CAPITA SYMONDS

Landmark, Oxford Street, Manchester Wind Environment

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Executive Summary

An experience-based desk study has been carried out to assess the potential impact of the proposed Landmark development on pedestrian level wind conditions in and around the site. The assessment considers the proposed development massing and exposure in conjunction with long term wind climate statistics applicable to the site and provides an expert review of the likely suitability of wind conditions based on the industry standard Lawson criteria for pedestrian comfort and safety.

The assessment of baseline wind conditions has considered the completed development at One St Peter's Square, currently under construction adjacent to the site.

The proposed development is exposed at upper levels to winds from most directions. There is therefore potential for downdraughts, for prevailing southerly winds, to impact on St James Street and around the east corner of the development. However, southerly and south-south-easterly winds are generally light to moderate and these downdraughts are not expected to be significant for the slightly stronger winds from the south-south-west. Downdraughts for the strongest, but less frequent, west-south-westerly winds are expected to be limited by the slenderness of the development's west-south-west facade.

As a result, the proposed development is not expected to have any significant impact on wind conditions with regards to pedestrian safety, with conditions expected to remain rated as safe for all users.

In terms of pedestrian comfort, with respect to wind force, thoroughfares within the site are expected to be suitable for pedestrian access to, and passage past, the proposed development, and entrances to the proposed development are expected to be suitable for pedestrian ingress/egress.

The proposed development is not expected to materially impact on the suitability of wind conditions for pedestrian activities in the surrounding area. Conditions are expected to remain suitable for at least leisurely strolling on surrounding thoroughfares, for pedestrian ingress/egress at entrances, for window shopping at retail frontages and for awaiting buses at the Oxford Street bus stop. As a result of downdraughts from the its own southwest facade, One St Peters Square's undercut south corner is expected to be susceptible to accelerated winds such that it is considered unlikely to enjoy suitable conditions for prolonged periods of outdoor sitting across the extent of the potential cafe seating area, and is expected to require purposely developed landscaping measures, such as trees and planters or screening, to maximise the potential for outdoor seating for both baseline and proposed site conditions.

No significant cumulative effects with consented future developments within the surrounding area are expected.

1. Introduction

1.1.1 Capita Symonds Ltd. has been commissioned by Deloitte LLP, on behalf of Hines UK Ltd and Manchester & Metropolitan Properties, to assess the potential impact of the proposed Landmark development, on Oxford Street in Manchester, on the pedestrian level wind environment in and around the site.

1.1.2 The assessment comprises an experience-based desk study and is based on details of the proposed development issued by the architects, Squire and Partners, in June 2013.

1.1.3 The proposed development comprises a 14-storey, trapezoidal, office development and is illustrated in Figures 1.1, below.

1.1.4 The figures also show the neighbouring development at One St Peter's Square. This development is currently under construction, and the completed building therefore forms part of the baseline for the purpose of this study.

