TELOPEA STAGE 1A

Qualitative Wind Assessment

Prepared for:

Frasers Property Australia Pty Ltd
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BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Frasers Property Australia Pty Ltd (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
610.19382-R01-v4.1	21 October 2022	Mark Hobday	Dr Neihad Al-Khalidy	Dr Neihad Al-Khalidy
610.19382-R01-v4.0	9 July 2021	James Cleary	Dr Neihad Al-Khalidy	Dr Neihad Al-Khalidy
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EXECUTIVE SUMMARY

This report has been prepared by SLR Consulting Pty Ltd (SLR) on behalf of Frasers Property Australia Pty Ltd (Frasers) and accompanies a State Significant Development application (SSDA) submitted to the NSW Department of Planning and Environment (DPE). The SSDA seeks Concept approval, in accordance with Division 4.4 of the Environmental Planning and Assessment Act 1979 (EP&A Act), for the staged redevelopment of the Telopea 'Concept Plan Area' (CPA), as well as a detailed proposal for the first stage of development, known as 'Stage 1A'.

The purpose of this report is to provide a Qualitative Environmental Wind Assessment of the Stage 1A of the Telopea CPA. A subsequent report has been provided detailing the design principles associated with the Telopea CPA at large.

The immediate surrounds comprise predominantly residential properties within an established landscape setting. The broader Precinct contains the Telopea Public School, a neighbourhood centre known as the Waratah Shops, and two large Council parks known as Sturt Park and Acacia Park.

Wind Climate

On the basis of long-term wind records obtained from Bureau of Meteorology stations at Bankstown Airport and Sydney Kingsford Smith Airport, SLR has determined the project site has local winds characteristics closer to Bankstown Airport than Sydney (KS) Airport, given Telopea's distance inland from the coast. Accordingly, key prevailing wind directions of interest are the northeast, southeast and south for summer and mainly west quadrant winds for winter.

Existing Wind Environment

Existing street level wind conditions in the vicinity of the site could be close to or greater than 16 m/s "walking comfort" criterion for some prevailing wind directions, resulting from channelling of winds along aligning streets.

Future Wind Environment

SLR has worked with the project team throughout the design process and addressed potential wind concerns, with appropriate design measures incorporated and reflected in architectural drawings and development documentation. In terms of the future wind environment with the proposed development, the following features of the development are noted as being of most significance:

- The winds along the surrounding footpaths should remain at similar levels providing appropriate landscaping is employed, as shown on plans.
- Landscaping is to be retained as planned throughout the site to mitigate potential downwash and channelling impacts throughout the development.
- Vertical windbreaks are proposed to the upper-level communal open space as a result of adverse upper level wind conditions.
- Wind mitigations are recommended to be incorporated to identified balconies from level 4 and above.

EXECUTIVE SUMMARY

The above analysis has been made on the basis of our best engineering judgment and on the experience gained from scale model wind tunnel testing and/or Computational Fluid Dynamics (CFD) analysis of a range of developments. Detailed windflow modelling via either Wind Tunnel Testing or Computational Fluid Dynamics (CFD) Simulation can be used to confirm wind speed levels at specific locations and determine the extent of treatment required.

Taking into account all of the above, it is believed that the proposed development will likely comply with the adopted wind acceptability criteria at pedestrian and public access locations within and around the Development.

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1 Introduction

This report has been prepared by SLR Consulting Pty Ltd (SLR) on behalf of Frasers Property Australia Pty Ltd (Frasers) and accompanies a State Significant Development application (SSDA) submitted to the NSW Department of Planning and Environment (DPE). The SSDA seeks Concept approval, in accordance with Division 4.4 of the Environmental Planning and Assessment Act 1979 (EP&A Act), for the staged redevelopment of the Telopea 'Concept Plan Area' (CPA), as well as a detailed proposal for the first stage of development, known as 'Stage 1A'.

The purpose of this report is to provide a Qualitative Environmental Wind Assessment of the Stage 1A of the Telopea CPA. A subsequent report has been provided detailing the design principles associated with the Telopea CPA at large.

1.1 Background

The Telopea CPA forms part of the **Telopea Precinct Master Plan** (February 2017), which was prepared by NSW Land and Housing Corporation (LAHC) and Parramatta City Council to facilitate the rezoning of the precinct in August 2018. The Master Plan seeks to revitalise the Telopea Precinct through the redevelopment of LAHC's social housing assets, as well as sites under private ownership, to deliver an integrated community with upgraded public domain and community facilities – and to capitalise on access to the new Parramatta Light Rail network.

The Telopea CPA is the land identified in **Figure 2** and is currently owned by LAHC. The proposed redevelopment of the CPA is part of the NSW Government Communities Plus program, which seeks to deliver new communities where social housing blends with private and affordable housing with good access to transport, employment, improved community facilities and open space. The program seeks to leverage the expertise and capacity of the private and non-government sectors.

The SSDA represents the first step in the delivery of the planned redevelopment of the Telopea CPA and the Stage 1A works will provide the first integrated social and market housing development on the site, as well as a new arrival plaza for the Parramatta Light Rail.

1.2 Site Description

Telopea is located in the Parramatta Local Government Area (LGA). It is approximately 4km north-east of the Parramatta Central Business District (CBD), 6km south-west of Macquarie Park Strategic Centre, and 17km from Sydney CBD.

The Telopea CPA site is approximately 13.4 (ha) and comprises 99 individual allotments (refer **Figure 1**). It currently accommodates 486 social housing dwellings, across a mix of single dwelling, townhouse, and 3-9 storey residential flat buildings. The Estate also currently accommodates a range of existing community facilities including the Dundas Community Centre, Dundas Branch Library, Community Health Centre, Hope Connect church, and Telopea Christian Centre.

The immediate surrounds comprise predominantly residential properties within an established landscape setting. The broader Precinct contains the Telopea Public School, a neighbourhood centre known as the Waratah Shops, and two large Council parks known as Sturt Park and Acacia Park.

Figure 1 Masterplan Location

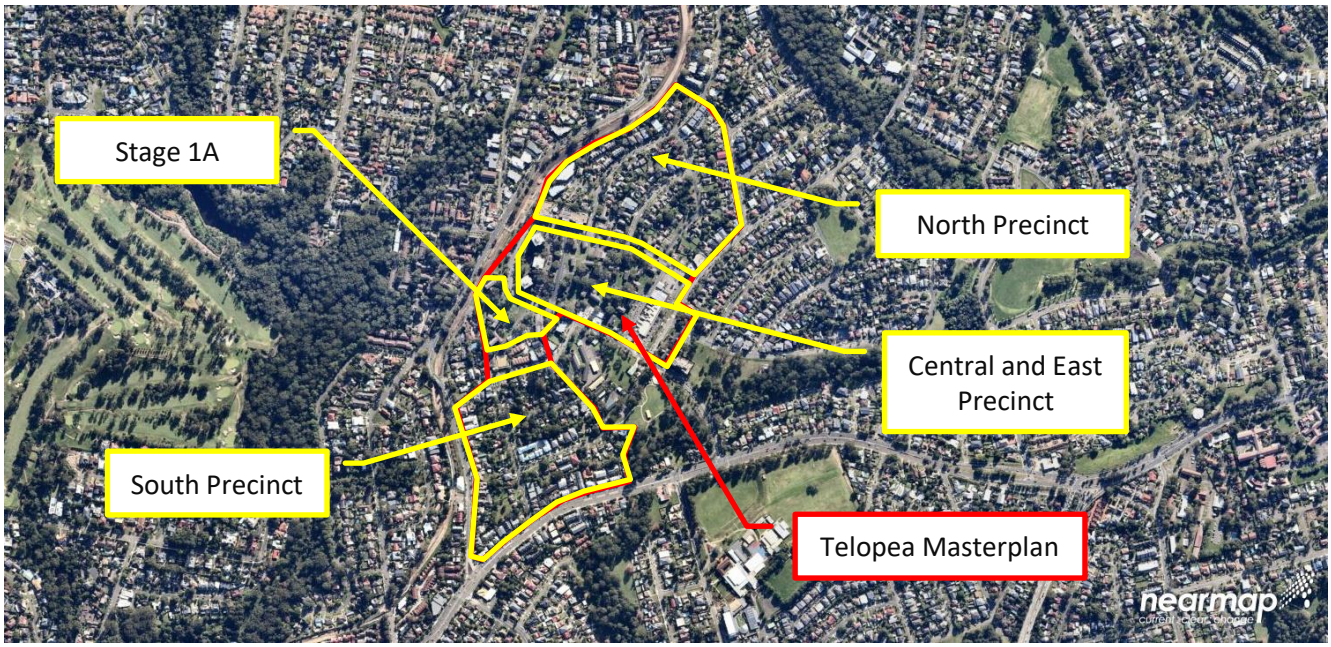


Image: Nearmap, 1 June 2020

1.3 Proposed Development

The SSDA seeks Concept approval for the staged redevelopment of the Telopea CPA, as well as a detailed proposal for the first stage of development. The Concept proposal sets out the maximum building envelopes and GFA that can be accommodated across the CPA, and identifies the land uses and public infrastructure upgrades to be provided. The Concept proposal will establish the planning and development framework from which any future development application will be assessed against.

