolling (<i>slow walking with occasional stops, such as browsing and shopping, or standing for short durations</i>)	8	6
Long-term Sitting (<i>in open-air cafes, parks, etc.</i>)	6	4
Entrance Doors (<i>specifically for entrances to buildings</i>)	6	3

Table 2: The Lawson Comfort Criteria (Reference [2])

Criterion number	Threshold wind speeds in terms of the Beaufort scale
1	B1 exceeded for more than 25% of the time
2	B1 exceeded for more than 50% of the time
3	B2 exceeded for more than 4% of the time
4	B2 exceeded for more than 6% of the time
5	B3 exceeded for more than 3% of the time
6	B3 exceeded for more than 6% of the time
7	B4 exceeded for more than 2% of the time
8	B4 exceeded for more than 4% of the time
9	B5 exceeded for more than 2% of the time
10	B5 exceeded for more than 6% of the time
11	B6 exceeded for more than 2% of the time
12	B6 exceeded for more than 4% of the time

Table 3: The Threshold Wind Speeds used for the Lawson Comfort Criteria



Distress Criteria

It can be seen from Table 1 that people can be blown over in winds exceeding Beaufort 8 or above and therefore such wind speeds should not be permitted to occur around buildings. If this is not possible, measures should be taken to prevent public access during windy conditions to any areas which are likely to be affected by such high-speed wind conditions. It is also evident from Table 1 that people can find it difficult to balance in gusts which exceed Beaufort 7 or greater and therefore such windspeeds are also undesirable in pedestrian accessible areas around buildings.

Criteria have been developed by Lawson (Reference [2]) 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 windspeeds used are Beaufort 7 windspeed for frail people and cyclists and Beaufort 8 windspeed for the general public in areas where frail people or cyclist would not normally be expected. The Beaufort 7 and Beaufort 8 windspeed thresholds are referred to in this report as the "lower distress conditions" and the "upper distress conditions", respectively.

Meteorological Data

Meteorological data were purchased by BRE from the Met Office for the meteorological station at London Heathrow. The meteorological data were processed to determine the probability of occurrence of winds from each wind direction using extreme-value statistics. The wind records for the London Heathrow met site are shown in Appendix B of this report.

It is known that the probability distribution of windspeeds averaged over periods of between about one second to one hour is well represented by the Weibull probability distribution. The Weibull cumulative distribution function 'P' is given by:

$$P = 1 - \exp(- (V/c)^k) \quad (1)$$

where: 'c' is the scale parameter, 'k' is the shape parameter and 'V' is the windspeed.

The windspeed data from the London Heathrow met site were fitted to this Weibull distribution using Equation 1.

Corrections then need to be applied to account for the differences in terrain, distance from the sea, height of anemometer, etc. at the proposed development site and the meteorological station. Appropriate correction factors were determined using BREVe3 computer program which takes account of changes in terrain for distances of up to 200km around a site. This program is fully compatible with the methodology in BS EN 1991-1-4. The outputs from the BREVe program for the London Heathrow met site and the proposed site are both provided in Appendix C.



Wind Tunnel Measurements

There were 50 measurement locations around the existing site and 56 measurement locations around the proposed development.

The measurement locations are identified and numbered for reference in Figure 4 for the existing site and Figure 5 for the proposed site. The positioning of the measurement locations was chosen based on BRE experience and information supplied by the Client and included areas such as entrances, public realm areas, and footpaths. Measurements of mean and gust windspeed were made using instruments known as Irwin probes.

The mean and gust windspeeds were measured at a height representative of head height at full-scale (1.5m) and converted to non-dimensional windspeed ratios by dividing by a reference windspeed. This reference windspeed was measured in the wind tunnel at a reference height of 300mm (90m at full-scale) above the ground in the undisturbed free air stream immediately upwind of the model. The windspeed ratios were then factored so they are consistent with the meteorological data described in the previous section of this report.

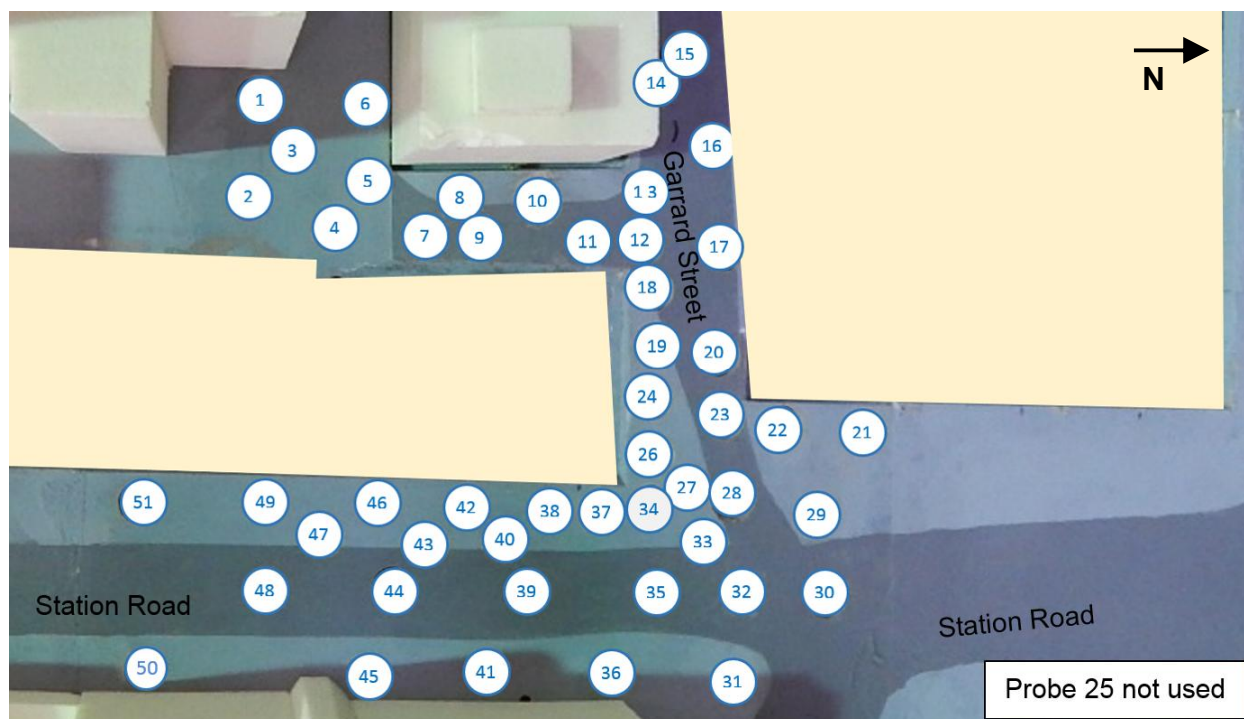


Figure 4. The windspeed measurement locations around the existing site

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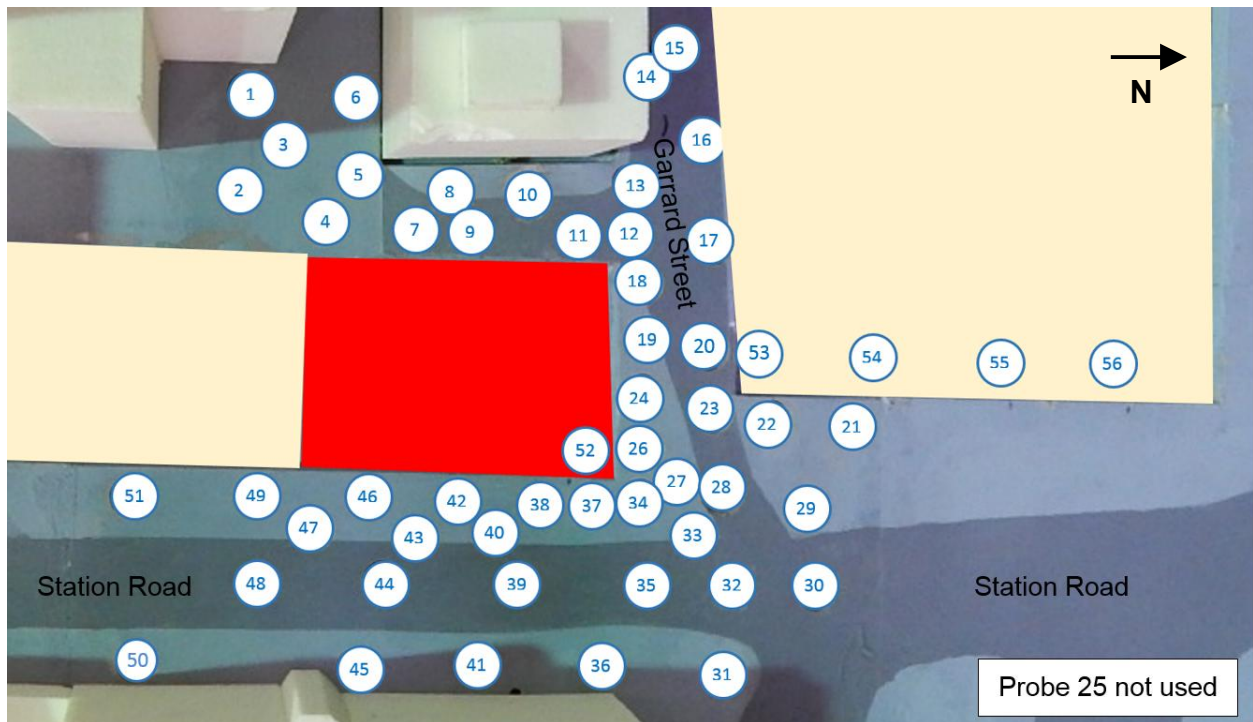


Figure 5. The windspeed measurement locations around the proposed site with existing and future surrounds



Results and Discussion

The wind conditions at each of the measurement locations were assessed for the pedestrian activities of Business Walking, Workers around buildings, Strolling, Long-term Sitting and Entrance Doors according to the Lawson Comfort Criteria defined previously in Table 2.

The results are presented in Appendices to this report for the various specified pedestrian activities for the year as a whole and for the four seasons: Summer (June, July, August), Autumn (September, October, November), Winter (December, January, February) and Spring (March, April, May). If a location is shown to be unacceptable then the wind conditions are such that the location is unsuitable for the given pedestrian activity. In such cases wind amelioration measures should normally be incorporated, or else the intended use of that location should be restricted to activities for which the conditions are more suited.

The onset of unacceptable wind conditions depends upon the activity. Unacceptable conditions for Long-term Sitting, for example, are where the wind speed exceeds Beaufort 3 (defined as a gentle breeze) for more than 6% of the time. From Table 1 it can be seen that such a wind speed would raise dust and loose paper. For Business Walking on the other hand, the onset of unacceptable conditions occurs when the windspeed exceeds Beaufort 5 (defined as 'fresh breeze') for more than 6% of the time. It is therefore entirely possible that a location that is unacceptable for a given pedestrian activity may be acceptable for another less wind-sensitive activity.

The windiest season of the year is generally the winter and the calmest season is the summer, therefore the wind conditions for these two seasons are presented in this section, the full sets of results for all seasons are given in the Appendices.

Expected Intended Usage

Based upon the information provided to BRE it is expected that the intended usage will be as follows:

- entrance usage at the entrances to the proposed development,
- pedestrian strolling in close proximity to the facades of the proposed development, and
- pedestrian strolling and business walking in the surrounding areas.

The results presented in Appendices D, E and F have been presented in terms of the intended usage of the measurement locations.

The known entrances to the proposed development are shown in Figure 6a for the basement level and in Figure 6b for the ground floor level.