Figure 1.1a: Proposed Development in Context, Southwest Elevation

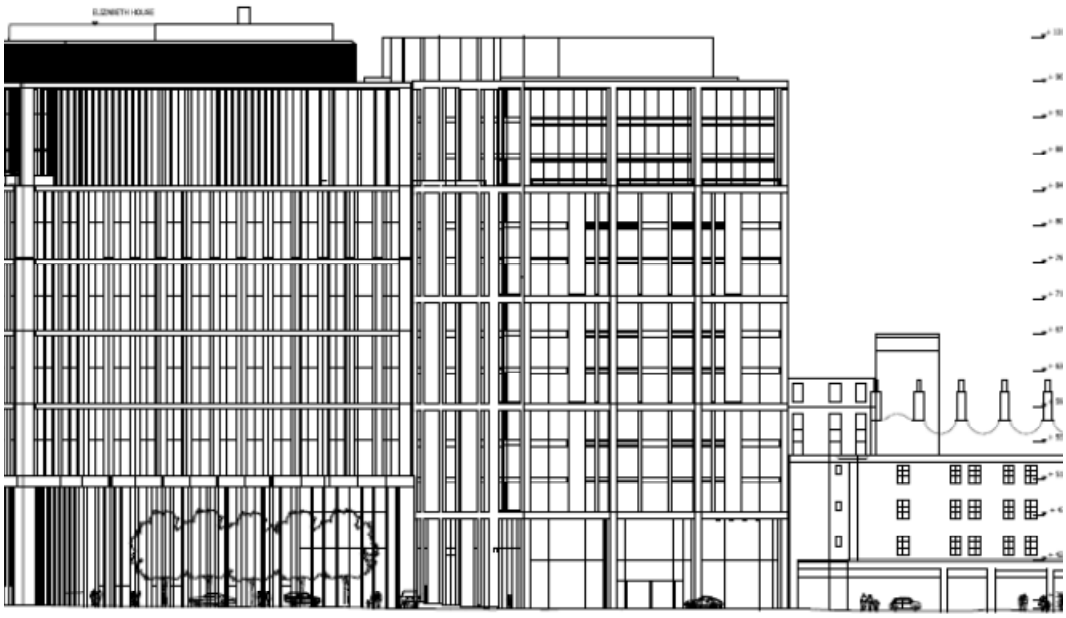


Figure 1.1b: Proposed Development in Context, Southeast Elevation

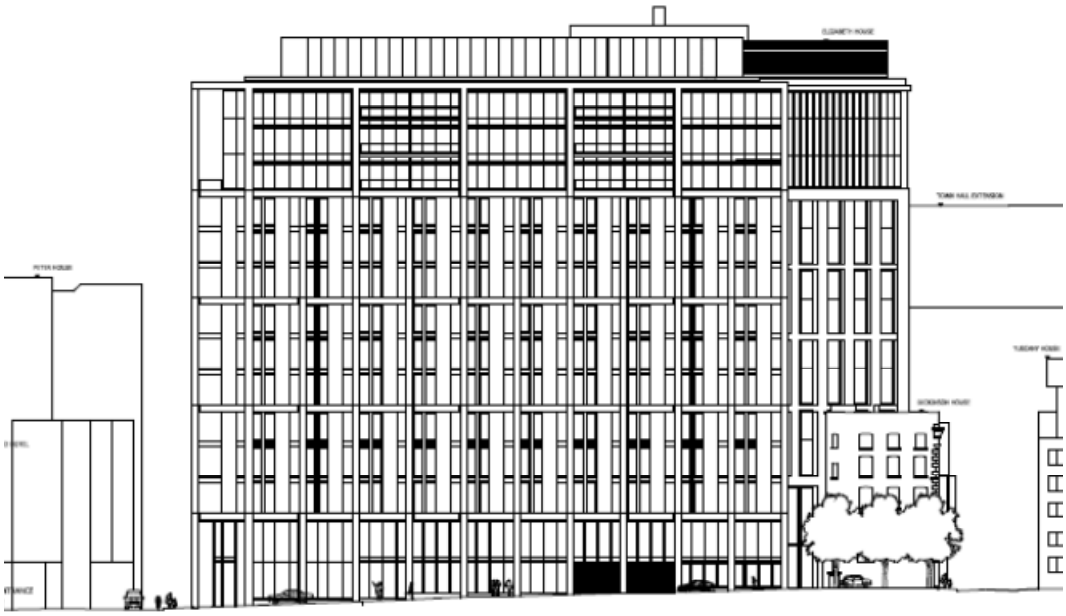
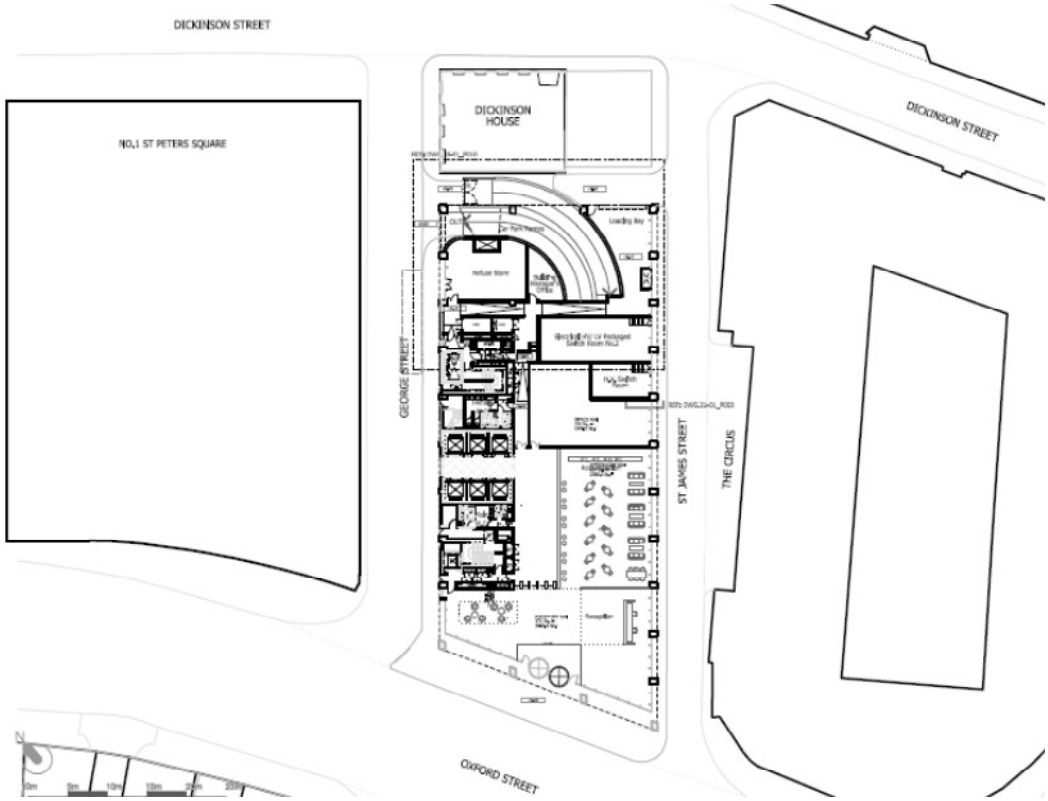