The Telopea CPA proposal comprises:

- A mixed-use development including:
    - Approximately 4,700 dwellings, including a mix of social, affordable and market dwellings
    - Inclusion of a new retail precinct with a new supermarket, food and beverage, and speciality retail
    - Proposed childcare facility
    - Proposed combined library and community centre
    - Proposed combined Church, Residential Aged Care Facility and Independent living unit's facility
- Delivery of new public open space, including:
    - A new light rail plaza
    - Hill top park

- Elyes pedestrian link
- Open space associated with the proposed library

- Retention of existing significant trees
- Road and intersection upgrades
- Cycle way upgrades
- Upgrade of utility services

The Telopea CPA is divided into four precincts known as Core, North, South and East incorporating a total of 29 lots. The Concept proposal is further detailed in the Urban Design Report prepared by Bates Smart and Hassell.

Figure 2 Telopea Estate Concept Plan

Source: Bates Smart and Hassell

2 Telopea Wind Climate

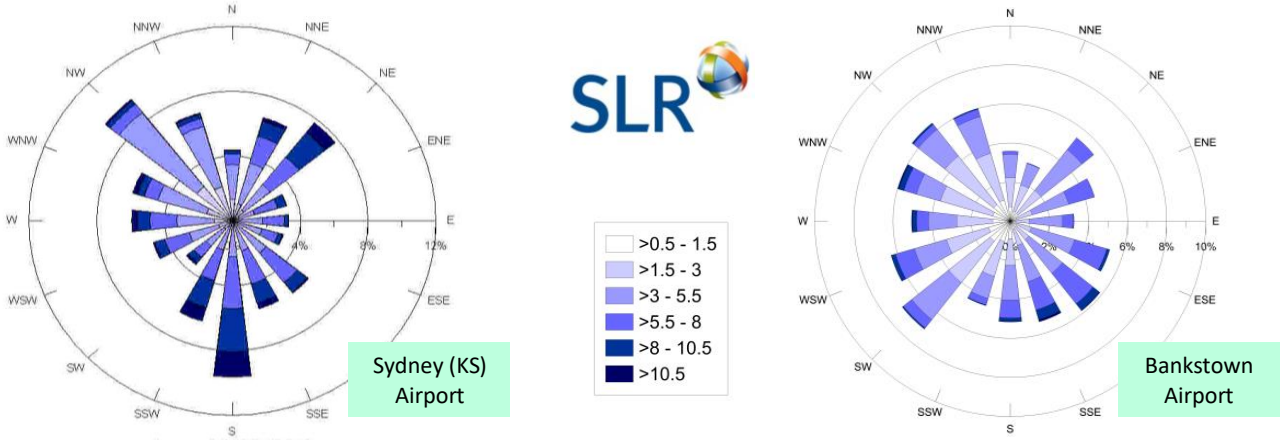
The data of interest in this study are the annual extreme, mean hourly wind speeds and largest gusts experienced throughout the year, how these winds vary with azimuth, and the seasonal break-up of winds into the primary Sydney wind seasons.

2.1 Sydney Region Seasonal Variations

Key characteristics of Sydney's Regional Wind Climate are illustrated in two representative wind roses shown in **Figure 3**, taken from Bureau of Meteorology (BoM) data recorded during the period 1999-2017 at Sydney (Kingsford Smith) Airport and Bankstown Airport. A review of the associated seasonal wind roses (refer **Appendix A**) shows that Sydney is affected by two primary wind seasons with relatively short (1-2 month) transition periods in between:

- Summer winds occur mainly from the northeast, southeast and south. While northeast winds are the more common prevailing wind direction (occurring typically as offshore land-sea breezes), southeast and southerly winds generally provide the strongest gusts during summer. Northeast sea breeze winds and stronger southerly winds associated with "Southerly Busters" and "East Coast Lows" typically have a significantly greater impact along the coastline. Inland, these systems lose strength and have altered wind direction characteristics.
- Winter/Early Spring winds occur mainly from west quadrants and to a lesser extent from the south. West quadrant winds provide the strongest winds during winter and in fact for the whole year, particularly at locations away from the coast.

Figure 3 Annual Wind Roses for Sydney (KS) Airport and Bankstown Airport (BoM Data)



2.2 Local Wind Characteristics

For the project site, SLR has determined that local upper level winds reflective of the weather systems experienced at the site have characteristics closer to Bankstown Airport than Sydney (KS) Airport, given Parramatta's distance inland being almost identical to Bankstown Airport. This implies that Telopea would have relatively lower strength characteristics from the northeast and south and correspondingly higher relative strengths from the southeast and southwest/northwest compared to Sydney (KS) Airport.

2.3 Wind Exposure at the Site – the "Local" Wind Environment

Close to the ground, the "regional" wind patterns described above are affected by the local terrain and topography.

- Lower level shielding from landscaping and vegetation along neighbouring streets and open park land.
- Significant existing vegetation to the west around Oatlands Golf Club.
- Generous lower level shielding provided from existing residential development surrounding the site.
- Some potential for wind channelling along neighbouring streets.
- Future master plan will offer some potential for further mid-level shielding, particularly to the north and south.

3 Wind Acceptable Criteria

3.1 Standard Local Government Criteria

The choice of suitable criteria for evaluating the acceptability of particular ground level conditions has been the subject of relatively recent research. The acceptability criteria that have been developed from this research and currently referenced by most Australian Local Government Development Control Plans have been summarised below in **Table 1**.

Table 1 Standard Local Government Wind Acceptability Criteria

Type of Criteria	Limiting Gust Wind Speed Occurring Once Per Year	Activity Concerned
Safety	24 m/s	Knockdown in Isolated Areas
	23 m/s	Knockdown in Public Access Areas
Comfort	16 m/s	Comfortable Walking
	13 m/s	Standing, Waiting, Window Shopping
	10 m/s	Dining in Outdoor Restaurant

The primary objectives relating to the above wind impact criteria are as follows:

- The general objective is for annual 3-second gust wind speeds to remain at or below the so-called 16 m/sec "Walking Comfort" criterion. Whilst this magnitude may appear somewhat arbitrary, its value represents a level of wind intensity which the majority of the population would find unacceptable for comfortable walking on a regular basis at any particular location.
- In many urban locations, either because of exposure to open water conditions or because of street "canyon" effects, etc., the 16 m/s "Walking Comfort" level may already be currently exceeded. In such instances a new development should ideally not exacerbate existing adverse wind conditions and, wherever feasible and reasonable, ameliorate such conditions.

It can be seen in **Table 1** that the recommended limiting wind speeds for spaces designed for activities such as seating, outdoor dining, etc., are lower than for "walking comfort".

3.2 Practical Application of Wind Criteria

The criteria provided in **Table 1** should not be viewed as "hard" numbers as the limiting values were generally derived from subjective assessments of wind acceptability. Such assessments have been found to vary with the height, strength, age, etc., of the pedestrian concerned.

A further factor for consideration is the extent of windy conditions, and some relaxation of the above criteria may be acceptable for small areas under investigation provided the general site conditions satisfy the relevant criteria.

Finally, it is noted that the limiting wind speed criteria in **Table 1** are based on the maximum wind gust occurring (on average) once per year. Winds at all other times, i.e. monthly winds, weekly winds, etc., would be of lesser magnitude. So for example, a location with a maximum annual gust of 10 m/sec would experience winds throughout the year of a generally very mild nature, conducive to stationary activities (seating, dining, etc).

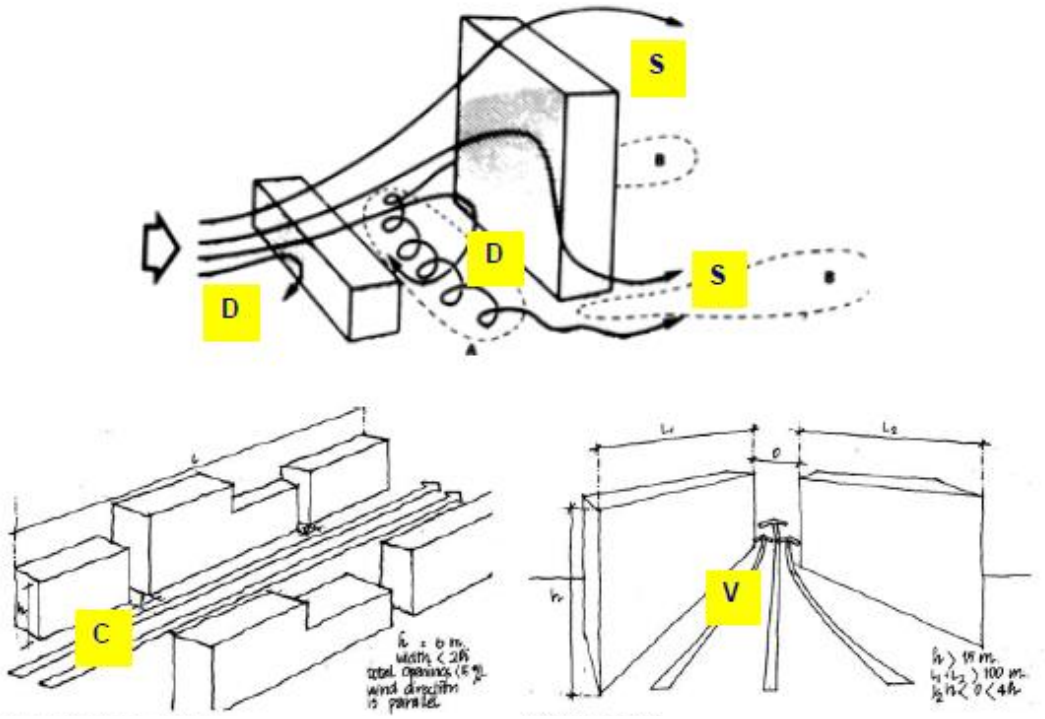
4 Building-Wind Interaction – Some General Observations

The impact of wind flowing past buildings has well known general impacts at ground level – refer **Figure 4**:

- **Downwash winds "D"** are the winds which impact on the windward face of a building and are then deflected downwards to ground level in a vertical direction
- Accelerating **Shearflow winds "S"** are the winds which experience an acceleration as they pass by the building edges and roof, as the wind flow moves around and past the building

In general, the taller the building, the more pronounced the impact on ground level winds. Local building details can also influence winds in the immediate vicinity; eg building undercrofts are often associated with local acceleration of winds.