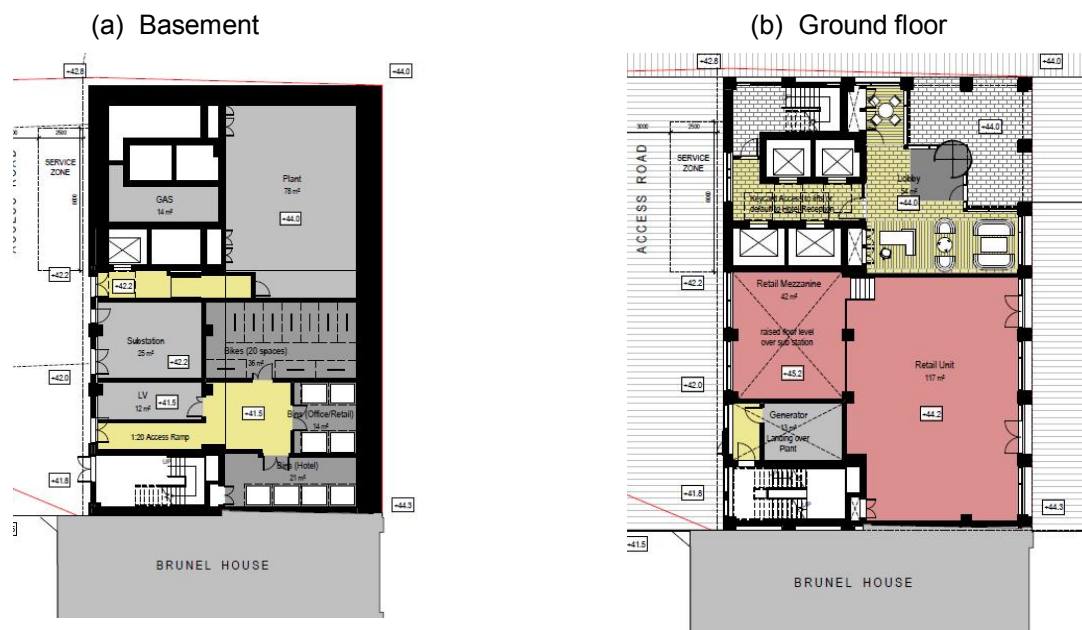


Figure 6. Known entrance locations in (a) basement and (b) ground floor

Wind Comfort around the Existing Site

The results of the wind tunnel tests to measure the pedestrian level wind conditions around the existing site are summarised in Figure 7 for the winter season and in Figure 8 for the summer season. The pedestrian level wind conditions are provided in full in Appendix D.

The wind conditions at 68% (34/50) of the measurement locations used around the existing site are suitable for any pedestrian activities (as described in Table 2) during the winter. Furthermore, the wind conditions at all of the measurement locations are suitable for pedestrian strolling and other more strenuous activities in the winter months.

During the summer, the wind conditions improve and the wind conditions at all but one of the measurement locations (location 29) are suitable for any pedestrian activity. Furthermore, the wind conditions at all of the measurement locations are suitable for pedestrian strolling and other more strenuous activities in the summer.

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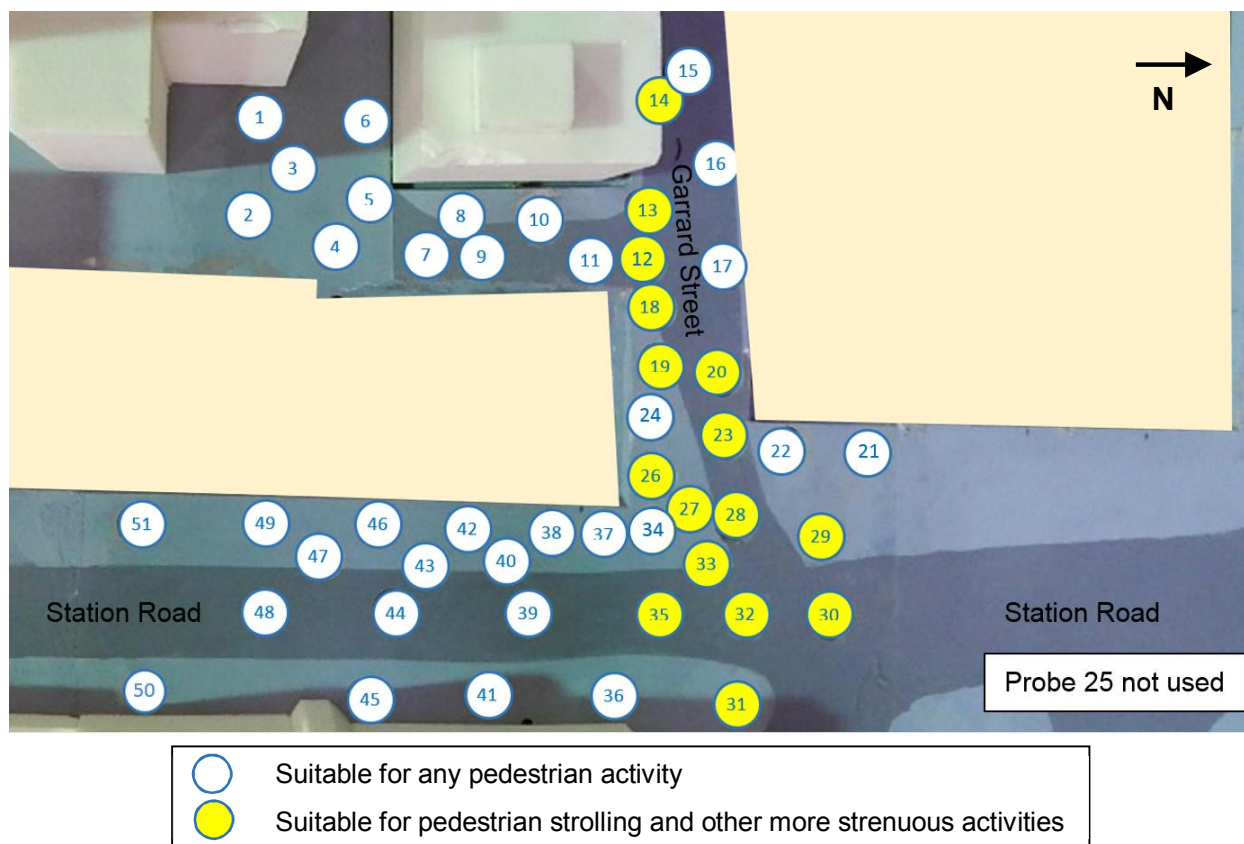


Figure 7. Wind conditions around the existing site during the winter

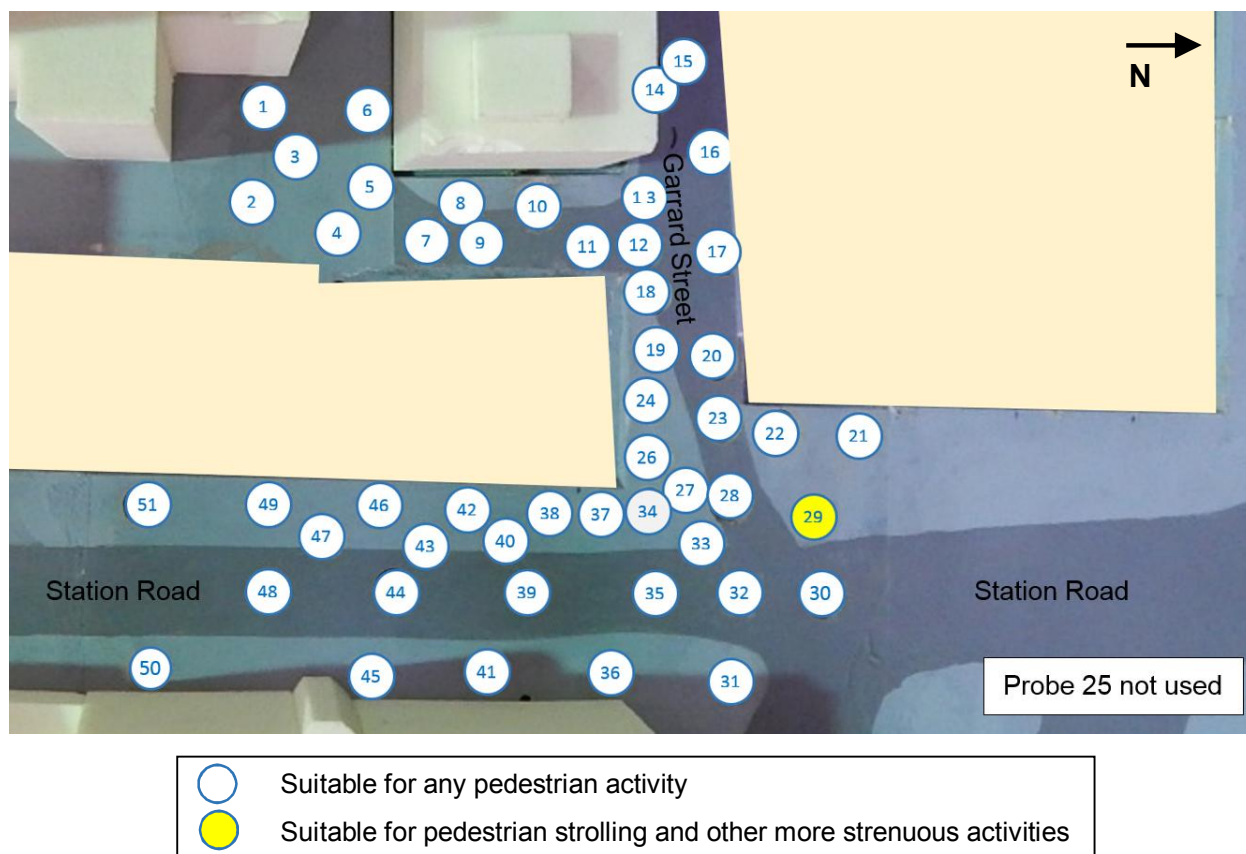


Figure 8. Wind conditions around the existing site during the summer



Wind Comfort around the Proposed Development with Existing Surrounds

The results of the wind tunnel tests to measure the pedestrian level wind around the proposed development with existing surrounds are summarised in Figure 9 for the winter season and Figure 10 for the summer season. The pedestrian level wind conditions are given in full in Appendix E.

The wind conditions at 71% (39/55) of the measurement locations around the proposed development with existing surrounds are suitable for any pedestrian activity (as described in Table 2) during the winter. Furthermore, the wind conditions at all but one of the measurement locations (location 33) are suitable for pedestrian strolling with the exceedance of strolling wind conditions by 7.8 hours in January and by 3.8 hours in February. The intended pedestrian activity at location 33 is Business walking and therefore the wind conditions are suitable at this location for this intended activity.

During the summer, the wind conditions improve and the wind conditions at 85% (47/55) of the measurement locations are suitable for any pedestrian activity. Furthermore, the wind conditions at all of the measurement locations are suitable for pedestrian strolling and other more strenuous activities in the summer months.

The measurement locations positioned at the known entrances to the proposed development showed that the wind conditions are suitable for entrance usage.