Figure 1.1c: Proposed Siteplan



2. Methodology and Criteria

2.1.1 There are no national codes of practice or legislative policies relating to the assessment of environmental wind flows in the built environment. The assessment of environmental wind flows also lies outside the scope of BS EN 1991-1-4:2005, the current European Standard for wind actions on structures, which focuses on wind loading issues. The impact of environmental wind on pedestrian spaces and the subsequent suitability of these spaces for planned usage are described by and compared against the industry standard Lawson criteria, which are recognised by Local Authorities as a suitable benchmark for wind assessments.

2.1.2 The Guide to Development in Manchester, Supplementary Planning Document and Planning Guidance (Adopted April 2007), includes:

Section 2. Design, Paragraph 2.40 (Hard landscaped areas within the public realm should be attractive):

> *"Where the public realm includes hard landscaped areas, its design should reflect the level and nature of their use, and should consider issues such as overshadowing, prevailing winds..."*

Section 12. The City Centre, Paragraph 12.8 (Development Quality):

> *"...Key questions will be ... the microclimate, including overshadowing and air turbulence effects, created by the relationship of the building to those adjacent; and the quality and usability of the spaces surrounding the building."*

2.1.3 In response to the above guidance, an experience-based desk study has been carried out to provide a qualitative assessment of the likely effects of the proposed development on the pedestrian level wind environment. The study considers the proposed development massing and exposure in conjunction with long term wind climate statistics applicable to the site, and draws on the author's extensive experience in the assessment of wind flows, gained from wind tunnel testing of similarly massed schemes within similar urban settings. These detailed studies were based on the aforementioned Lawson criteria for pedestrian comfort and safety.

2.1.4 Long-term wind frequency statistics from Manchester Airport, approximately 16 km to the south-south-east of the site, were sourced from the National Oceanic and Atmospheric Administration, for the period 2001 to 2010. Historical data is used as standard practice due, in part, to lack of certainty in potential future changes in wind patterns, though any changes are expected to be minor.

2.1.5 The data from Manchester Airport was corrected to the site, accounting for differences in upwind terrain, on each wind sector, between the site and weather centre based on the widely accepted Deaves and Harris log law wind model of the atmospheric boundary layer. Differences in altitude were also corrected for, based on BS EN 1991-1-4:2005.

2.1.6 Details of the Lawson criteria for pedestrian comfort are presented in Table 2.1 and are based on the exceedance of threshold wind speeds, considering mean-hourly and gust-equivalent-mean values, occurring less than 5% of the time. The thresholds represent upper bounds of acceptability for a range of common activities. The value of 5% has been established as giving a reasonable allowance for extreme and relatively infrequent winds that are acceptable within each category.