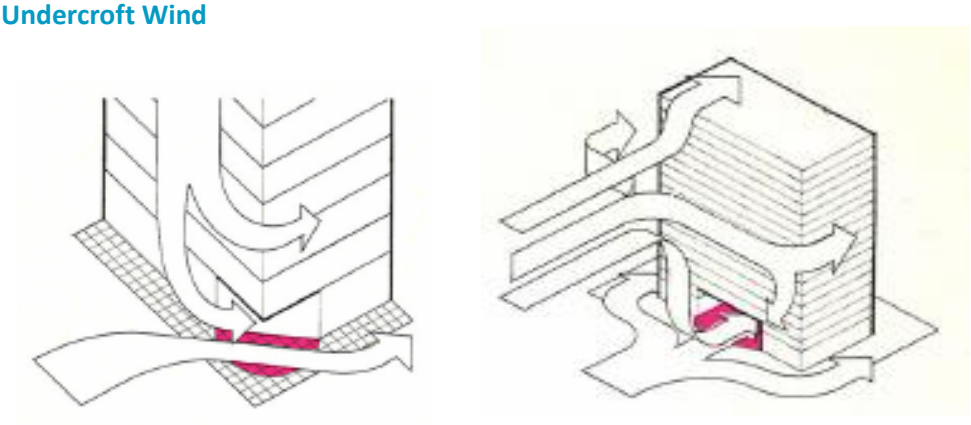
Figure 4 Wind Flow Patterns past Regular Shaped Buildings



The grouping of buildings can also have an impact on resulting pedestrian winds – refer **Figure 4**:

- **Canyon Effect winds "C"** result when there are rows of parallel buildings (especially taller ones) where the gaps in between line up with prevailing wind directions.
- **Venturi Effect winds "V"** result when wind flow is forced to pass between two converging buildings or groups of buildings with a resulting increase in flow.
- **"Undercroft"** effect is a well-known adverse building-wind characteristic as depicted in the generic building wind effect diagrams shown in **Figure 5**. The winds are induced towards the negative pressure area within the undercroft, creating concentrated adverse wind flow through undercrofts.

Figure 5 Undercroft Wind



Building Undercrofts (left) and Building Cross-Façade Openings (right) can induce concentrated adverse wind flow past and through a building.

5 Wind Impact of the Proposed Development

5.1 Existing Winds – Wind Impact and Effects

Existing street level wind conditions in the vicinity of the site could be close to or greater than 16 m/s "walking comfort" criterion for some prevailing wind directions, resulting from channelling of winds along aligning streets. The surrounding built environment which consists of dense low-level residential development provides generous wind shielding to the majority of prevailing wind directions.

Northeast Winds

Lower level shielding is provided to the northeast, consisting of medium and low-level development surrounding the site with low-level residential housing beyond that. Northeast winds are generally mild and the potential for exceedance of the 16 m/s criterion along pedestrian pathways is small, i.e. occurrences, if any, are likely to be very infrequent. However, there is some potential that wind channelling could occur through the corridor presented along Adderton Road and the former railway line, this could result in some exceedances being recorded along the northwest boundary of the site.

Southerly Winds

Low level shielding to the south is generous and should provide shielding to the majority of the site and neighbouring pedestrian areas. Similar to winds from the northeast there remains some risk for channelling of winds through the Adderton Road/former rail corridor which could result in exceedances of the 16 m/s along the western site boundary.

Westerly Winds

There is currently dense vegetation provided west of the site and combining this with the neighbouring residential development, provides significant shielding to the existing site. Exceedances of the 16 m/s criterion are considered to be minimal, i.e. occurrences, if any, are likely to be very infrequent

Upper Level Winds

Existing upper level wind conditions at the site are likely to exceed the 10 m/s "outdoor eating" comfort criterion for some prevailing wind directions at elevations above the height limits of surrounding buildings.

5.2 Future Winds – Predicted Wind Flow Patterns

The following sections analyse the expected impacts of the proposed development on the pedestrian wind environment in the adjacent streetscape.

The wind impact of the proposed development is described by examining the impact of prevailing wind conditions on all public access areas of interest within and external to the development.

Areas of interest (i.e. surrounding footpaths, primary entry points, internal public access areas, seating and dining areas, etc) are identified in **Figure 6** to **Figure 10**.