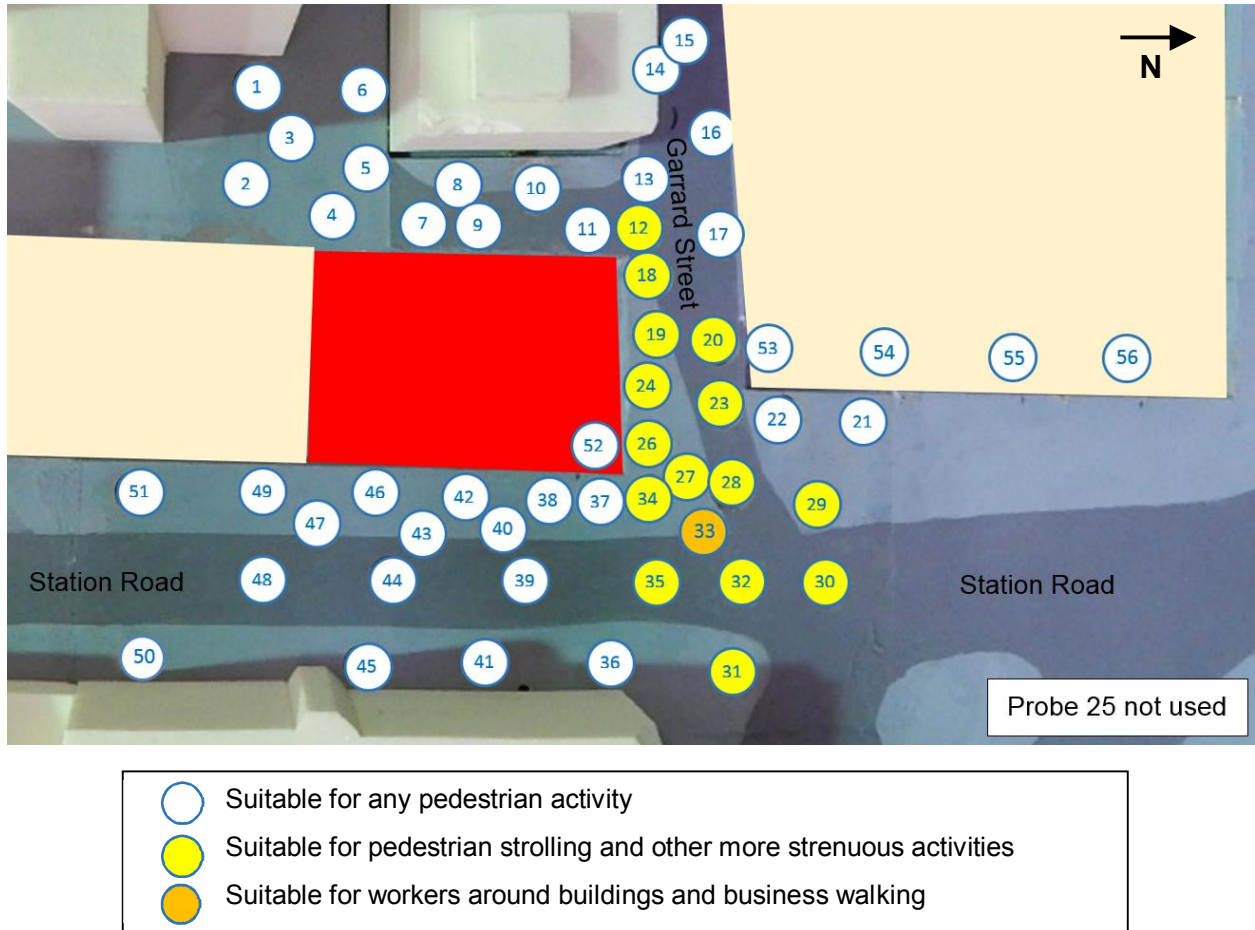
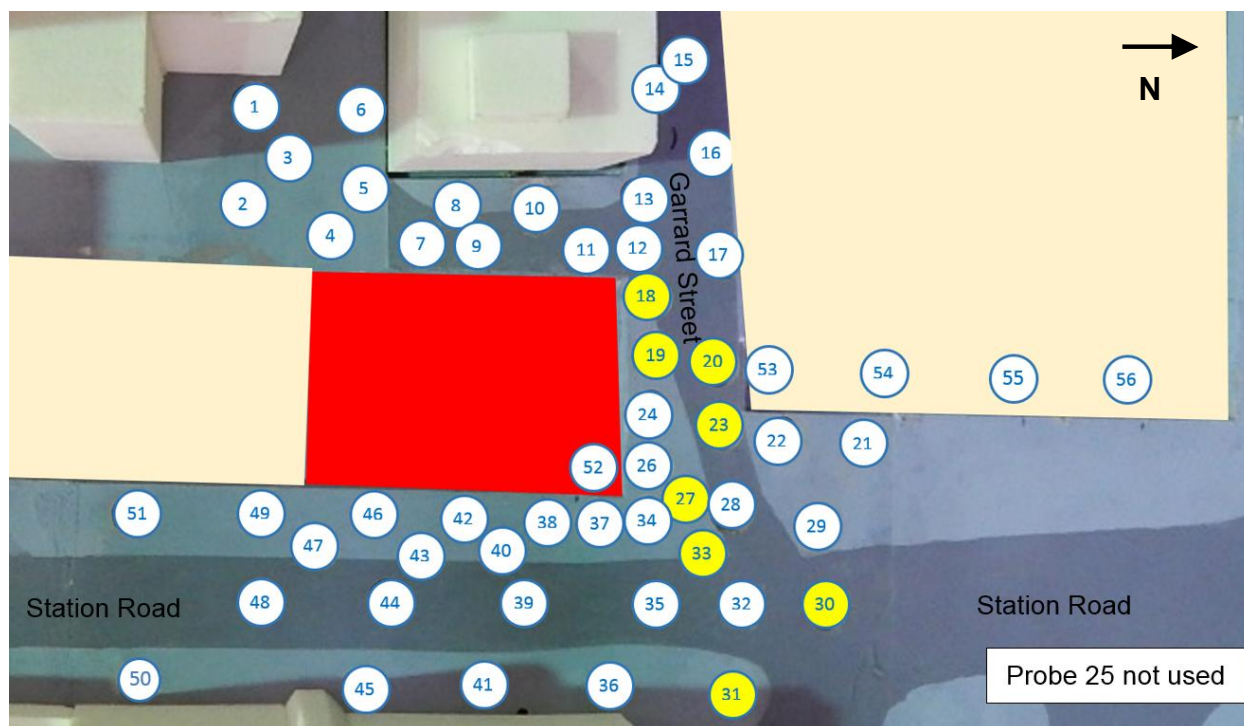


Figure 9. Wind conditions around the proposed development with existing surrounds during the winter

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- Suitable for any pedestrian activity
- Suitable for pedestrian strolling and other more strenuous activities

Figure 10. Wind conditions around the proposed development with existing surrounds during the summer



Wind Comfort around the Proposed Development with Future Surrounds

The results of the wind tunnel tests to measure the pedestrian level wind around the proposed development with future surrounds are summarised in Figure 11 for the winter season and Figure 12 for the summer season. The pedestrian level wind conditions are given in full in Appendix F.

The wind conditions at 81% (46/55) of the measurement locations around the proposed development with future surrounds are suitable for any pedestrian activity (as described in Table 2) during the winter. Furthermore, the wind conditions at all of the measurement locations are suitable for pedestrian strolling.

During the summer, the wind conditions improve and the wind conditions at all locations but one (location 33) are suitable for any pedestrian activity. Wind conditions around the location 33 are suitable for pedestrian strolling and more strenuous activity.

The measurement locations positioned at the known entrances to the proposed development showed that the wind conditions are suitable for entrance usage.

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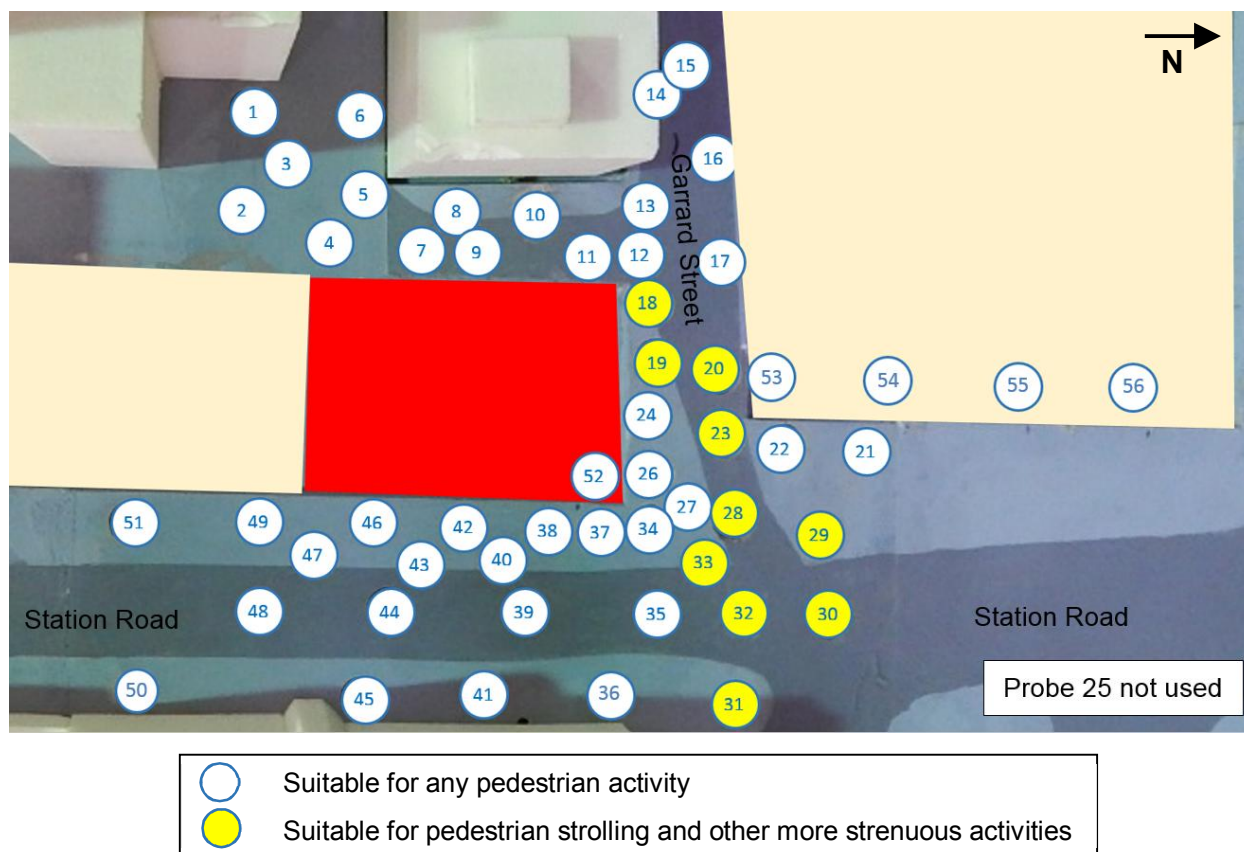


Figure 11. Wind conditions around the proposed development with future surrounds during the winter

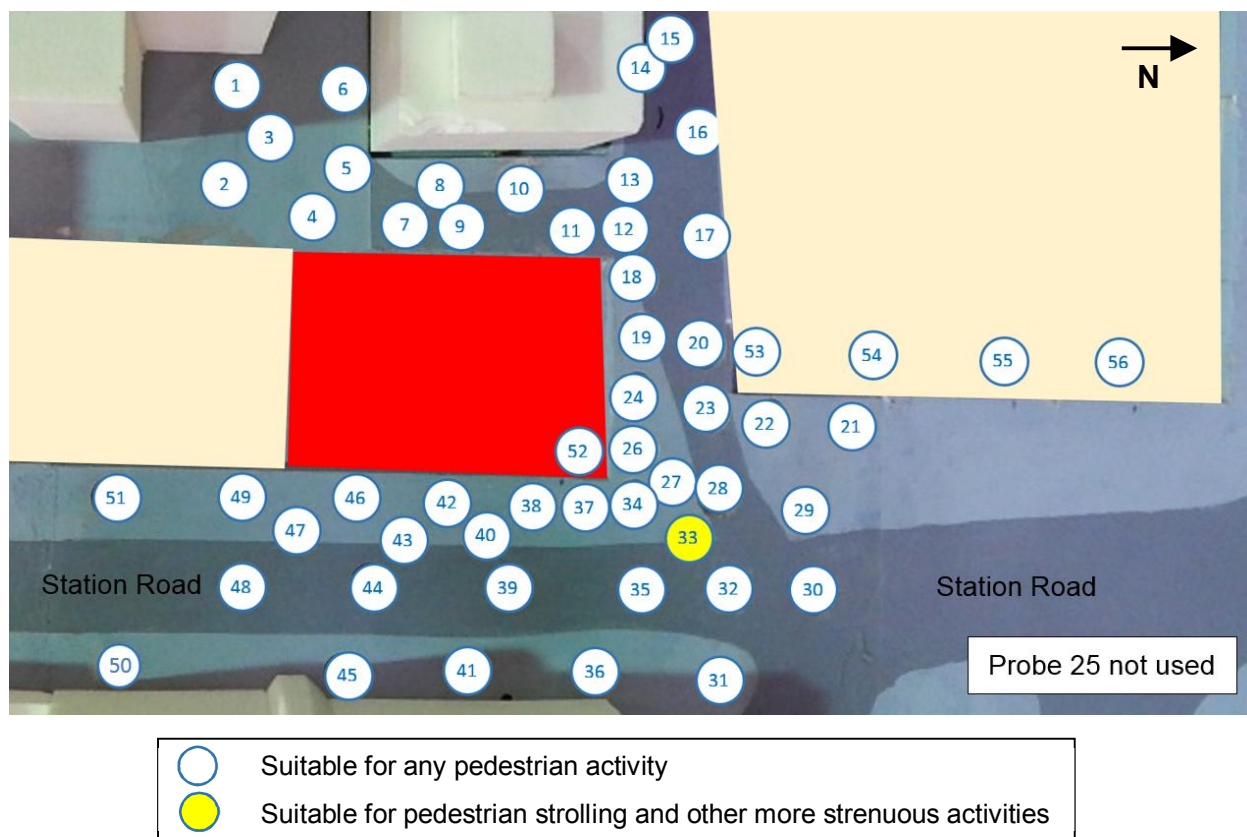


Figure 12. Wind conditions around the proposed development with future surrounds during the summer