Table 2.1 Lawson Criteria for Pedestrian Comfort

Threshold Mean-hourly Wind Speed Exceeded < 5% of the Time	**Comfort Rating / Activity**		**Qualifying Comments**
0 - 4m/s	C4	Long term Sitting	Reading a newspaper and eating and drinking
4 - 6m/s	C3	Standing or short term Sitting	Appropriate for bus stops, window shopping and building entrances
6 - 8m/s	C2	Walking and Strolling	General areas of walking and sightseeing
8 - 10m/s	C1	Business walking	Local areas around tall buildings where people are not likely to linger

2.1.7 Details of the Lawson criteria for pedestrian safety, or distress, are presented in Table 2.2 and are based on the exceedance of the threshold wind speeds, considering mean-hourly and gust-equivalent-mean values, occurring once per annum. These thresholds represent wind speeds with the potential to destabilise the less able or more susceptible members of the public (including elderly, cyclists and children) and able-bodied users.

Table 2.2 Lawson Criteria for Pedestrian Safety or Distress

Threshold mean-hourly wind speed exceeded once a year	**Safety rating**		**Qualifying comments**
> 15 m/s	S2	Unsuitable for general public.	Less able and cyclists find conditions physically difficult.
> 20 m/s	S1	Unsuitable for able-bodied.	Able-bodied persons find conditions difficult. Physically impossible to remain standing during gusts.

2.1.8 The pedestrian level wind environment assessment is summarised in terms of suitability for various activities, based on expected seasonal comfort and safety ratings in accordance with the above criteria. The assessment takes full account of seasonal variations in wind conditions and pedestrian activities. Thus conditions for recreational activities focus on summer, but also consider spring and autumn. Recreational activities do not consider winter comfort ratings as it is anticipated that users would not demand suitable conditions 95% of the time in winter, but would instead be satisfied to use the amenity spaces on occasions when conditions, including precipitation and temperature, permit. Conditions for pedestrian thoroughfare, access or waiting (for example at bus stops) consider all seasons, with winter being predominantly the critical season due to generally higher wind speeds in the winter months.

2.1.9 The activities considered, and their relation to the comfort criteria detailed above, are shown in Table 2.3. The table is ordered in terms of decreasing sensitivity to wind speeds. Conditions considered suitable for the more sensitive activities would also be suitable for the subsequent, less sensitive, uses.

Table 2.3 Suitability Assessment

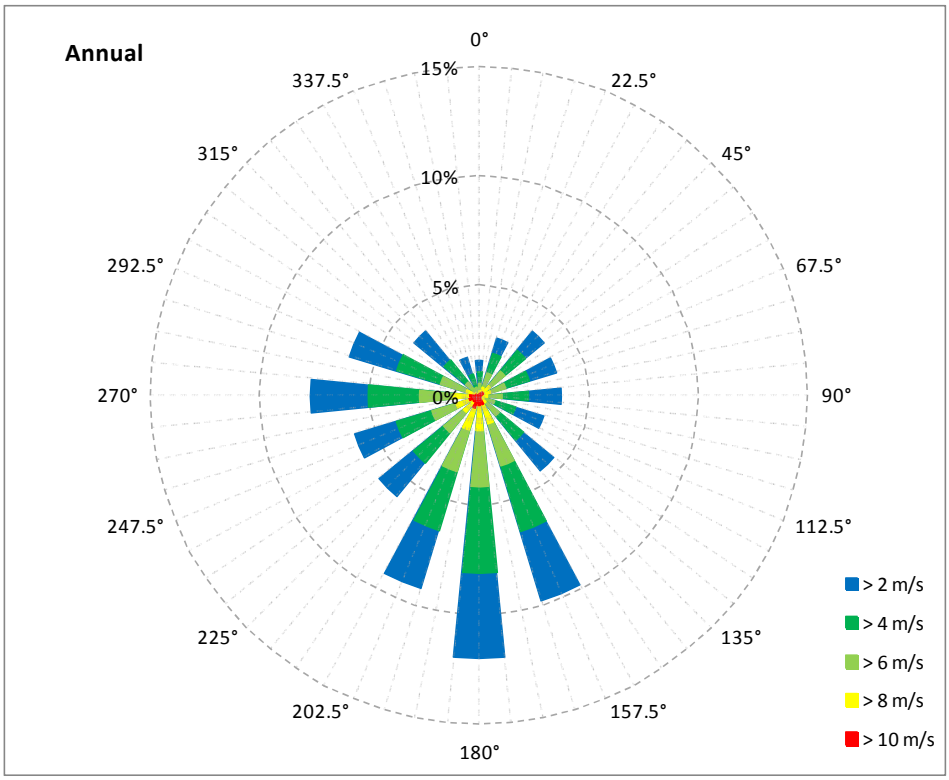
Suitability		**Target Lawson comfort and safety criteria for specified seasons**
Outdoor seating	For long periods of sitting, such as for an outdoor café or picnic area.	'Long term sitting' (C4) in at least summer.
Entrances, waiting areas	For pedestrian ingress/egress at entrances, or short periods of sitting or standing such as at a bus stop, taxi rank, meeting point, window shopping, etc.	'Standing or short term sitting' (C3) in all seasons.
General leisure (excluding seating areas)	For leisure uses excluding long periods of outdoor sitting, such as active leisure, general park spaces, children's play area, etc.	'Standing or short term sitting' (C3) from spring to autumn.
Thoroughfare	For pedestrian access to, and passage through, the Site and surrounding area.	'Business walking' / 'Walking or strolling' (C1/C2) in all seasons..
Unsuitable	Unsuitable for all activities.	Exceeds comfort criterion for 'Business walking' (C1) or safety criteria (S1/S2).