Figure 6 Areas of Interest Basement 01

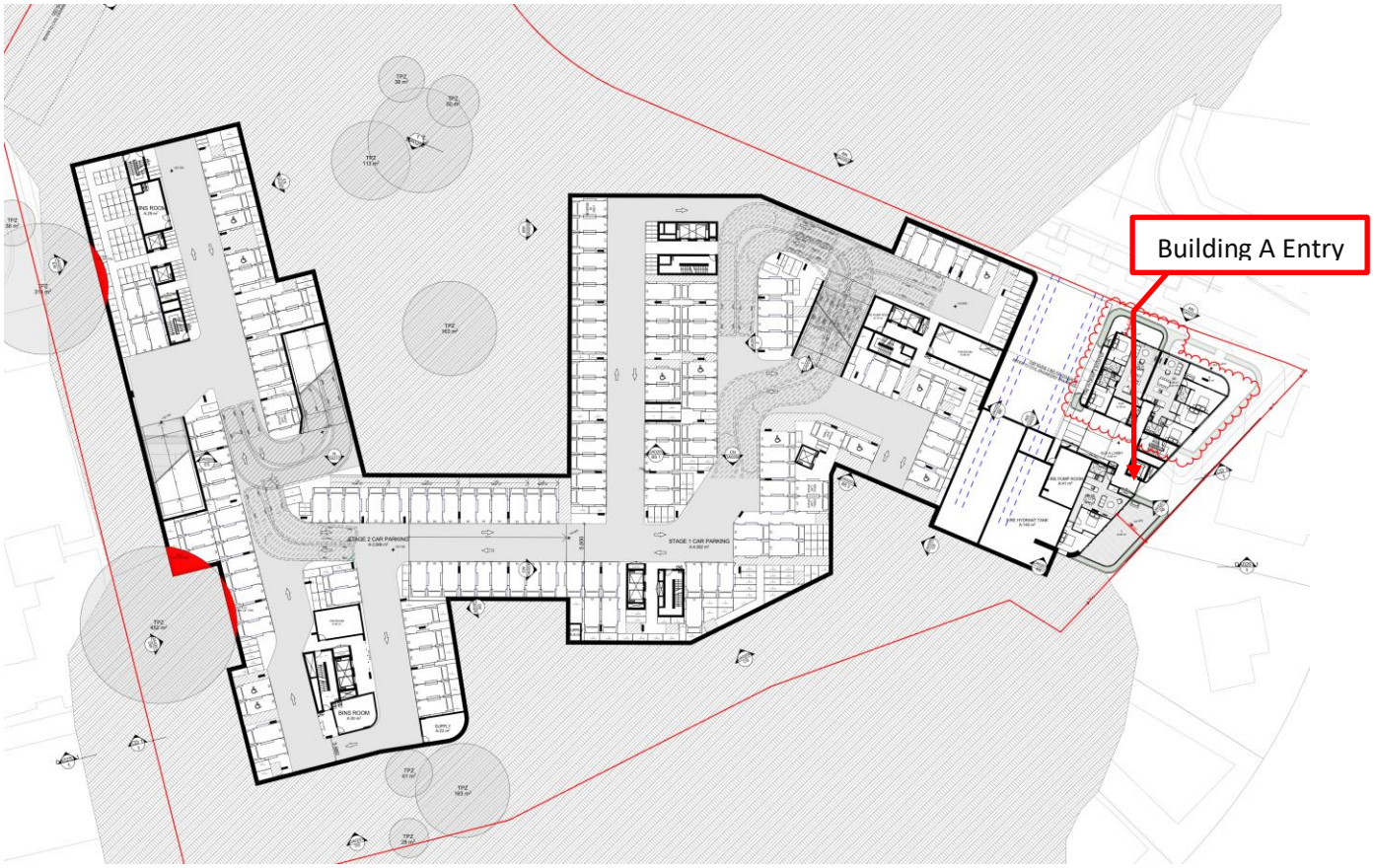


Figure 7 Areas of Interest Lower Ground Level

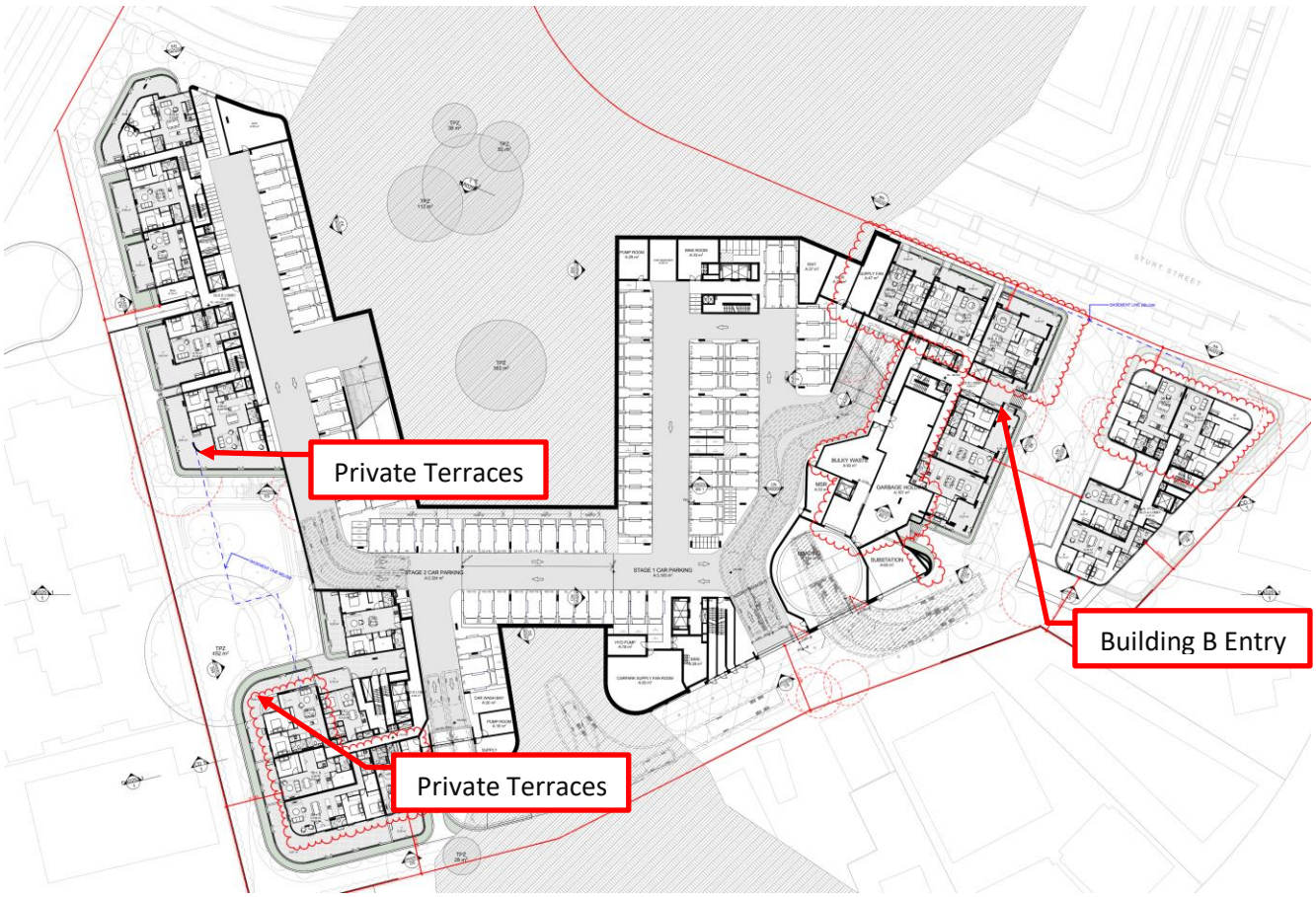


Figure 8 Areas of Interest Upper Ground Level

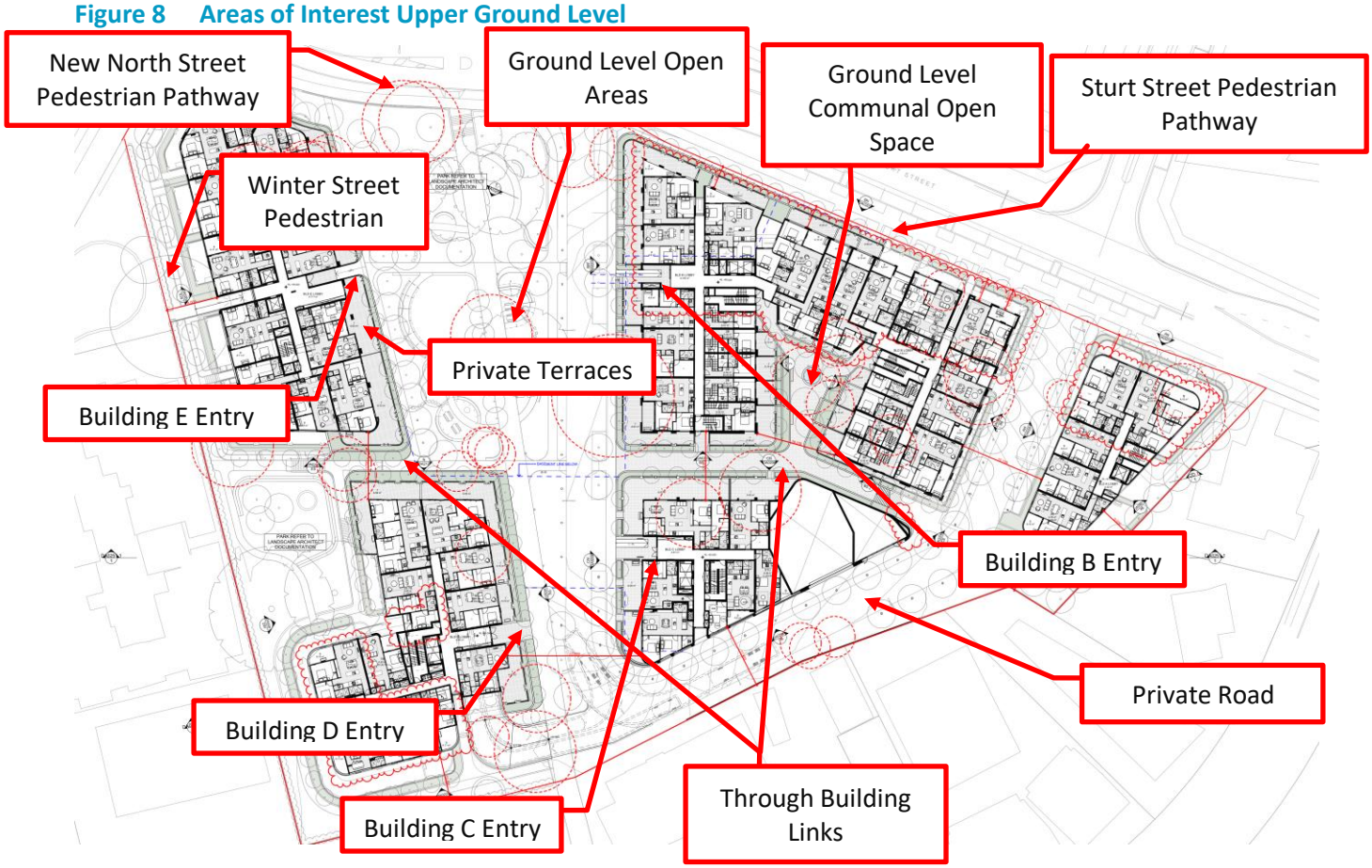


Figure 9 Areas of Interest Level 04

Figure 10 Areas of Interest Level 05

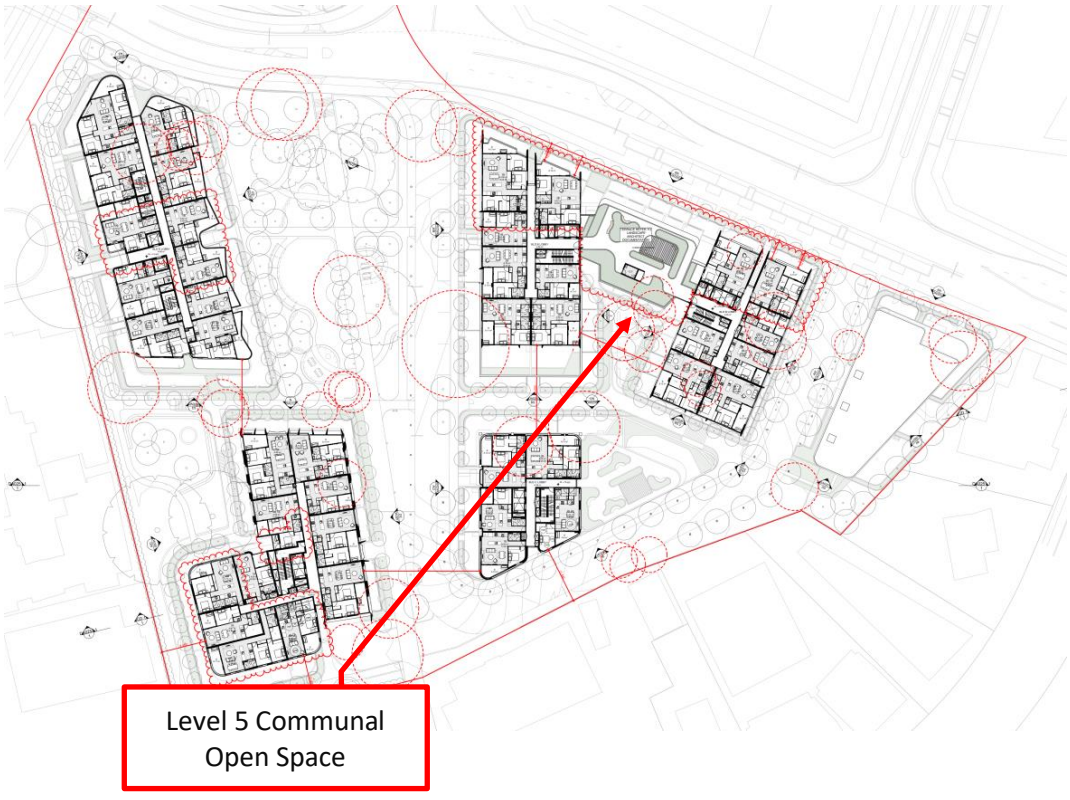


Figure 11 Areas of Interest Typical Level

5.2.1 Northeast Winds

Location	Wind Impact
Building A Entry	Potential impact here should be **less than 13m/s**, affected by: • Shielding from upstream buildings. • Shielding from the development itself. • Shielding from proposed landscaping.
Building B Entry	Potential impact here should be **less than 13m/s**, affected by: • Shielding from upstream buildings. • Shielding from the development itself. • Shielding from proposed landscaping.
Building C Entry	Potential impact here should be **less than 13m/s**, affected by: • Shielding from upstream buildings. • Shielding from the development itself. • Shielding from proposed landscaping.
Building D Entry	Potential impact here should be **less than 13m/s**, affected by: • Shielding from upstream buildings. • Shielding from the development itself. • Shielding from proposed landscaping.
Building E Entry	Potential impact here should be **less than 13m/s**, affected by: • Shielding from upstream buildings. • Shielding from the development itself. • Shielding from proposed landscaping. • Potential for downwash winds from the development facades.
Winter Street Pedestrian Pathway	Potential impact here should be **less than 16m/s**, affected by: • Shielding from upstream buildings. • Shielding from the development itself. • Shielding from existing landscaping.
Sturt Street Pedestrian Pathway	Potential impact here should be **less than 16m/s**, affected by: • Shielding from upstream buildings. • Shielding from existing landscaping. • Potential downwash from development facades. • Proposed landscaping to protect pedestrian pathways.
New North Street Pedestrian Pathway	Potential impact here should be **less than 16m/s**, affected by: • Shielding from upstream buildings. • Shielding from existing landscaping.
Private Road	Potential impact here should be **less than 16m/s**, affected by: • Shielding from upstream buildings. • Shielding from existing landscaping. • Some Shielding from the development itself. • Potential of channelling winds between the building

Location	Wind Impact
Ground Level Open Area	Potential impact here should be **equal to or greater than 10m/s**, affected by: • Shielding from upstream buildings. • Some shielding from the development itself. • Shielding from existing landscaping. • Potential downwash winds from some development facades. • Shielding from proposed landscaping and wind screening. • Potential of channelling winds between the buildings
Enclosed Communal Open Space (Building B)	Potential impact here should be **less than 10m/s** affected by: • Shielding from upstream buildings. • Some shielding from the development itself. • Shielding from existing landscaping. • Shielding from proposed landscaping and wind screening. • Potential of channelling winds between the building
Private Terraces	Potential impact here should be **less than 13m/s**, affected by: • Shielding from upstream buildings. • Some shielding from the development itself. • Shielding from existing landscaping. • Potential downwash winds from some development facades. • Shielding from overhang of levels above. • Shielding from proposed landscaping.
Through Building Links	Potential impact here should be **less than 16m/s**, affected by: • Shielding from upstream buildings. • Shielding from the development itself. • Shielding from existing landscaping. • Shielding from proposed landscaping.
Level 4 Communal Open Space	Potential impact here could be **equal to or greater than 10m/s**, affected by: • Reduced upstream shielding at higher levels. • Stronger upper level winds.
Level 5 Communal Open Space	Potential impact here could be **equal to or greater than 10m/s**, affected by: • Reduced upstream shielding at higher levels. • Stronger upper level winds.
Upper Level Balconies	Potential impact here could be **equal to or greater than 10m/s**, affected by: • Stronger upper level winds. • Reduced upper level shielding from the surrounding environment. • Corner balcony orientation providing less shielding to private space.

5.2.2 South and Southeast Winds

Location	Wind Impact
Building A Entry	Potential impact here should be **less than 13m/s**, affected by: • Shielding from upstream buildings. • Shielding from the development itself. • Potential wind channelling along aligning streets. • Shielding from proposed landscaping.
Building B Entry	Potential impact here should be **less than 13m/s**, affected by: • Shielding from upstream buildings. • Shielding from the development itself. • Potential wind channelling along aligning streets. • Shielding from proposed landscaping.
Building C Entry	Potential impact here should be **less than 13m/s**, affected by: • Shielding from upstream buildings. • Shielding from the development itself. • Potential wind channelling along aligning streets. • Shielding from proposed landscaping.
Building D Entry	Potential impact here should be **less than 13m/s**, affected by: • Shielding from upstream buildings. • Shielding from the development itself. • Potential wind channelling along aligning streets. • Shielding from proposed landscaping.