Wind Conditions on Roads

Wind speed measurements were made along the roadways within close proximity to the proposed development, including Station Road and Garrard Street. The measurements indicate that the wind speeds on the roadways will remain similar to those measured around the existing site following the introduction of the proposed development. Furthermore, the wind conditions along the roadways are shown to remain suitable for pedestrian strolling and other more strenuous activities throughout the year at all but one location (location 33). At this location (positioned at the intersection of Station Road and Garrard Street) the wind conditions in proposed development with existing surrounds test configuration are shown to be suitable for workers around buildings and business walking.

There are no regulations governing allowable wind speeds on public roads or any standardised guidance defining wind speeds at which road vehicles are likely to be blown over. The critical wind speed depends on a number of factors including wind gust size and duration, vehicle speed, vehicle height, length and weight distribution, direction of the wind relative to the vehicle, etc. It is generally accepted that the lowest threshold wind speed at which the most susceptible road vehicles can be affected by crosswinds is approximately 20m/s (in most cases it will be much higher than this). To put a wind speed of 20m/s into context, it is the threshold windspeed at which an average person might be unbalanced or blown over by the wind.

Taking the information above into consideration, BRE have adopted a criterion to assess road vehicle safety based on a probability of exceedance of 0.025% per year, or a 0.04% exceedance per month, of a Beaufort 8 threshold wind speed (20.7m/s). These conditions relate approximately to a probability of occurrence of once per year and once per month respectively which should not be exceeded. As part of this wind tunnel study the wind speeds measured on the roads around the site were assessed to determine if there were any exceedances of the aforementioned road vehicle safety criterion. It was found that the road vehicle safety criterion was not exceeded at any of the measurement locations on the roads.



Assessment of Distress Criteria

From Table 1 it can be seen that people can be blown over in winds of Beaufort 9 or above and hence such wind speeds should not be allowed to occur around buildings unless measures are taken to prevent access to those areas. It can also be seen in Table 1 that people can find it difficult to balance in gusts which occur at Beaufort 8 and such wind speeds are therefore undesirable. Criteria have been developed by Lawson (Reference [2]) for use in assessing the onset of distress and are based on a probability of exceedance of 0.025% of a given threshold wind speed per year, or 0.04% exceedance per month. These conditions relate approximately to a probability of occurrence of once per year and once per month respectively which should not be exceeded. The threshold wind speeds used are Beaufort 7 for the frail or cyclists and Beaufort 8 for the general able-bodied public in areas where frail people or cyclist would not be expected.

An assessment of distress conditions was carried out for each of the three test configurations. There were no exceedances of the distress conditions in any of the three test configurations.



Reading Planning Policy

The adopted Reading Central Area Action Plan (2009) requires under policy RC13 (Tall Buildings) that all tall building proposals should *'mitigate any wind speed or turbulence or overshadowing effects through design and siting'*. The policy is supported by paragraph 8.59 which states that *'tall buildings can adversely affect the environmental quality of surrounding areas, particularly through the diversion of high-speed winds to ground level and through overshadowing of other areas. However, good design and siting can successfully mitigate these impacts. In terms of wind effects, the use of architectural devices such as screens, terraces and awnings as well as façade setbacks can be used to minimise the effects of high wind speed at the base of a tall building.'*

The emerging Reading Local Plan sets out a number of policies relating to wind/microclimate. Emerging policy CC3 (Adaptation to climate change) requires new development *'reduces exposure to wind and other elements.'* In addition, emerging policy CC8 (Safeguarding Amenity) seeks to ensure that new development will not cause a detrimental impact on the living environment of existing residential properties or new residential properties in terms of wind. In addition, policy CR10 (Tall Buildings) continues to reflect the wording of adopted policy RC13 cited above. The supporting text, paragraph 5.3.47, sets out that *'a building, or grouping of buildings, should be modelled and simulated within its surrounding context, to examine environmental performance at an early design stage to highlight and potential issues that need to be addressed. Wind should be assessed against the Lawson Criteria.'*

This wind tunnel study conducted for the Reading Station Road development complied with the Reading planning policy requirements – the tests were conducted within the context of existing and future surrounding building and the wind conditions were assessed against the Lawson Criteria. No adverse impacts on the environmental quality of the proposed scheme or surrounding areas were found.



Comparison of wind conditions between the existing site and proposed scheme

Table 4 shows a comparison between the wind conditions around the existing site and the proposed scheme for the winter and summer seasons.

Location	Winter		
	Existing site	Proposed development with existing surrounds	Proposed development with future surrounds
1	any pedestrian activity	any pedestrian activity	any pedestrian activity
2	any pedestrian activity	any pedestrian activity	any pedestrian activity
3	any pedestrian activity	any pedestrian activity	any pedestrian activity
4	any pedestrian activity	any pedestrian activity	any pedestrian activity
5	any pedestrian activity	any pedestrian activity	any pedestrian activity
6	any pedestrian activity	any pedestrian activity	any pedestrian activity
7	any pedestrian activity	any pedestrian activity	any pedestrian activity
8	any pedestrian activity	any pedestrian activity	any pedestrian activity
9	any pedestrian activity	any pedestrian activity	any pedestrian activity
10	any pedestrian activity	any pedestrian activity	any pedestrian activity
11	any pedestrian activity	any pedestrian activity	any pedestrian activity
12	strolling, bussines walking	strolling, bussines walking	any pedestrian activity
13	strolling, bussines walking	any pedestrian activity	any pedestrian activity
14	strolling, bussines walking	any pedestrian activity	any pedestrian activity
15	any pedestrian activity	any pedestrian activity	any pedestrian activity
16	any pedestrian activity	any pedestrian activity	any pedestrian activity
17	any pedestrian activity	any pedestrian activity	any pedestrian activity
18	strolling, bussines walking	strolling, bussines walking	strolling, bussines walking
19	strolling, bussines walking	strolling, bussines walking	strolling, bussines walking
20	strolling, bussines walking	strolling, bussines walking	strolling, bussines walking
21	any pedestrian activity	any pedestrian activity	any pedestrian activity
22	any pedestrian activity	any pedestrian activity	any pedestrian activity
23	strolling, bussines walking	strolling, bussines walking	strolling, bussines walking
24	any pedestrian activity	strolling, bussines walking	any pedestrian activity
26	strolling, bussines walking	strolling, bussines walking	any pedestrian activity
27	strolling, bussines walking	strolling, bussines walking	any pedestrian activity
28	strolling, bussines walking	strolling, bussines walking	strolling, bussines walking
29	strolling, bussines walking	strolling, bussines walking	strolling, bussines walking
30	strolling, bussines walking	strolling, bussines walking	strolling, bussines walking
31	strolling, bussines walking	strolling, bussines walking	strolling, bussines walking
32	strolling, bussines walking	strolling, bussines walking	strolling, bussines walking
33	strolling, bussines walking	bussines walking	strolling, bussines walking
34	any pedestrian activity	strolling, bussines walking	any pedestrian activity
35	strolling, bussines walking	strolling, bussines walking	any pedestrian activity
36	any pedestrian activity	any pedestrian activity	any pedestrian activity
37	any pedestrian activity	any pedestrian activity	any pedestrian activity
38	any pedestrian activity	any pedestrian activity	any pedestrian activity
39	any pedestrian activity	any pedestrian activity	any pedestrian activity
40	any pedestrian activity	any pedestrian activity	any pedestrian activity
41	any pedestrian activity	any pedestrian activity	any pedestrian activity
42	any pedestrian activity	any pedestrian activity	any pedestrian activity
43	any pedestrian activity	any pedestrian activity	any pedestrian activity
44	any pedestrian activity	any pedestrian activity	any pedestrian activity
45	any pedestrian activity	any pedestrian activity	any pedestrian activity
46	any pedestrian activity	any pedestrian activity	any pedestrian activity
47	any pedestrian activity	any pedestrian activity	any pedestrian activity
48	any pedestrian activity	any pedestrian activity	any pedestrian activity
49	any pedestrian activity	any pedestrian activity	any pedestrian activity
50	any pedestrian activity	any pedestrian activity	any pedestrian activity

Table 4. Comparison of wind conditions around the existing site with wind conditions around the proposed development with existing and surrounding buildings during the winter



Location	Summer		
	Existing site	Proposed development with existing surrounds	Proposed development with future surrounds
1	any pedestrian activity	any pedestrian activity	any pedestrian activity
2	any pedestrian activity	any pedestrian activity	any pedestrian activity
3	any pedestrian activity	any pedestrian activity	any pedestrian activity
4	any pedestrian activity	any pedestrian activity	any pedestrian activity
5	any pedestrian activity	any pedestrian activity	any pedestrian activity
6	any pedestrian activity	any pedestrian activity	any pedestrian activity
7	any pedestrian activity	any pedestrian activity	any pedestrian activity
8	any pedestrian activity	any pedestrian activity	any pedestrian activity
9	any pedestrian activity	any pedestrian activity	any pedestrian activity
10	any pedestrian activity	any pedestrian activity	any pedestrian activity
11	any pedestrian activity	any pedestrian activity	any pedestrian activity
12	any pedestrian activity	any pedestrian activity	any pedestrian activity
13	any pedestrian activity	any pedestrian activity	any pedestrian activity
14	any pedestrian activity	any pedestrian activity	any pedestrian activity
15	any pedestrian activity	any pedestrian activity	any pedestrian activity
16	any pedestrian activity	any pedestrian activity	any pedestrian activity
17	any pedestrian activity	any pedestrian activity	any pedestrian activity
18	any pedestrian activity	strolling, bussines walking	any pedestrian activity
19	any pedestrian activity	strolling, bussines walking	any pedestrian activity
20	any pedestrian activity	strolling, bussines walking	any pedestrian activity
21	any pedestrian activity	any pedestrian activity	any pedestrian activity
22	any pedestrian activity	any pedestrian activity	any pedestrian activity
23	any pedestrian activity	strolling, bussines walking	any pedestrian activity
24	any pedestrian activity	any pedestrian activity	any pedestrian activity
26	any pedestrian activity	any pedestrian activity	any pedestrian activity
27	any pedestrian activity	strolling, bussines walking	any pedestrian activity
28	any pedestrian activity	any pedestrian activity	any pedestrian activity
29	strolling, bussines walking	any pedestrian activity	any pedestrian activity
30	any pedestrian activity	strolling, bussines walking	any pedestrian activity
31	any pedestrian activity	strolling, bussines walking	any pedestrian activity
32	any pedestrian activity	any pedestrian activity	any pedestrian activity
33	any pedestrian activity	strolling, bussines walking	strolling, bussines walking
34	any pedestrian activity	any pedestrian activity	any pedestrian activity
35	any pedestrian activity	any pedestrian activity	any pedestrian activity
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45	any pedestrian activity	any pedestrian activity	any pedestrian activity
46	any pedestrian activity	any pedestrian activity	any pedestrian activity
47	any pedestrian activity	any pedestrian activity	any pedestrian activity
48	any pedestrian activity	any pedestrian activity	any pedestrian activity
49	any pedestrian activity	any pedestrian activity	any pedestrian activity
50	any pedestrian activity	any pedestrian activity	any pedestrian activity

Table 5. Comparison of wind conditions around the existing site with wind conditions around the proposed development with existing and surrounding buildings during the summer

From Table 4 it can be seen that during the winter season, the proposed scheme has a neutral impact on the wind microclimate with conditions at two locations improving and conditions at three locations worsening. With the cumulative schemes the wind conditions improve at seven locations during the winter.