3. Assessment

3.1 BASELINE CONDITIONS

3.1.1 The wind climate expected at the site is summarised in Figure 3.1 in terms of the annual wind speed and direction probability distributions at a reference height of 64m, corresponding to the approximate roof height of the proposed development relative to local ground level. Seasonal wind speed and direction probability distributions are presented in Appendix A.

Figure 3.1: Wind Climate at Site (at reference height of 64m)



3.1.2 Based on the climate statistics from Manchester Airport, winds from the southerly quadrant are prevalent. Light to moderate winds from the south and south-south-east are most common, whilst stronger winds more frequently blow from the south-south-west. Winds from the west-south-west also occur frequently, and extreme wind speeds (relevant to pedestrian safety) are most likely to blow from this direction. Northerly winds are generally light and rare, though cold north-easterly winds are common during spring. Wind speeds are generally higher during winter and lower during summer.

3.1.3 Applying these wind statistics at the site, an area free from localised building effects (either sheltering or acceleration) would be expected to experience wind conditions generally rated as comfortable for standing or short term sitting, and marginally suitable for long term sitting in summer, in accordance with the Lawson criteria.

3.1.4 The existing site comprises a disused low-level building, formerly a cinema, and is substantially sheltered from winds approaching from all directions by surrounding buildings.

3.1.5 Adjacent to the site, the completed One St Peters Square is expected to protrude above the surrounding buildings, exposing the upper levels to high-level winds from all directions. In particular there is potential for prevailing southerly and stronger west-south-westerly winds to be deflected down to pedestrian level, subsequently channelling along the building facades and accelerating around the east and south corners, respectively.

3.1.6 Despite these potential wind effects, pedestrian level wind conditions in and around the site are expected to rate as safe for all users. In terms of pedestrian comfort, with respect to wind force, thoroughfares are expected to be suitable for at least leisurely strolling.

3.1.7 Main entrances to surrounding buildings are expected to generally enjoy suitable conditions for pedestrian ingress/egress. Surrounding retail frontages are also expected to enjoy suitable conditions for short periods of standing, such as for window shopping. George Street is potentially susceptible to channelling of prevailing southerly winds along the southeast side of One St Peters Square. However service entrances to One St Peters Square are expected to be recessed and should be suitable for associated uses.

3.1.8 The sheltered bus stop on Oxford Street, to the southwest of the site, is expected to be suitable for short periods of sitting or standing, such as for awaiting a bus.

3.1.9 It is understood that One St Peters Square may include outdoor seating within the undercut south corner area. The northern part of this area is expected to enjoy suitable conditions for prolonged periods of outdoor sitting, such as for cafe outdoor seating, during at least summer. However the southern part is potentially susceptible to the accelerated winds discussed above and is considered unlikely to be suitable for cafe outdoor seating without purposely developed landscaping measures such as trees and planters or screening.

3.2 IMPACT OF PROPOSED DEVELOPMENT

3.2.1 DEMOLITION AND CONSTRUCTION

3.2.2 Compared to an empty site, the low-level existing building on the site is expected to exacerbate downdraughts from the southeast facade of the completed One St Peters Square, for prevailing southerly winds, by increasing the pressure gradient down the windward facade. Demolition of the existing building, whilst temporarily increasing the exposure of One St Peters Square to southerly winds, is not therefore expected to generally increase wind speeds along George Street, relative to baseline conditions. Dickinson House may also be exposed to stronger west-south-westerly winds for a short period. However the modest massing of this building is expected to limit the potential for resulting accelerated pedestrian level winds.