Building E Entry	Potential impact here should be **less than 13m/s**, affected by: • Shielding from upstream buildings. • Shielding from the between buildings. • Shielding from proposed landscaping.
Winter Street Pedestrian Pathway	Potential impact here should be **less than 16m/s**, affected by: • Shielding from upstream buildings. • Shielding from existing landscaping. • Potential wind channelling along Adderson Road and former railway corridor. • Shielding from proposed landscaping.
Sturt Street Pedestrian Pathway	Potential impact here should be **less than 16m/s**, affected by: • Shielding from upstream buildings. • Shielding from existing landscaping. • Shielding from the development itself.
New North Street Pedestrian Pathway	Potential impact here should be **less than 16m/s**, affected by: • Shielding from upstream buildings. • Shielding from existing landscaping. • Shielding from the development itself.
Private Road	Potential impact here should be **less than 16m/s**, affected by: • Shielding from upstream buildings. • Potential for downwash winds from the development itself. • Shielding from proposed landscaping.

Location	Wind Impact
Ground Level Open Area	Potential impact here should be **equal to or greater than 10m/s**, affected by: • Shielding from upstream buildings. • Some shielding from the development itself. • Shielding from existing landscaping. • Potential channelling of winds between buildings. • Shielding from proposed landscaping.
Enclosed Communal Open Space (Building B)	Potential impact here should be **less than 10m/s** affected by: • Shielding from upstream buildings. • Some shielding from the development itself. • Shielding from existing landscaping. • Shielding from proposed landscaping and wind screening. • Potential of channelling winds between the building
Private Terraces	Potential impact here should be **less than 13m/s**, affected by: • Shielding from upstream buildings. • Shielding from the development itself. • Shielding from existing landscaping.
Through Building Links	Potential impact here should be **less than 16m/s**, affected by: • Shielding from upstream buildings. • Shielding from the development itself. • Shielding from existing landscaping. • Shielding from proposed landscaping.
Level 4 Communal Open Space	Potential impact here could be **equal to or greater than 10m/s**, affected by: • Reduced upstream shielding at higher levels. • Stronger upper level winds.
Level 5 Communal Open Space	Potential impact here could be **equal to or greater than 10m/s**, affected by: • Reduced upstream shielding at higher levels. • Stronger upper level winds. • Potential channelling of winds between buildings.
Upper Level Balconies	Potential impact here could be **equal to or greater than 10m/s**, affected by: • Stronger upper level winds. • Reduced upper level shielding from the surrounding environment. • Corner balcony orientation providing less shielding to private space.

5.2.3 Westerly Winds

Location	Wind Impact
Building A Entry	Potential impact here should be **less than 13m/s**, affected by: • Shielding from the development itself. • Shielding from proposed landscaping.
Building B Entry	Potential impact here should be **less than 13m/s**, affected by: • Shielding from the development itself. • Shielding from proposed landscaping.

Location	Wind Impact
Building C Entry	Potential impact here should be **less than 13m/s**, affected by: • Shielding from the development itself. • Shielding from proposed landscaping.
Building D Entry	Potential impact here should be **less than 13m/s**, affected by: • Shielding from the development itself. • Shielding from proposed landscaping.
Building E Entry	Potential impact here should be **less than 13m/s**, affected by: • Shielding from the development itself. • Shielding from proposed landscaping.
Winter Street Pedestrian Pathway	Potential impact here should be **less than 16m/s**, affected by: • Shielding from upstream buildings. • Shielding from existing landscaping.
Sturt Street Pedestrian Pathway	Potential impact here should be **less than 16m/s**, affected by: • Shielding from upstream buildings. • Shielding from existing landscaping. • Shielding from the development itself.
New North Street Pedestrian Pathway	Potential impact here should be **less than 16m/s**, affected by: • Shielding from upstream buildings. • Shielding from existing landscaping. • Potential channelling along new street. • Shielding from proposed landscaping.
Private Road	Potential impact here should be **less than 16m/s**, affected by: • Shielding from upstream buildings. • Shielding from existing landscaping. • Shielding from the development itself.
Ground Level Open Area	Potential impact here should be **equal to or greater than 10m/s**, affected by: • Shielding from upstream buildings. • Shielding from the development itself. • Shielding from existing landscaping.
Enclosed Communal Open Space (Building B)	Potential impact here should be **less than 10m/s** affected by: • Shielding from upstream buildings. • Some shielding from the development itself. • Shielding from existing landscaping. • Shielding from proposed landscaping and wind screening. • Potential of channelling winds between the building
Private Terraces	Potential impact here should be **less than 10m/s**, affected by: • Shielding from upstream buildings. • Some shielding from the development itself. • Shielding from existing landscaping. • Potential downwash winds from some development facades. • Shielding from proposed landscaping.