Conclusions

BRE has conducted a wind tunnel study to assess the pedestrian-level wind microclimate around the proposed No.1 Reading, 29-35 Station Road development. Measurements of wind speeds were made around the existing site and the proposed development. These measurements were taken at 50 locations around the existing site and 55 locations around the proposed development and the wind conditions around the site were assessed against the Lawson Criteria.

The following conclusions can be drawn from this study:

- The wind conditions around the proposed development with existing surrounding buildings are similar to the wind conditions around the existing site. During the winter, wind conditions at two locations improve compared to the existing site and conditions worsen at three locations. However, these changes are not significant and wind conditions remain suitable for the intended use. Wind conditions at the remaining locations are similar for the existing site and for the proposed development with existing buildings. During the summer, wind conditions around the proposed development with existing buildings change from being suitable for any activity to suitable for strolling in eight locations, however, wind conditions at these locations are still suitable for their intended use.
- With the proposed development and existing surrounds, there is one location, location 33, where during the winter the wind conditions are suitable for Workers around buildings and Business walking. The intended pedestrian activity at this location is Business walking, therefore the conditions at this location are suitable for the intended pedestrian activity.
- Wind conditions around the proposed development with future surroundings improve compared to those around the proposed development with existing buildings. There are seven locations during the winter and three locations during the summer where wind conditions improve from being suitable for strolling to being suitable for any pedestrian activity.
- Measurements at the known entrances to the proposed development were found to be suitable for entrance usage throughout the year with both the existing surrounds and future surrounds.
- An assessment of road vehicle safety has been carried out for this study. It was found that there are no locations where the wind conditions exceeded the road vehicle safety criterion adopted by BRE.
- An assessment of the distress conditions has been carried out for this study. There were no locations with wind conditions exceeding the distress conditions.

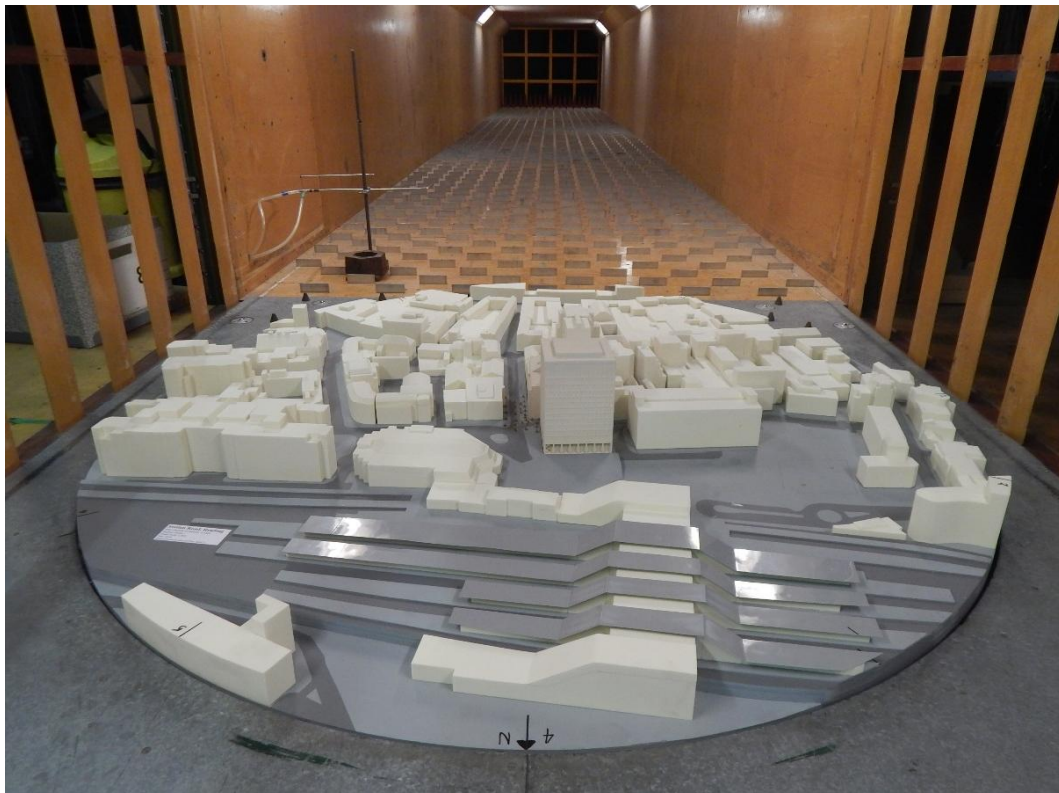
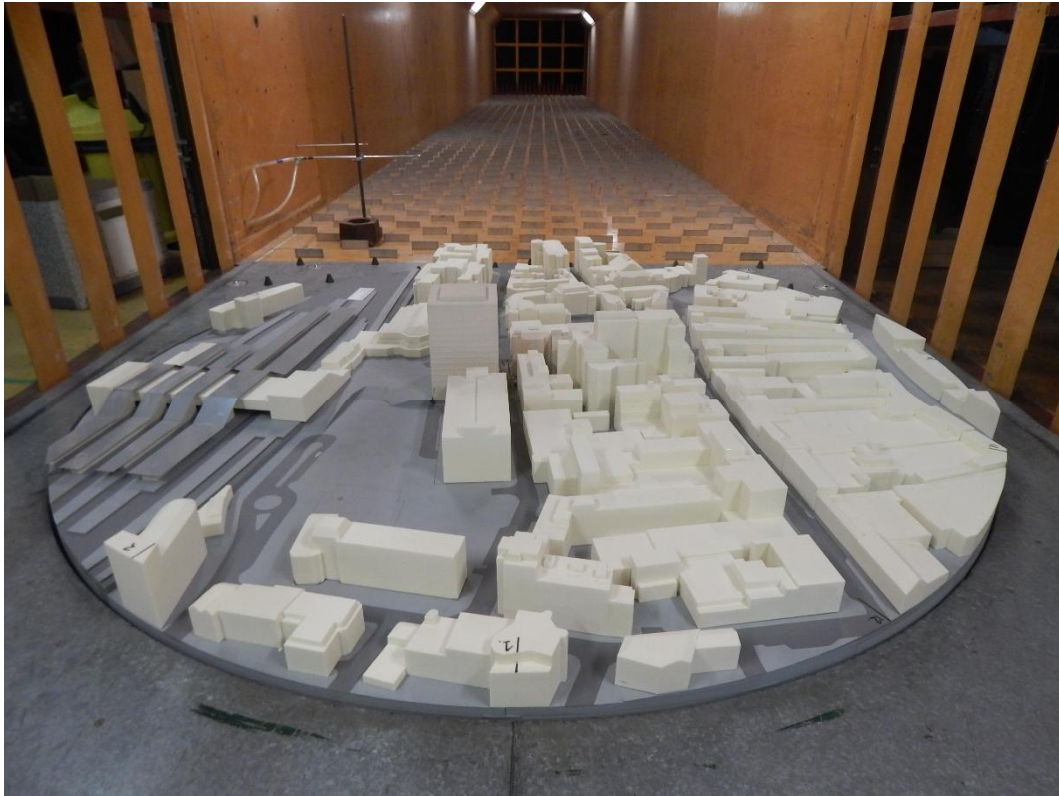
In summary; the impact of the proposed development with existing surrounds is expected to be neutral with respect to the wind microclimate and with the future surrounds the impact is minor beneficial. At all locations the wind conditions are expected to be suitable for the intended pedestrian activities.



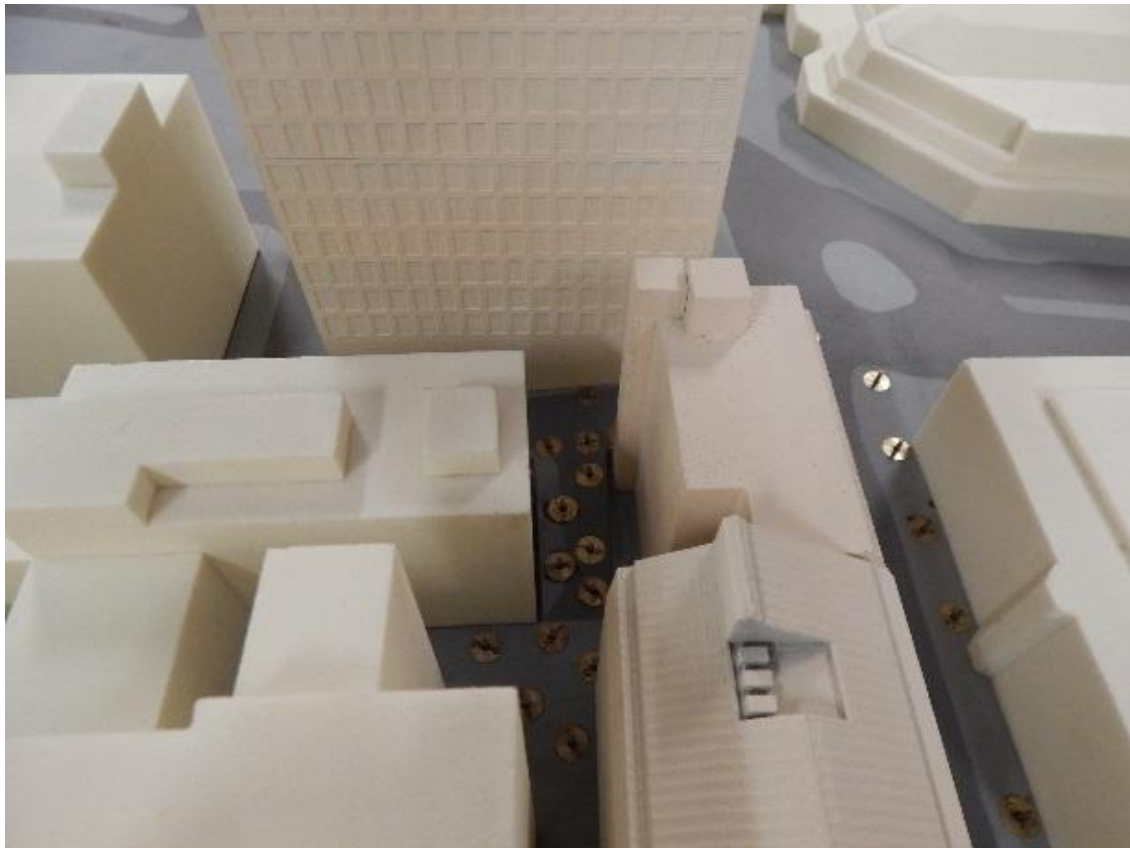
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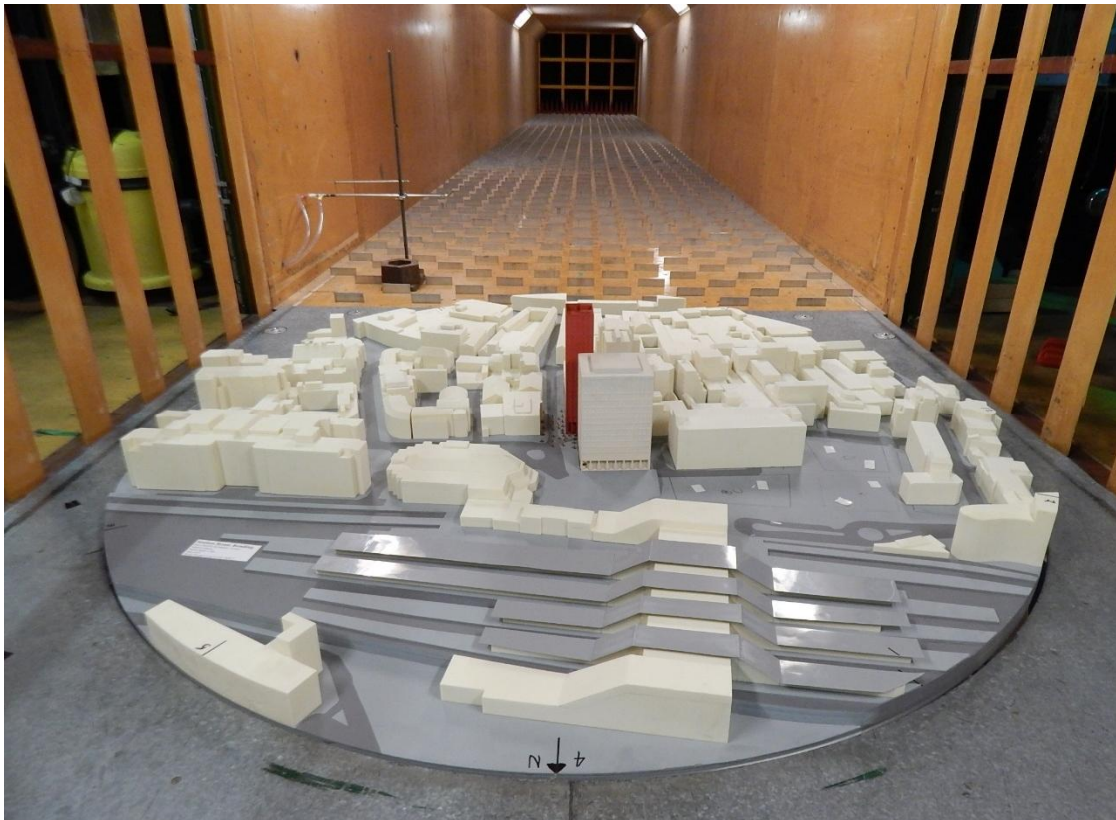
1. BS EN 1991-1-4: Eurocode 1: Actions on structures – Part 1-4: General actions – wind actions, and the UK National Annex, BSI, 2010.
2. T. V. Lawson, Wind effects on buildings, Volume 1: Design Application, Applied Science Publisher LTD, London, UK, 1980.