3.2.3 During construction, the development will increase in height, potentially enhancing the exacerbation of downdraughts from One St Peters Square, discussed above, until it reaches a height where the southerly winds are encouraged to pass up and over the neighbouring building. This effect is less significant for a porous, unclad, upwind building under construction and is expected to occur for only a short period of time. In addition, pedestrian perception of conditions adjacent to the site is also likely to be affected by expectations of conditions around a building site, with pedestrians more likely to tolerate adverse conditions as they can appreciate it as a temporary situation.

3.2.4 Overall, wind effects during construction are not expected to be significant.

3.2.5 OPERATION

3.2.6 The completed proposed development represents a substantial structure with respect to wind. The development is sheltered from north-westerly winds by One St Peters Square, but is exposed at upper levels to winds from remaining directions.

3.2.7 In particular, there is potential for downdraughts, for prevailing southerly winds, to reach pedestrian level, channel along St James Street and subsequently accelerate around the east corner of the development. However, southerly and south-south-easterly winds are generally light to moderate and, due to the orientation of the development, downdraughts from the southeast facade are not expected to be significant for the slightly stronger winds from the south-south-west.

3.2.8 There is also potential for the stronger, but less frequent, west-south-westerly winds to be deflected down to pedestrian level by the development's west-south-west facade. This effect, and the subsequent acceleration of winds around the west and south corners, is expected to be limited by the slenderness of the facade. There is potential for channelling of west-south-westerly winds, in particular, along George Street, between the proposed development and One St Peters Square. There is also potential for channelling of the more frequent south-south-westerly winds along the west-south-west facade and around the west corner of the proposed development. However, the proposed development is not expected to significantly affect the accelerated winds around the south corner of One St Peters Square expected for baseline conditions.

3.2.9 The proposed development is expected to significantly shelter One St Peters Square from southerly winds, alleviating the potential for downdraughts from the neighbouring building's southeast facade.

3.2.10 The resulting pedestrian level wind environment in and around the site is presented in terms of suitability for pedestrian activities in Figure 3.2.

Pedestrian Safety

3.2.11 As discussed above, the development is well orientated with respect to the most frequent strong winds from the west-south-west. The larger southeast elevation is susceptible to downdraughts for winds from the south and south-south-east, but these are generally light-to-moderate and unlikely to affect pedestrian safety in accordance with the Lawson criteria.

3.2.12 In addition, the potential funnelling of west-south-westerly winds between the proposed development and One St Peters Square is not expected to significantly exacerbate the accelerated winds around the south corner of One St Peters Square, expected for baseline conditions.

3.2.13 As a result, pedestrian level wind conditions in and around the site are expected to remain rated as safe for all users. The proposed development is thus considered to have no significant impact with respect to pedestrian safety.

Pedestrian Comfort

3.2.14 In terms of pedestrian comfort, with respect to wind force, thoroughfares within the site are expected to be suitable for at least leisurely strolling. Conditions are therefore considered suitable for pedestrian access to, and passage past, the proposed development.

3.2.15 The main entrance to the proposed development is expected to enjoy suitable conditions for pedestrian ingress/egress. Service entrances along George Street and St James Street are generally recessed and should be suitable for associated uses.

3.2.16 Within the surrounding area, thoroughfares are expected to remain suitable for at least leisurely strolling. The Oxford Street bus stop, to the southwest of the site, is also expected to remain suitable for short periods of sitting or standing awaiting a bus.

3.2.17 Main entrances to surrounding buildings are expected to remain suitable for pedestrian ingress/egress, and retail frontages are expected to remain suitable for window shopping and pedestrian ingress/egress at associated entrances. The service entrances along George Street and St James Street are also expected to remain suitable for associated uses.

3.2.18 Conditions within the potential outdoor seating area within the undercut south corner of One St Peters Square are not expected to materially change from baseline conditions. The northern part of this area is expected to enjoy suitable conditions for prolonged periods of outdoor sitting, such as for cafe outdoor seating, during at least summer. However the southern part is likely to require purposely developed landscaping measures, such as trees and planters or screening, to alleviate the accelerated winds resulting from downdraughts from its southwest facade, to ensure suitable conditions for cafe outdoor seating.