Location	Wind Impact
Through Building Links	Potential impact here should be **less than 16m/s**, affected by: • Shielding from upstream buildings. • Shielding from the development itself. • Shielding from existing landscaping. • Potential channelling of winds between buildings. • Shielding from proposed landscaping.
Level 4 Communal Open Space	Potential impact here should be **less than 10m/s**, affected by: • Reduced upstream shielding at higher levels. • Stronger upper level winds. • Shielding from the development itself.
Level 5 Communal Open Space	Potential impact here should be **less than 10m/s**, affected by: • Reduced upstream shielding at higher levels. • Stronger upper level winds. • Shielding from the development itself.
Upper Level Balconies	Potential impact here could be **equal to or greater than 10m/s**, affected by: • Stronger upper level winds. • Reduced upper level shielding from the surrounding environment. • Corner balcony orientation providing less shielding to private space.

6 Wind Amelioration Recommendations

On the basis of the expected wind impacts outlined in previous four sections, recommendations for wind break features are made in areas where winds are expected to

- Approach or exceed 10 m/s, 13 m/s or 16 m/s depending on the designed use for that area.

These wind mitigation recommendations are summarised in **Table 2**.

Table 2 Recommended Wind Mitigation

Location of Interest	Wind Impact Potential	Windbreak Treatment/Recommendation
Building A Entry	**Low** Winds should be below 13 m/s for all prevailing wind directions.	**No Additional Mitigation Required** Additional landscaping could further protect against adverse winds. Landscaping should have a canopy height of 3m and be densely foliated evergreen species. Retain the setback from the main façade.
Building B Entry	**Low** Winds should be below 13 m/s for all prevailing wind directions.	**No Additional Mitigation Required** Additional landscaping could further protect against adverse winds. Landscaping should have a canopy height of 3m and be densely foliated evergreen species. Retain the setback from the main façade.
Building C Entry	**Low** Winds should be below 13 m/s for all prevailing wind directions.	**No Additional Mitigation Required** Additional landscaping could further protect against adverse winds. Landscaping should have a canopy height of 3m and be densely foliated evergreen species. Retain the setback from the main façade.
Building D Entry	**Low** Winds should be below 13 m/s for all prevailing wind directions.	**No Additional Mitigation Required** Additional landscaping could further protect against adverse winds. Landscaping should have a canopy height of 3m and be densely foliated evergreen species. Retain the setback from the main façade.

Location of Interest	Wind Impact Potential	Windbreak Treatment/Recommendation
Building E Entry	**Low** Winds should be below 13 m/s for all prevailing wind directions.	**No Additional Mitigation Required** Additional landscaping could further protect against adverse winds. Landscaping should have a canopy height of 3m and be densely foliated evergreen species. Retain the setback from the main façade.
Winter Street Pedestrian Pathway	**Low** Winds should be below 16 m/s for all prevailing wind directions	**No Additional Mitigation Required** SLR requires the retention of existing landscaping where possible. Additional proposed landscaping should be provided in quantities similar to those shown on plans. Landscaping should have a canopy height of 3m and be densely foliated evergreen species.
Sturt Street Pedestrian Pathway	**Low** Winds should be below 16 m/s for all prevailing wind directions	**No Additional Mitigation Required** SLR requires the retention of existing landscaping where possible. Additional proposed landscaping should be provided in quantities similar to those shown on plans. Landscaping should have a canopy height of 3m and be densely foliated evergreen species.
New North Street Pedestrian Pathway	**Low** Winds should be below 16 m/s for all prevailing wind directions	**No Additional Mitigation Required** SLR requires the retention of existing landscaping where possible. Additional proposed landscaping should be provided in quantities similar to those shown on plans. Landscaping should have a canopy height of 3m and be densely foliated evergreen species.

Location of Interest	Wind Impact Potential	Windbreak Treatment/Recommendation
Private Road	**Low** Winds should be below 16 m/s for all prevailing wind directions	**No Additional Mitigation Required** SLR requires proposed landscaping to be provided in quantities similar to those shown on plans. Landscaping should have a canopy height of 3m and be densely foliated evergreen species.
Ground Level Open Area	**Low - Moderate** Winds should be below 10 m/s for all prevailing wind directions.	**No Additional Mitigation Required** SLR requires the retention of existing landscaping where possible. Additional proposed landscaping should be provided in quantities similar to those shown on plans. Landscaping should have a canopy height of 3m and be densely foliated evergreen species. Additional landscaping could further protect against adverse winds.
Ground Level Open Area	**Low - Moderate** Winds should be below 10 m/s for all prevailing wind directions.	**No Additional Mitigation Required** SLR requires the retention of existing landscaping where possible. Additional proposed landscaping should be provided in quantities similar to those shown on plans. Landscaping should have a canopy height of 3m and be densely foliated evergreen species. Additional landscaping could further protect against adverse winds.

Location of Interest	Wind Impact Potential	Windbreak Treatment/Recommendation
Private Terraces	**Low - Moderate** Winds should be below 10 m/s for all prevailing wind directions.	**No Additional Mitigation Required** SLR requires the retention of existing landscaping where possible. Additional proposed landscaping should be provided in quantities similar to those shown on plans. Landscaping should have a canopy height of 3m and be densely foliated evergreen species.
Through Building Links	**Low- Moderate** Winds should be below 16 m/s for all prevailing wind directions.	**No Additional Mitigation Required** SLR requires proposed landscaping to be provided in quantities similar to those shown on plans. Landscaping should have a canopy height of 3m and be densely foliated evergreen species.
Level 4 Communal Open Space	**Moderate-High** Winds could be above 10 m/s for NE, S and SE wind directions	**Mitigation Required** SLR requires that vertical windbreaks in the form of balustrade, planter, balustrade+planter, wind screens or other practical wind shielding be installed to the perimeter of the communal open space. Windbreaks should be 1.8m in height minimum. Landscaping is recommended throughout the communal open area.
Level 5 Communal Open Space	**Moderate-High** Winds could be above 10 m/s for NE, S and SE wind directions	**Mitigation Required** SLR requires that vertical windbreaks in the form of balustrade, planter, balustrade+planter, wind screens or other practical wind shielding be installed to the perimeter of the communal open space. Windbreaks should be 1.8m in height minimum. Landscaping is recommended throughout the communal open area.

Location of Interest	Wind Impact Potential	Windbreak Treatment/Recommendation
Upper Level Balconies	**High** Winds could be above 10 m/s for all prevailing wind directions.	**Mitigation Required** For levels 4 and above SLR requires that corner and balconies with multiple open aspects be converted to nested balconies with a single open aspect, this can be achieved using full height balustrade, wing walls, wind screens or other practical shielding. The extent of required shielding can be further quantified during the detailed design stage of the project.