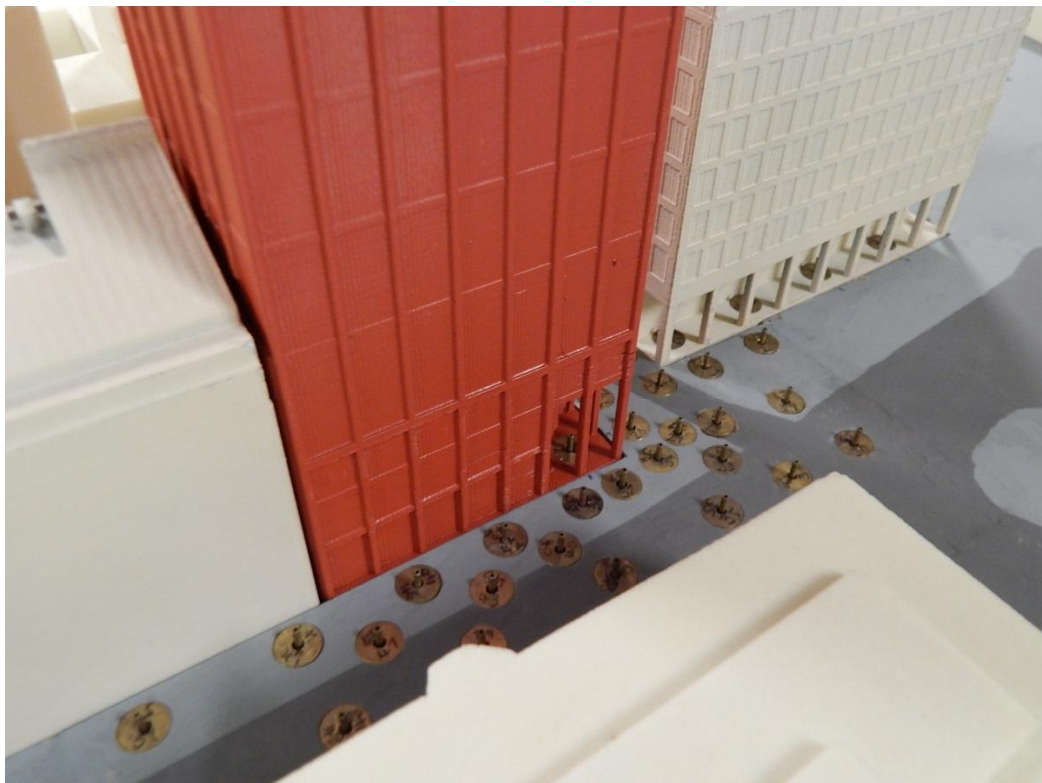
Appendix A Photographs of the Wind Tunnel Model