Figure 3.2: Suitability Assessment



3.3 CUMULATIVE EFFECTS

3.3.1 Within the surrounding area, it is understood that the site of Peterloo House, diagonally opposite the site to the north, has consent for a 12-storey office development. This increase in height relative to the existing building has the potential to further shelter the north corner of the site from northerly winds. However these winds are rare and generally light, and this effect is not therefore considered significant. No accelerated winds emanating from the Peterloo House development are expected to impact on the site. Similarly, the proposed development is not expected to significantly affect wind conditions around the south corner of Peterloo House, in terms of suitability for proposed and existing activities.

3.3.2 Cumulative effects are not therefore expected to be significant.

3.4 MITIGATION MEASURES

3.4.1 No mitigation measures are expected to be required within the development.

3.5 RESIDUAL EFFECTS

3.5.1 As no mitigation measures are expected to be required, the residual effects will be as discussed above for the proposed development.

4. Conclusions

Baseline Conditions

4.1.1 With completion of the neighbouring One St Peters Square development, wind conditions in and around the existing site are expected to be suitable, in terms of pedestrian comfort and safety, for pedestrian thoroughfare, ingress/egress at entrances, window shopping at retail frontages and awaiting buses at the Oxford Street bus stop.

4.1.2 The potential cafe seating area within the undercut south corner of One St Peters Square is considered unlikely to enjoy suitable conditions for prolonged periods of outdoor sitting across the extent of the area, and is expected to require purposely developed landscaping measures to maximise the potential for outdoor seating.

Impact of Proposed Development

4.1.3 The proposed development is not expected to have any significant impact on pedestrian level wind conditions with regards to pedestrian safety, with conditions expected to remain rated as safe for all users.

4.1.4 Thoroughfares within the site are expected to be suitable for pedestrian access to, and passage past, the proposed development.

4.1.5 Entrances to the proposed development are expected to be suitable for pedestrian ingress/egress.

4.1.6 The proposed development is not expected to have any significant impact on the pedestrian level wind conditions within the surrounding area, which are expected to remain as discussed above.

4.1.7 No significant cumulative effects with the proposed Peterloo House development are expected.

Appendix A Wind Climate at Site

Figure A.1: Autumn Wind Speed and Direction Distribution (at ref height of 64m)

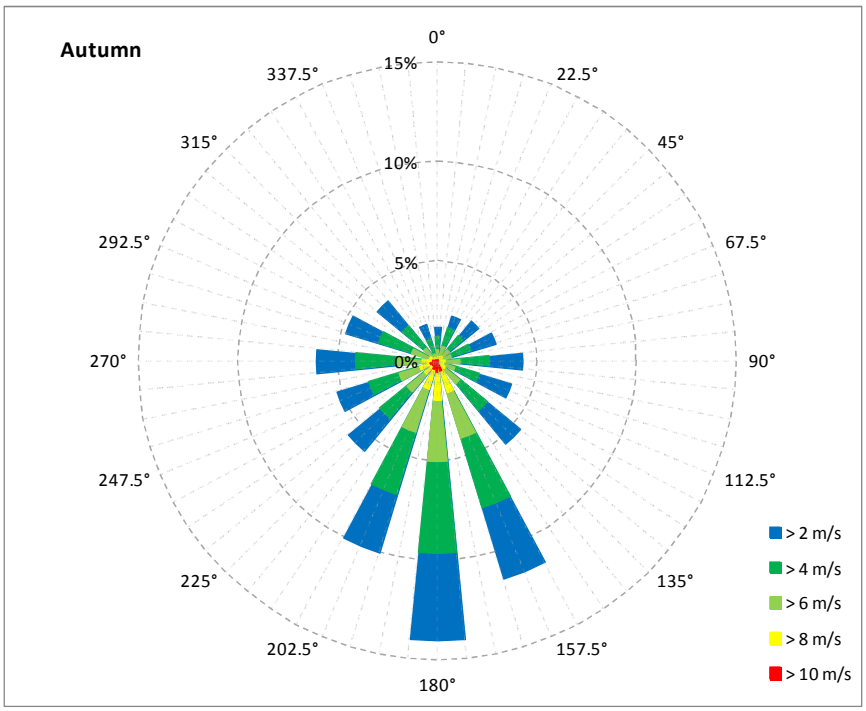


Figure A.2: Winter Wind Speed and Direction Distribution (at ref height of 64m)