Figure 12 Mitigation Recommendations Upper Ground Level

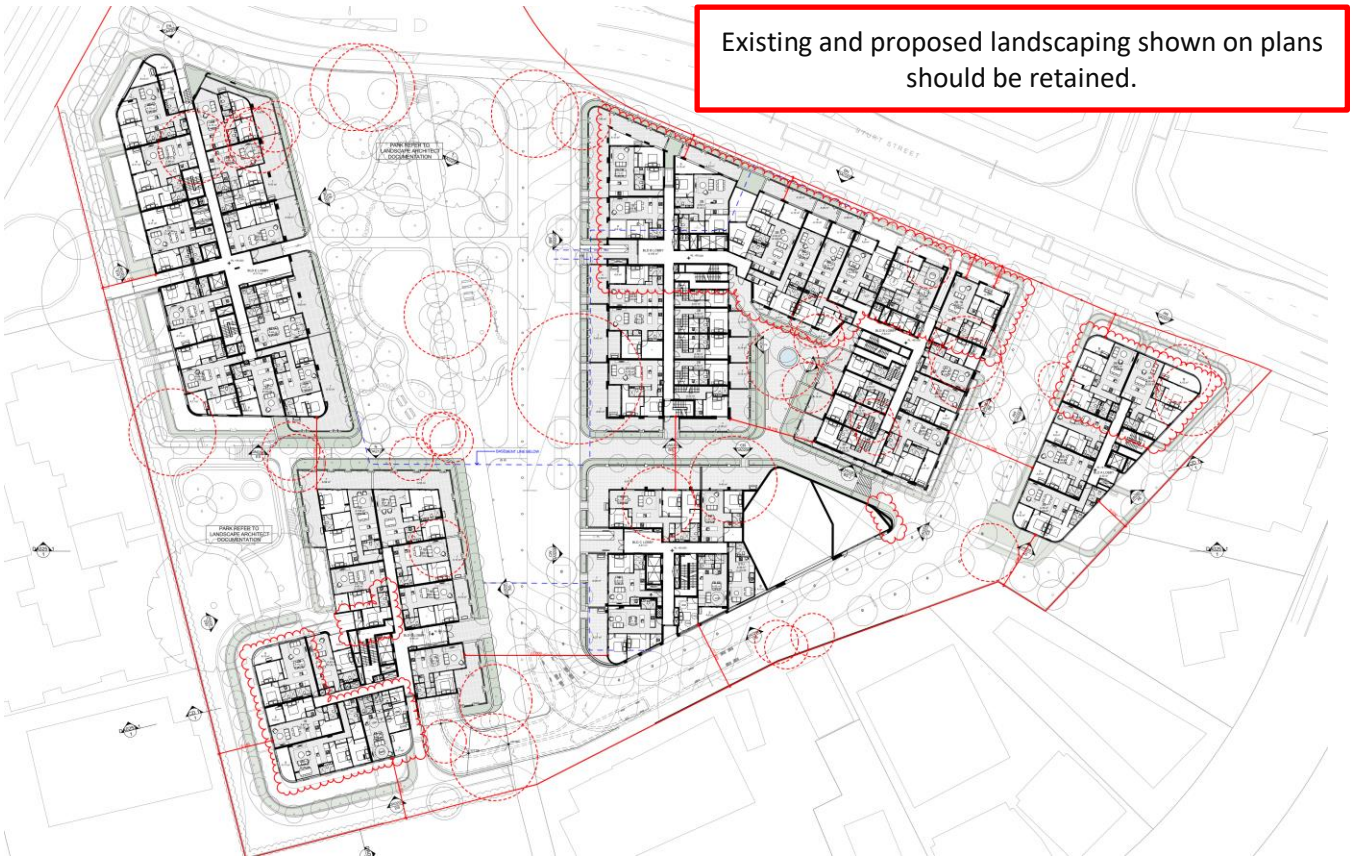


Figure 13 Mitigation Recommendations Level 2

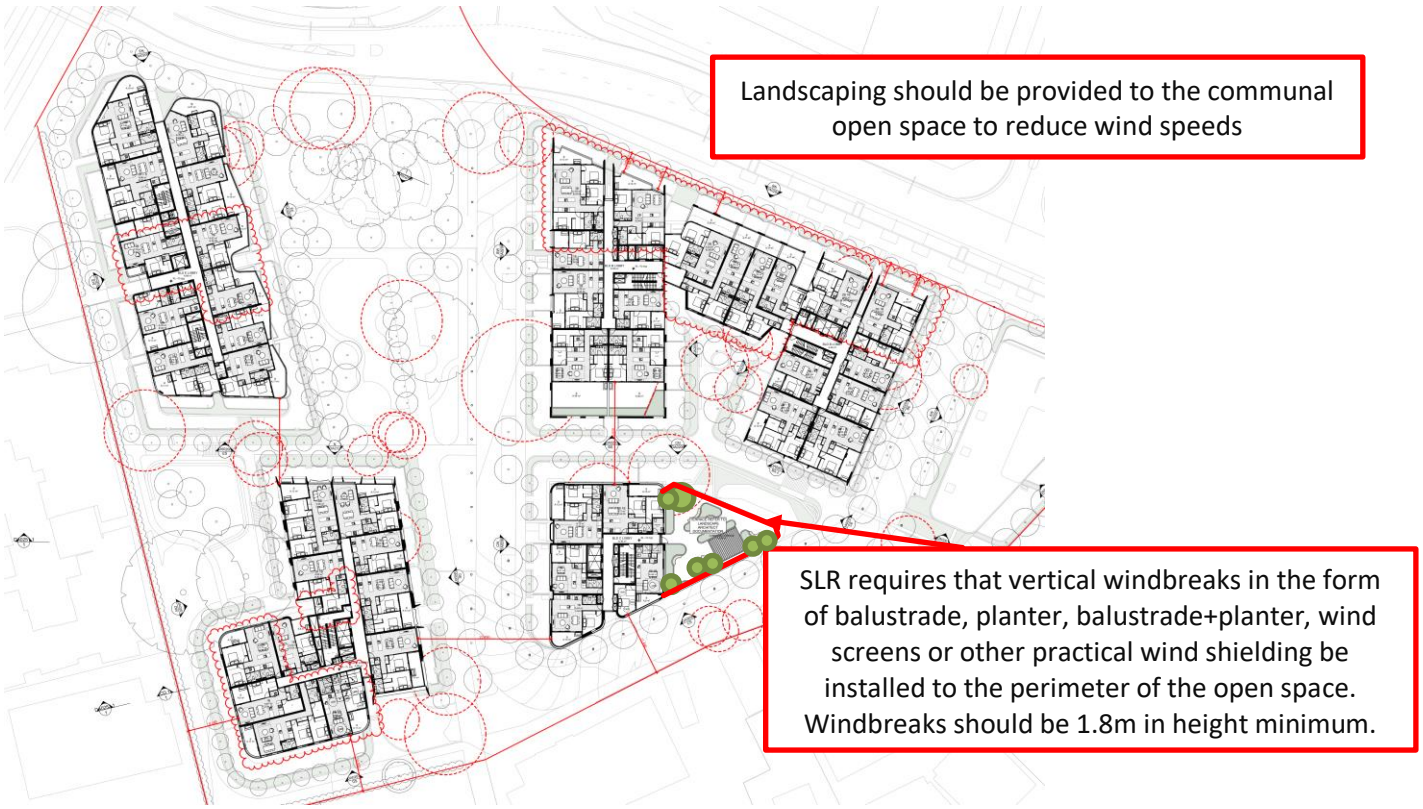


Figure 14 Mitigation Recommendations Level 4

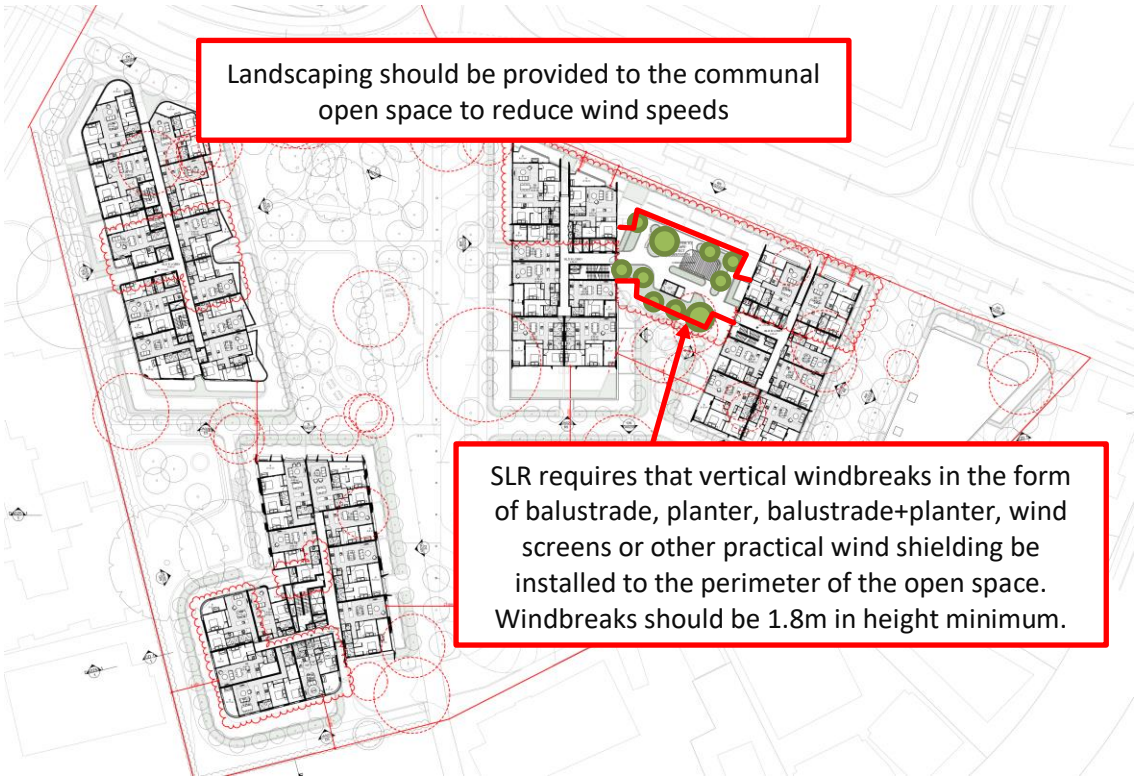


Figure 15 Mitigation Recommendations Level 4 and Above

For level 4 and above SLR requires that highlighted balconies and those similar be converted to nested balconies with a single open aspect, this can be achieved using full height balustrade, wing walls, wind screens or other practical shielding. The extent of required shielding can be further quantified during the detailed design stage of the project.

7 Conclusion

This report has been prepared by SLR Consulting Pty Ltd (SLR) on behalf of Frasers Property Australia Pty Ltd (Frasers) and accompanies a State Significant Development application (SSDA) submitted to the NSW Department of Planning and Environment (DPE). The SSDA seeks Concept approval, in accordance with Division 4.4 of the Environmental Planning and Assessment Act 1979 (EP&A Act), for the staged redevelopment of the Telopea 'Concept Plan Area' (CPA), as well as a detailed proposal for the first stage of development, known as 'Stage 1A'.

The purpose of this report is to provide a Qualitative Environmental Wind Assessment of the Stage 1A of the Telopea CPA. A subsequent report has been provided detailing the design principles associated with the Telopea CPA at large.

The immediate surrounds comprise predominantly residential properties within an established landscape setting. The broader Precinct contains the Telopea Public School, a neighbourhood centre known as the Waratah Shops, and two large Council parks known as Sturt Park and Acacia Park.

Wind Climate

On the basis of long-term wind records obtained from Bureau of Meteorology stations at Bankstown Airport and Sydney Kingsford Smith Airport, SLR has determined that project site has local winds characteristics closer to Bankstown Airport than Sydney (KS) Airport, given Telopea's distance inland from the coast. Accordingly, key prevailing wind directions of interest are the northeast, southeast and south for summer and mainly west quadrant winds for winter.

Existing Wind Environment

Existing street level wind conditions in the vicinity of the site could be close to or greater than 16 m/s "walking comfort" criterion for some prevailing wind directions, resulting from channelling of winds along aligning streets.

Future Wind Environment

SLR has worked with the project team throughout the design process and addressed potential wind concerns, with appropriate design measures incorporated and reflected in architectural drawings and development documentation. In terms of the future wind environment with the proposed development, the following features of the development are noted as being of most significance:

- The winds along the surrounding footpaths should remain at similar levels providing appropriate landscaping is employed, as shown on plans.
- Landscaping is to be retained as planned throughout the site to mitigate potential downwash and channelling impacts throughout the development.
- Vertical windbreaks are proposed to the upper level communal open space as a result of adverse upper level wind conditions.
- Wind mitigations are recommended to be incorporated to identified balconies from level 4 and above.

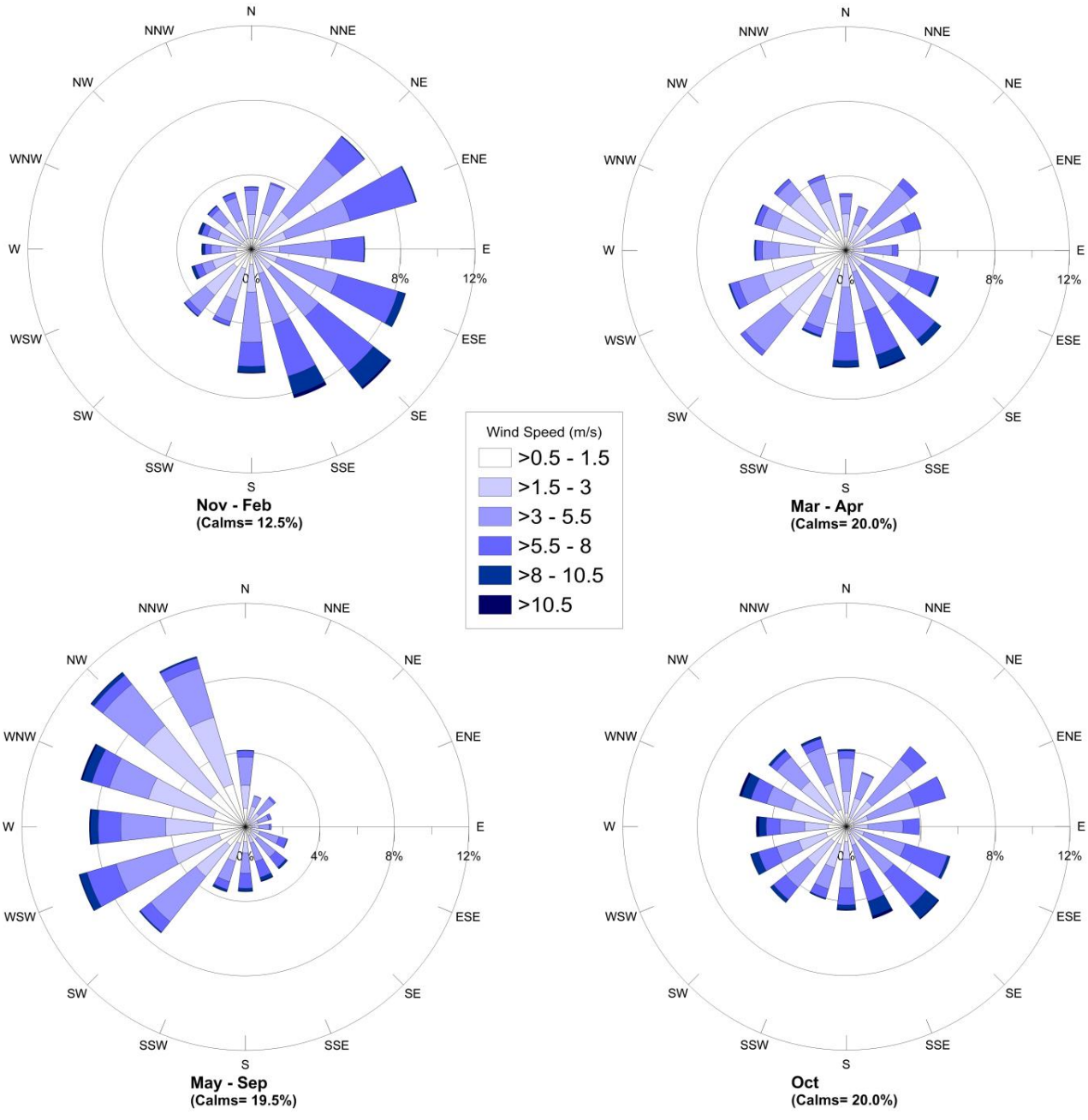
The above analysis has been made on the basis of our best engineering judgment and on the experience gained from scale model wind tunnel testing and/or Computational Fluid Dynamics (CFD) analysis of a range of developments. Detailed windflow modelling via either Wind Tunnel Testing or Computational Fluid Dynamics (CFD) Simulation can be used to confirm wind speed levels at specific locations and determine the extent of treatment required.

Taking into account all of the above, it is believed that the proposed development will likely comply with the adopted wind acceptability criteria at pedestrian and public access locations within and around the Development.

APPENDIX A

Seasonal Wind Roses for Bureau of Meteorology Met Stations at Bankstown Airport and Sydney (Kingsford Smith) Airport

Bankstown Airport AWS
(Observations)
1999-2017
600.09300



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Seasonal Wind Roses for Bureau of Meteorology Met Stations at Bankstown Airport and Sydney (Kingsford Smith) Airport

Sydney Airport AWS
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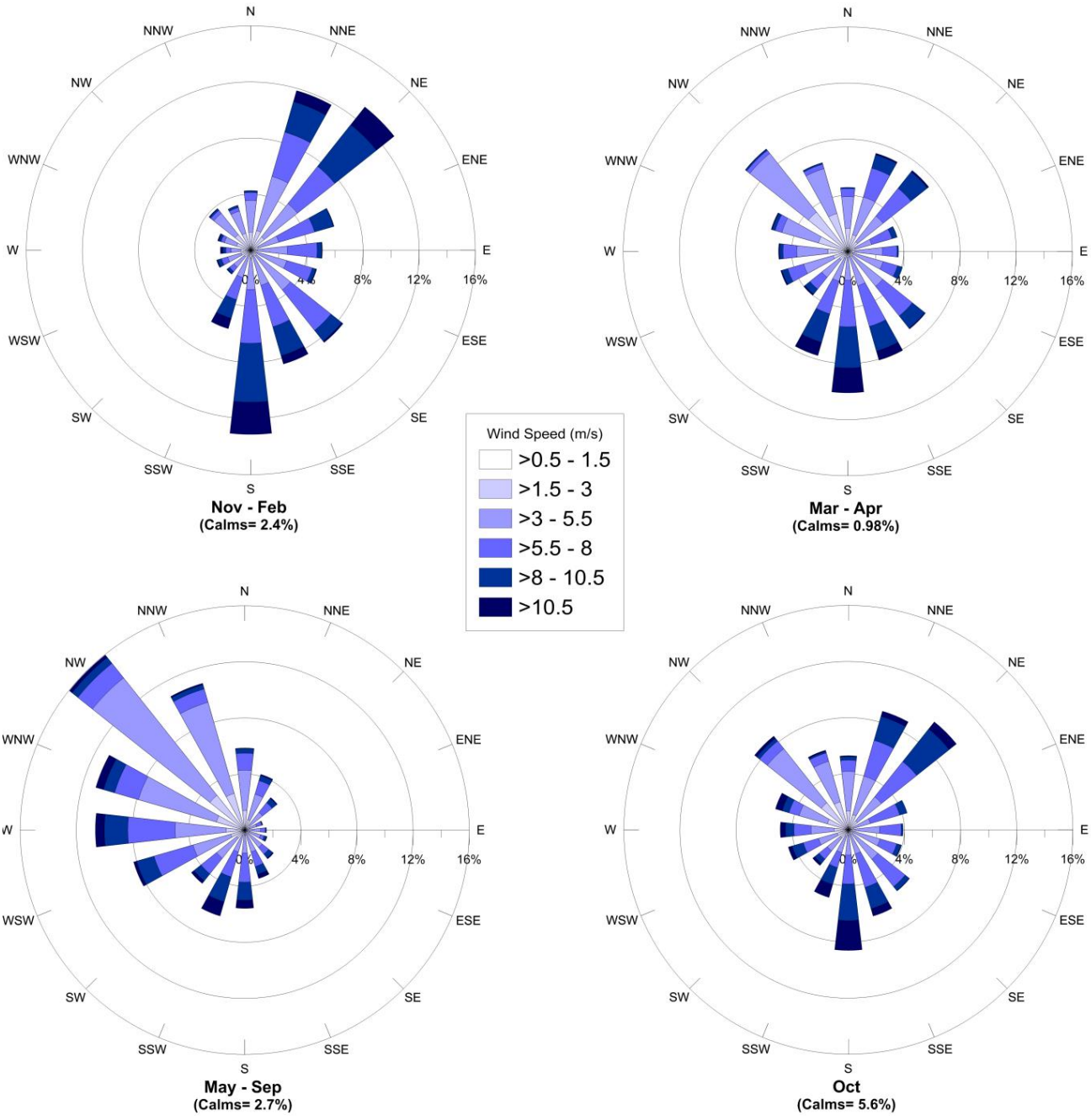
1999-2017
600.09300



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