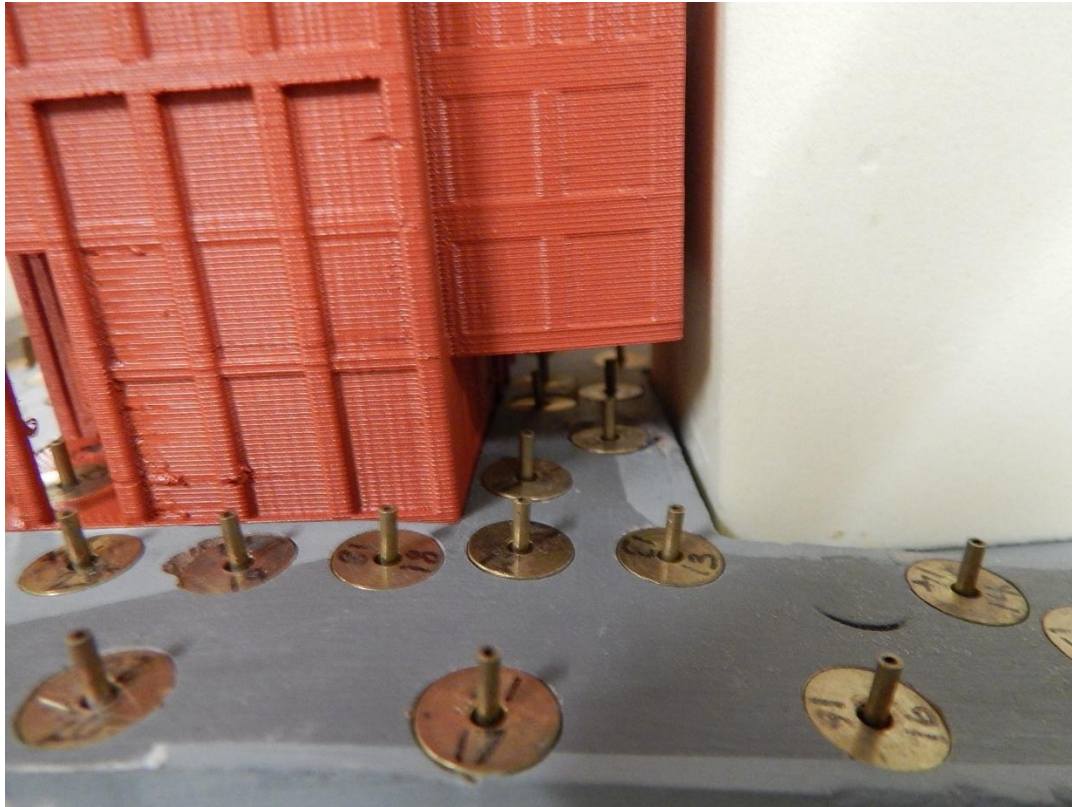


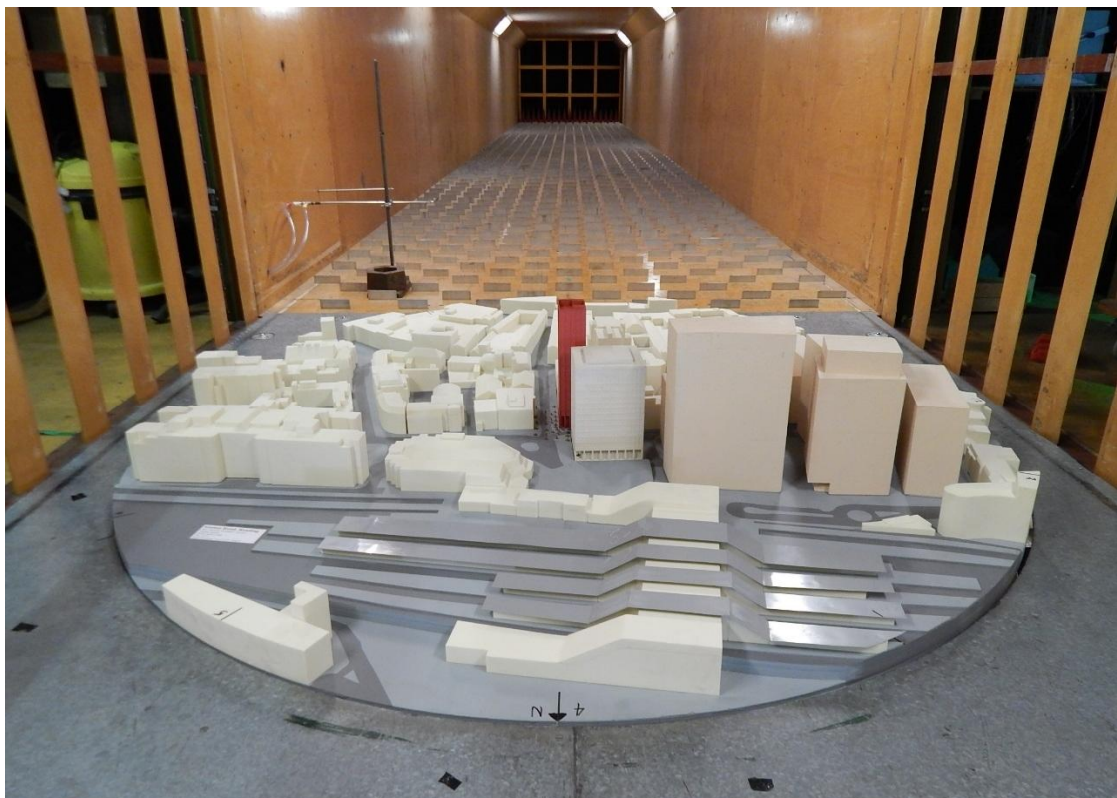


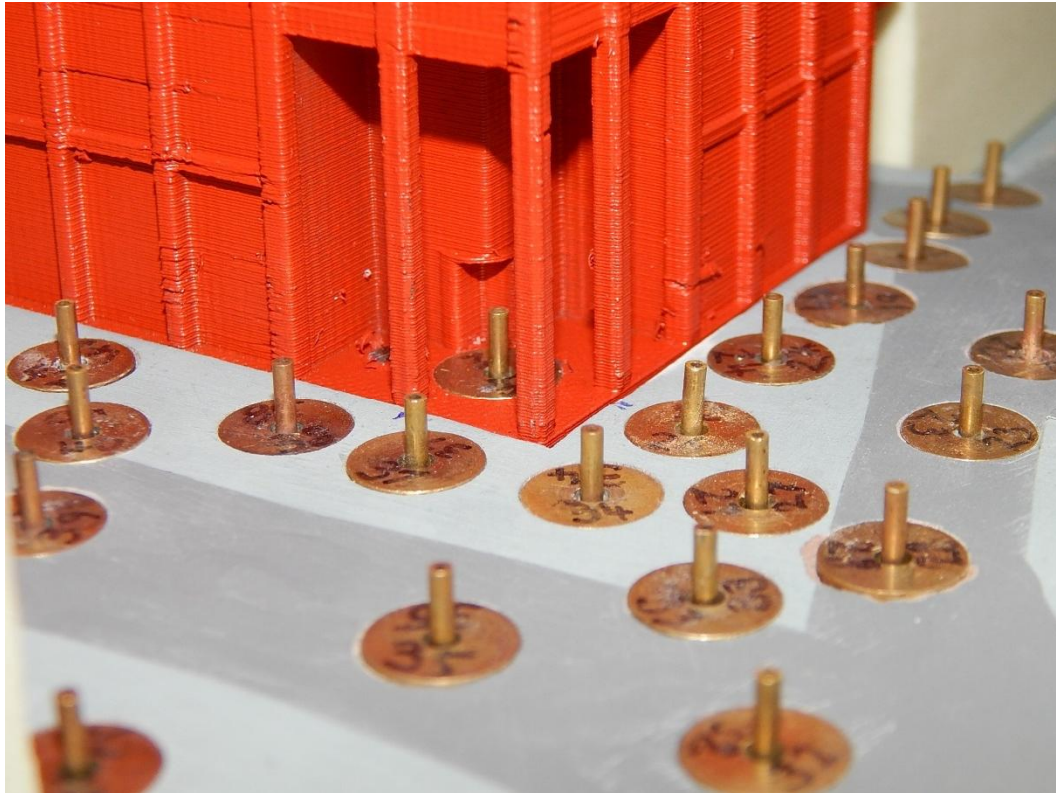




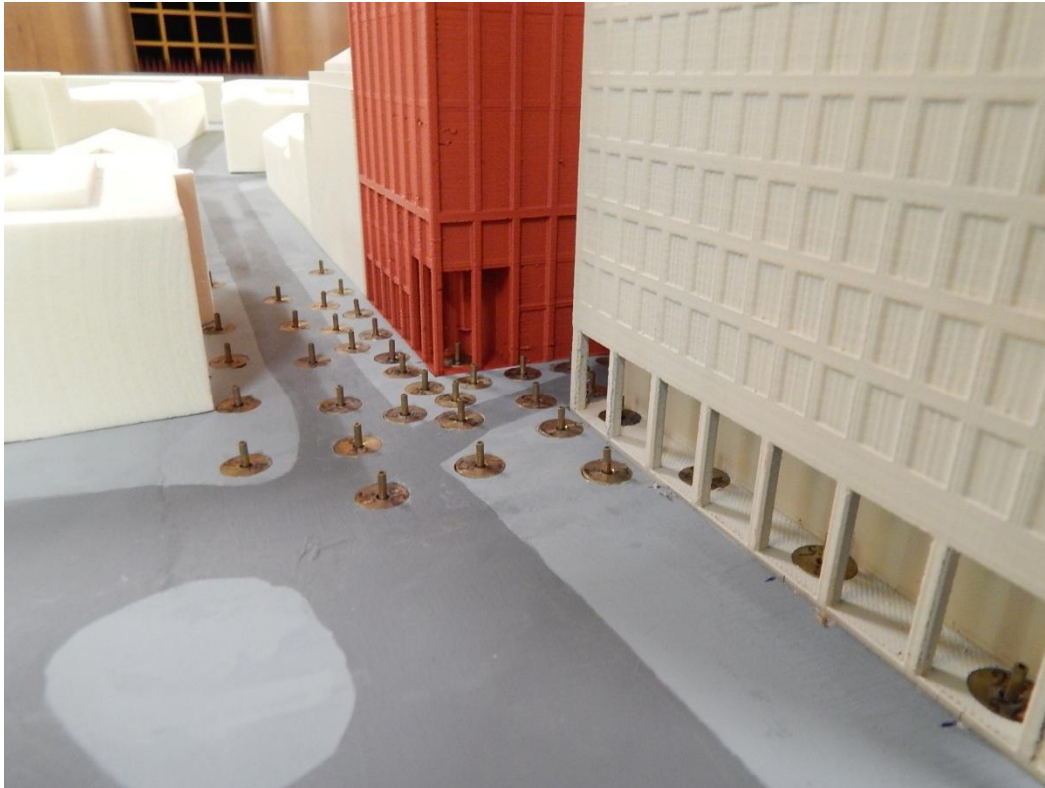






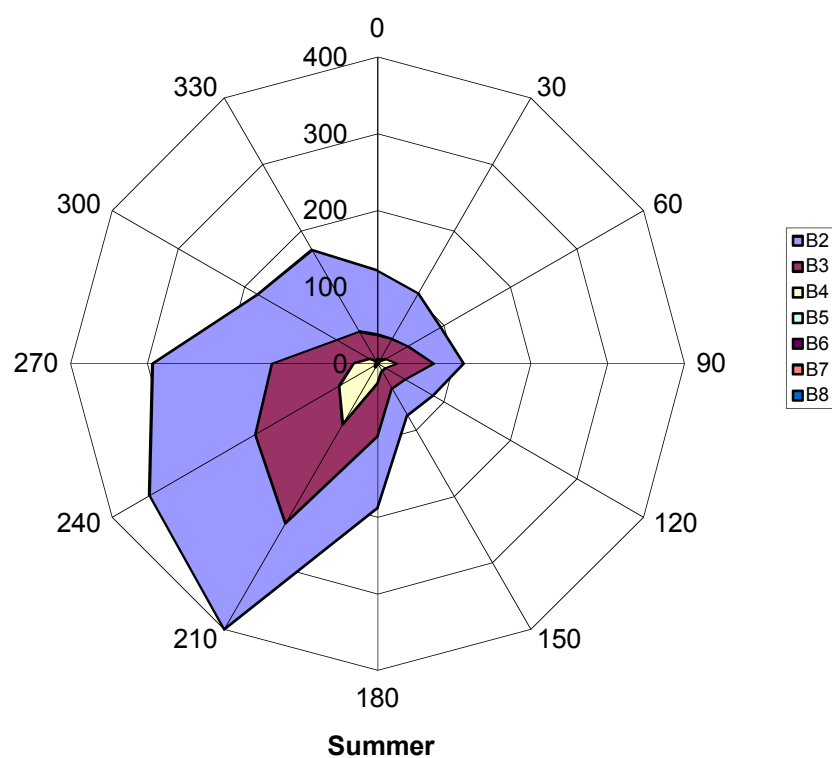
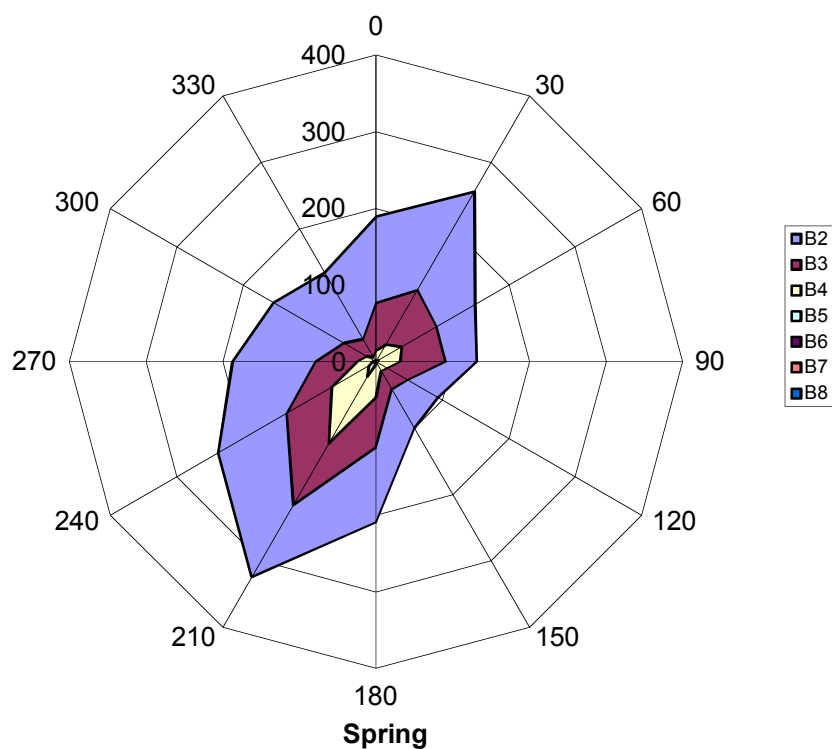