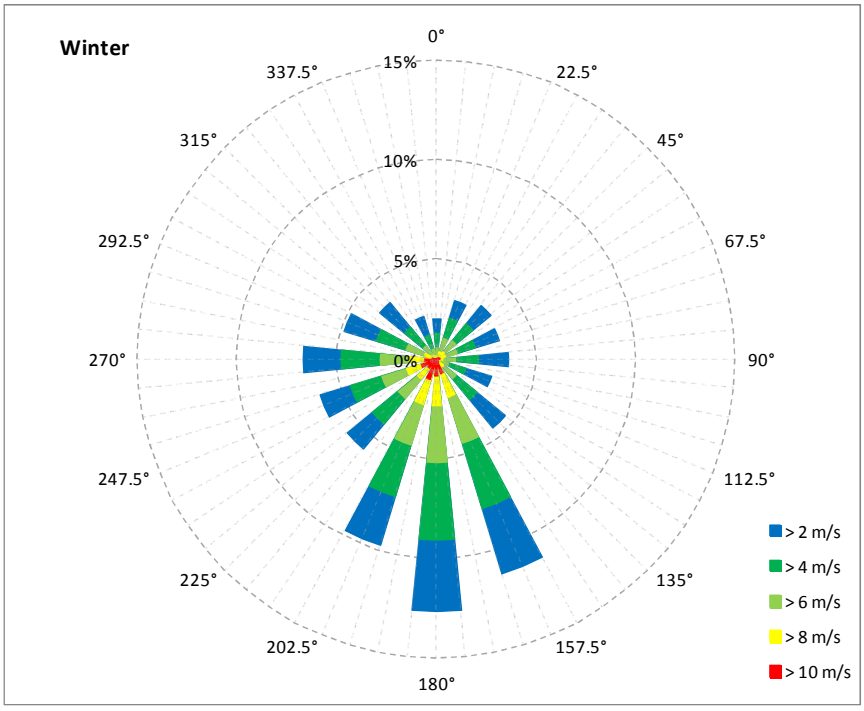


Figure A.3: Spring Wind Speed and Direction Distribution (at ref height of 64m)

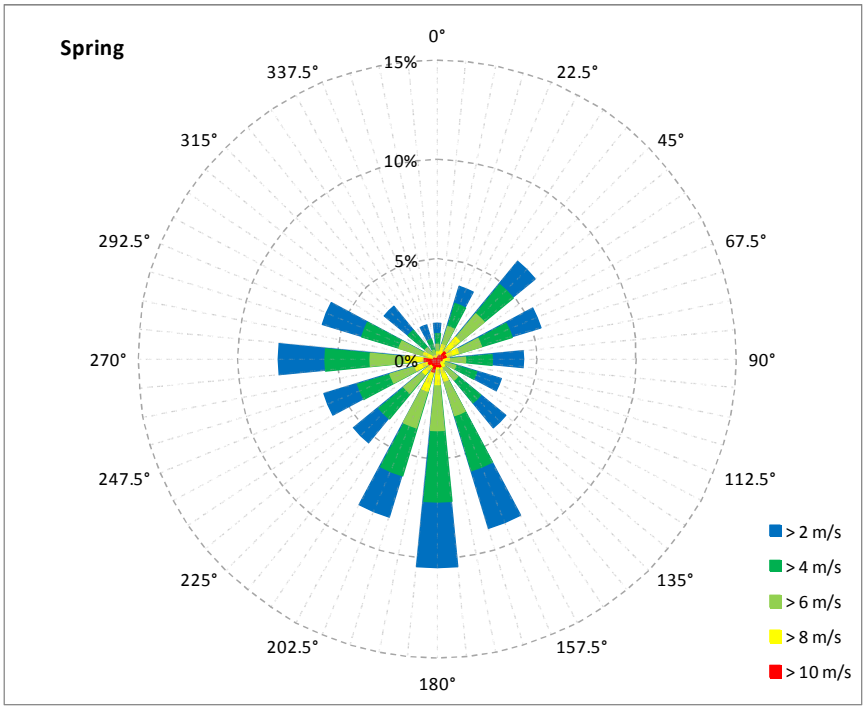


Figure A.4: Summer Wind Speed and Direction Distribution (at ref height of 64m)