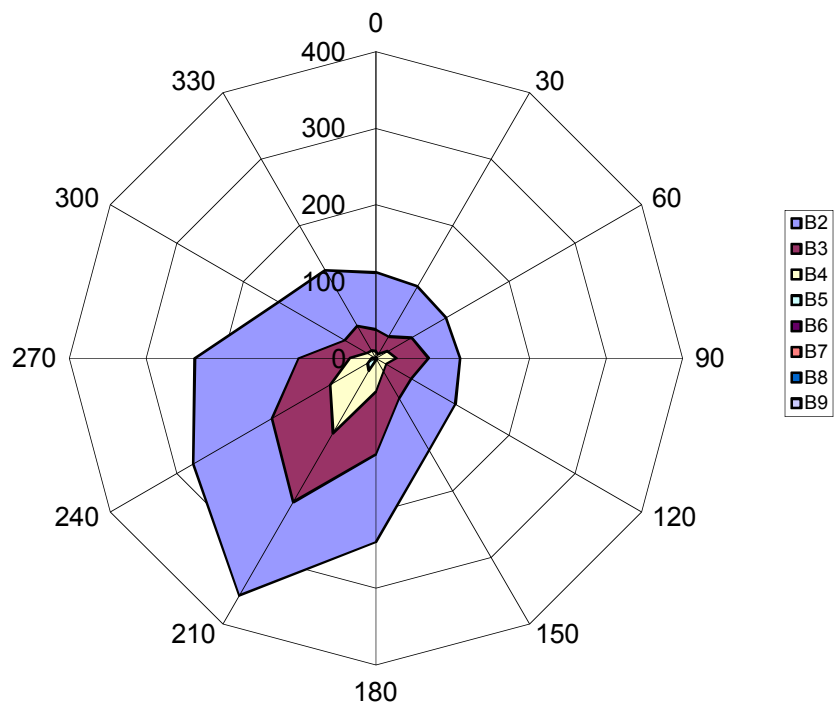
bre



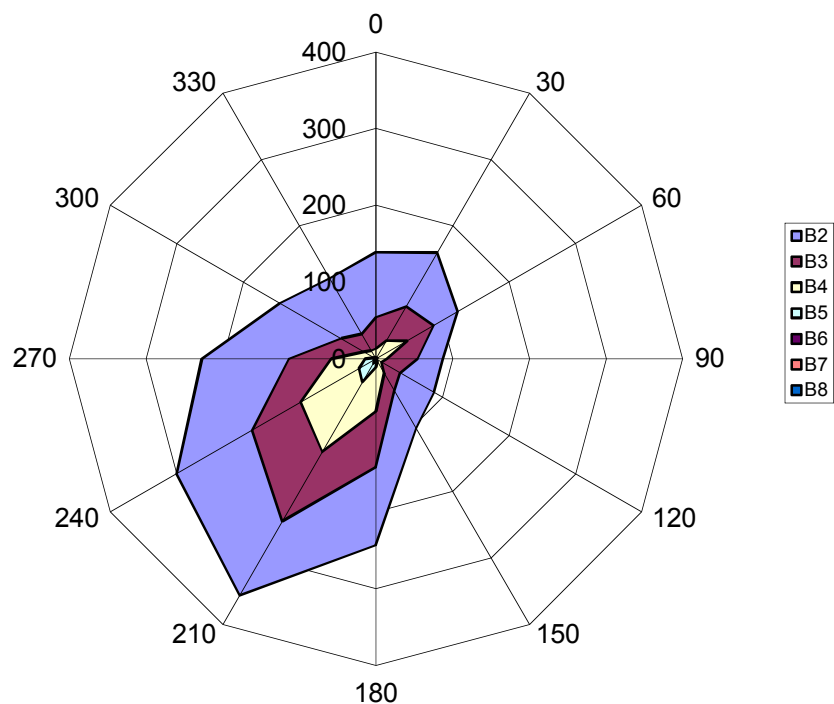


Appendix B Met Data for London Heathrow





Autumn



Winter



Appendix C Output from the BREVe Computer Program

BREVe Output for the London Heathrow Met Site

Design wind speeds in m/s

Provenance

Report generated by BREVe 3.2.1.5, 10/31/2017 12:24:38 PM
 TQ077767 BREVe3 site data for TQ077767
 Design annual risk = 0.02000
 Shelter effect from obstructions is included.
 Site altitude = 25.0m.
 Topographic increment from internal parameters. Range = 500 m
 Season length is all year.
 Using UK / Irish direction factors.
 Basic wind speeds :
 BSVb (1 hour) = 20.0 m/s.
 ENVb,map (10 min.) = 21.5 m/s.
 (EN equiv. 1 hour = 20.3 m/s. Ratio EN/BS = 1.014.)

Site altitude = 25.0m

Probability factor, Sp & $Cprob$ = 1.000

Seasonal factor, Ss & $Cseason$ = 1.000

Direction (°N) :	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°
Dir. fac. Sd & $Cdir$:	0.780	0.730	0.730	0.740	0.730	0.800	0.850	0.930	1.000	0.990	0.910	0.820
Topography :												
Crest height (m) :	6.0	4.5	3.0	6.0	4.5	3.0	6.0	6.5	7.0	13.0	7.5	7.0
Site location (m) :	1300.0	1361.5	1414.3	1350.0	1380.0	1414.3	1300.0	1211.1	1033.3	1066.7	1166.7	1033.3
Upwind length (m) :	200	138	86	150	120	86	200	289	467	433	333	467
Dnwind length (m) :	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000
Base altitude (m) :	24.0	25.5	27.0	24.0	25.5	27.0	24.0	23.5	23.0	17.0	22.5	23.0
Upwind slope :	0.030	0.032	0.035	0.040	0.038	0.035	0.030	0.023	0.015	0.030	0.023	0.015

EN1991-1-4 UK National Annex Method - Effective Gust, Mean, and Turbulence wind speeds

TQ077767	BREVe3 site data for TQ077767											
Direction (°N) :	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°
Direction factor, $Cdir$:	0.780	0.730	0.730	0.740	0.730	0.800	0.850	0.930	1.000	0.990	0.910	0.820
Dist. to sea (km) :	200.0	189.8	182.0	126.0	103.0	89.9	76.0	114.0	200.0	200.0	200.0	200.0
Dist. in town (km) :	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Obst. ht. H_{ave} (m) :	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Obst. space, X_o (m) :	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Displ. ht. H_{dis} (m) :	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Height above ground = 10.0 m												
Direction (°N) :	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°
Eff. height, Z_e (m) :	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Alt. factor C_{alt} :	1.024	1.026	1.027	1.024	1.026	1.027	1.024	1.023	1.023	1.017	1.023	1.023
Orog. factor C_o :	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.005	1.009	1.000	1.005
Exposure fac. C_e :	2.329	2.329	2.329	2.329	2.329	2.335	2.345	2.329	2.329	2.329	2.329	2.329
EN peak gust V (m/s) :	26.2	24.6	24.6	24.9	24.6	27.0	28.7	31.2	33.7	33.2	30.5	27.6
EN C_s zone :	B	B	B	B	B	B	B	B	B	B	B	B
Rough. fac. C_r :	1.004	1.004	1.004	1.004	1.004	1.006	1.008	1.004	1.004	1.004	1.004	1.004
Rough. corr. C_{rT} :	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Mean V (m/s) :	17.2	16.2	16.2	16.4	16.2	17.8	18.9	20.6	22.2	21.9	20.1	18.2
Turb. flat I_v :	0.173	0.173	0.173	0.173	0.173	0.173	0.173	0.173	0.173	0.173	0.173	0.173
Turb. corr kIT :	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Turbulence V (m/s) :	2.99	2.80	2.80	2.83	2.80	3.07	3.26	3.56	3.82	3.76	3.48	3.14



BREVe Output for the No. 1 Reading, 29-35 Station Road Site

Design wind speeds in m/s

Provenance

Report generated by BREVe 3.2.1.5, 22/05/2018 12:51:56

SU714736 BREVe3 site data for SU714736

Design annual risk = 0.02000

Shelter effect from obstructions is included.

Site altitude = 51.0m.

Topographic increment from internal parameters. Range = 500 m

Season length is all year.

Using UK / Irish direction factors.

Basic wind speeds :

BSVb (1 hour) = 19.8 m/s.

ENVb,map (10 min.) = 21.4 m/s.

(EN equiv. 1 hour = 20.2 m/s. Ratio EN/BS = 1.020.)

Site altitude = 51.0m

Probability factor, S_p & C_{prob} = 1.000

Seasonal factor, S_s & C_{season} = 1.000

Direction (°N) :	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°
Dir. fac. S_d & C_{dir} :	0.780	0.730	0.730	0.740	0.730	0.800	0.850	0.930	1.000	0.990	0.910	0.820

Topography :

	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°
Crest height (m) :		12.0	13.0	13.5	12.3	12.0	4.0	12.0	9.0	7.0	10.0	12.0
Site location (m) :		1020.0	980.0	1050.0	1088.9	1200.0	1420.0	1200.0	1223.1	1220.0	1166.7	1100.0
Upwind length (m) :	480	520	450	411	300	80	300	277	280	333	400	240
Dnwind length (m) :	10000	10000	10000	10000	10000	80	10000	10000	10000	10000	10000	10000
Base altitude (m) :	39.0	38.0	37.5	38.7	39.0	47.0	39.0	42.0	44.0	41.0	39.0	39.0
Upwind slope :	0.025	0.025	0.030	0.030	0.040	0.050	0.040	0.032	0.025	0.030	0.030	0.050

EN1991-1-4 UK National Annex Method - Effective Gust, Mean, and Turbulence wind speeds

SU714736

BREVe3 site data for SU714736

Direction (°N) :	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°
Direction factor, C_{dir} :	0.780	0.730	0.730	0.740	0.730	0.800	0.850	0.930	1.000	0.990	0.910	0.820
Dist. to sea (km) :	200.0	200.0	200.0	162.0	121.6	83.8	86.0	122.0	200.0	200.0	200.0	200.0
Dist. in town (km) :	3.5	0.0	0.0	5.5	5.5	4.5	3.5	1.5	2.5	6.5	0.0	0.0
Obst. ht. H_{ave} (m) :	10.0	2.5	2.5	10.0	10.0	10.0	10.0	10.0	10.0	10.0	2.5	2.5
Obst. space, X_o (m) :	20.0	4.0	4.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	4.0	4.0
Displ. ht. H_{dis} (m) :	8.0	2.0	2.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	2.0	2.0

Height above ground = 90.0 m

Direction (°N) :	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°
Eff. height, Z_e (m) :	82.0	88.0	88.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	88.0	88.0
Alt. factor C_{alt} :	1.025	1.024	1.024	1.025	1.025	1.030	1.025	1.027	1.028	1.026	1.025	1.025
Orog. factor C_o :	1.013	1.015	1.014	1.011	1.000	1.000	1.000	1.000	1.000	1.005	1.011	1.052
Exposure fac. C_e :	3.694	3.736	3.736	3.694	3.694	3.711	3.708	3.694	3.694	3.694	3.736	3.736
EN peak gust V (m/s) :	33.2	31.3	31.3	31.4	30.8	34.0	35.9	39.3	42.3	41.9	38.9	36.1
EN C_s zone :	B	B	B	B	B	B	B	B	B	B	B	B
Rough. fac. C_r :	1.394	1.409	1.409	1.394	1.394	1.397	1.397	1.394	1.394	1.394	1.409	1.409
Rough. corr. C_{rT} :	0.906	1.000	1.000	0.894	0.894	0.899	0.906	0.932	0.916	0.890	1.000	1.000
Mean V (m/s) :	21.9	22.9	22.9	20.5	20.0	22.2	23.6	26.6	28.1	27.1	28.4	26.7
Turb. flat I_v :	0.126	0.124	0.124	0.126	0.126	0.126	0.126	0.126	0.126	0.126	0.124	0.124
Turb. corr kIT :	1.378	1.000	1.000	1.431	1.431	1.408	1.378	1.267	1.335	1.450	1.000	1.000
Turbulence V (m/s) :	3.76	2.80	2.80	3.66	3.61	3.94	4.10	4.25	4.74	4.94	3.49	3.14



Appendix D Acceptability Table for the Existing Site (Baseline Conditions)

The wind conditions presented in the following table are within appropriate threshold shown in Table 3

Location	Pedestrian Activity	Season				
		Year	Spring	Summer	Autumn	Winter
1	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
2	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
3	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
4	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
5	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
6	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
7	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
8	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
9	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
10	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
11	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
12	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
13	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
14	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
15	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
16	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
17	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
18	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
19	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
20	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
21	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
22	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
23	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
24	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
26	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
27	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
28	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
29	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
30	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
31	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
32	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
33	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
34	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
35	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
36	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
37	Entrances	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
38	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
39	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
40	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
41	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
42	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
43	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
44	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
45	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
46	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
47	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
48	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
49	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
50	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
51	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable



Appendix E Acceptability Tables for the Proposed Development with Existing Surrounds

The wind conditions presented in the following table are within appropriate threshold shown in Table 3

Location	Pedestrian Activity	Season				
		Year	Spring	Summer	Autumn	Winter
1	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
2	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
3	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
4	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
5	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
6	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
7	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
8	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
9	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
10	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
11	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
12	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
13	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
14	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
15	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
16	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
17	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
18	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
19	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
20	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
21	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
22	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
23	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
24	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
26	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
27	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
28	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
29	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
30	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
31	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
32	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
33	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
34	Entrances	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
35	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
36	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
37	Entrances	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
38	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
39	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
40	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
41	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
42	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
43	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
44	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
45	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
46	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
47	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
48	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
49	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
50	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
51	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
52	Entrances	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
53	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
54	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
55	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
56	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable



Appendix F Acceptability Tables for the Proposed Development with Future Surrounds

The wind conditions presented in the following table are within appropriate threshold shown in Table 3

Location	Pedestrian Activity	Season				
		Year	Spring	Summer	Autumn	Winter
1	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
2	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
3	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
4	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
5	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
6	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
7	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
8	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
9	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
10	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
11	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
12	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
13	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
14	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
15	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
16	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
17	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
18	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
19	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
20	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
21	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
22	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
23	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
24	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
26	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
27	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
28	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
29	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
30	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
31	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
32	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
33	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
34	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
35	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
36	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
37	Entrances	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
38	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
39	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
40	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
41	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
42	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
43	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
44	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
45	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
46	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
47	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
48	Walking	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
49	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
50	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
51	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
52	Entrances	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
53	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
54	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
55	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
56	Strolling	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable