15-21 COTTONWOOD CRESCENT

MACQUARIE PARK, NSW

PEDESTRIAN WIND ASSESSMENT

PROJECT # 2510813

9 FEBRUARY 2026

SUBMITTED TO

Cottonwood Development Pty Ltd
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SUBMITTED BY

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DOCUMENT CONTROL

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A	Initial	9 December 2025	AMC	RL / MJP
B	Final	3 February 2026	AMC	HK
C	Update for latest architectural drawings (received on 6 Feb 2026)	9 February 2026	AMC	HK

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STATEMENT OF DECLARATION

The undersigned declares that the Pedestrian Wind Assessment Report (PWA Report) has been prepared in accordance with relevant policy, guidelines, or legislative requirements. The PWA Report contains all available information relevant to the environmental assessment of the development, activity or infrastructure to which the PWA Report relates; does not contain information that is false or misleading; identifies and addresses the relevant Planning Secretary's environmental assessment requirements (SEARs) for the project; identifies and addresses the relevant statutory requirements for the project, including any relevant matters for consideration in environmental planning instruments to which the PWA Report relates; and contains a consolidated summary of the proposed or necessary mitigation measures.

Michael Pieterse, M.A.Sc., CPEng., P.Eng., RPEN
Senior Project Manager| Associate Principal

EXECUTIVE SUMMARY

This Pedestrian Wind Assessment Report has been prepared by RWDI Australia Pty Ltd (RWDI) to accompany a State Significant Development Application (SSDA) and concurrent Rezoning Proposal – SSD-94006708 for a mixed-use development identified at 15-21 Cottonwood Crescent, Macquarie Park (the site).

The proposal includes provision for the demolition of existing buildings and construction of a residential development comprising two residential flat buildings above a common basement car park / sleaved podium incorporating residential, car parking, and a retail component within the Waterloo Road frontage and provision of 10% affordable housing.

The legal description of the site is outlined in Table below.

Property Address	Title Description
15 Cottonwood Crescent, Macquarie Park	SP8144
17 Cottonwood Crescent, Macquarie Park	SP7630
19 Cottonwood Crescent, Macquarie Park	SP7892
21 Cottonwood Crescent, Macquarie Park	SP7984

Note: for the purposes of reporting and branding of the proposal, we will also refer to the site as '88 Waterloo Road, Macquarie Park'.

This report has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs) issued for the project (SSD-94006708).

This report concludes that the Proposed Development is suitable and warrants approval subject to the implementation of the mitigation measures outlined in **Section 5.4 of the report**. Following the implementation of these management measures / mitigation measures, the remaining impacts are considered appropriate and acceptable.

1. INTRODUCTION AND OBJECTIVES

1.1 Introduction

This report has been prepared in support of a State Significant Development Application (SSDA) and concurrent Rezoning Proposal – SSD-94006708 – at 15-21 Cottonwood Crescent, Macquarie Park (AKA. 88 Waterloo Road).

The application seeks development consent for the redevelopment of the site for a mixed-use development comprising residential accommodation and retail uses.

Specifically, this application seeks approval for the following:

- Demolition of all existing four-storey residential flat buildings on the site
- Site preparation works including:
    - Excavation of the site to a maximum depth of six (6) basement levels
- Construction of two mixed-use buildings comprising a 60 and 52 storey building respectively, which will accommodate:
    - 858 Residential apartments inclusion 10% affordable housing of the uplift being sought
- Six (6) levels of basement with 825 car parking spaces, bicycle parking, services.
    - A two-level commercial podium containing:
        - Retail spaces
        - Four townhouses
        - Residential lobbies
        - Waste Storages
        - Residential and visitor Parking spaces
        - Bicycle Parking spaces
- Communal Open Space and residential amenities on level four (4).
- Rooftop Terrace on Level 52 of Cottonwood Crescent Tower and level 60 of Waterloo Road Tower.

The proposal includes provision to amend Clauses 4.3 and 4.4 of the *Ryde Local Environmental Plan 2014* (RLEP2014) by virtue of the concurrent rezoning process. This includes the following amendments:

- Clause 4.3 – Height of Buildings:
    - Amend the current 65m maximum building height to 205.5m
- Clause 4.4 – FSR:
    - Amend the current FSR of 4.5:1 to 17:8:1

1.2 Purpose of this Report

This report has been prepared in response to the requirements contained within the Secretary's Environmental Assessment Requirements (SEARs) dated 8 October 2025 and issued for the SSDA (SSD-94006708). Specifically, this report has been prepared to respond to the SEARs requirement and government agency comments issued below.

Item	Description of Requirement	Section Reference
	Environment Amenity	
7	Assess amenity impacts on the surrounding locality, including solar access, visual privacy, view loss and view sharing, as well as **wind**, lighting and reflectivity impacts. A high level of environmental amenity for any surrounding residential or other sensitive land uses must be demonstrated.	Section 5.2
	Public Domain and Public Spaces	
23	If public space is proposed as part of the development, demonstrate how the development: • maximises the amenity of public spaces in line with their intended use, such as through adequate facilities, solar access, shade and **wind protection.**	Section 5.4

1.3 Site Description

The site is at 15-21 Cottonwood Crescent; Macquarie Park is located within the Ryde Local Government Area (LGA). The site occupies a prominent and highly accessible position within the Macquarie Park precinct, benefitting from dual street frontages to Waterloo Road along the north-eastern boundary and Cottonwood Crescent along the south-eastern boundary. These street interfaces provide strong address, visibility and access opportunities for the proposed development.

The western boundary adjoins Elouera Reserve, providing a high-amenity interface with publicly accessible open space, mature vegetation and a landscaped green corridor. This relationship enhances the site's environmental quality and outlook and provides opportunities for sensitive integration of the proposed development with the adjoining parkland.

The south-western boundary adjoins existing residential properties at 13 Cottonwood Crescent and 12–14 Lachlan Avenue, which represent the primary low-rise residential interface for the site.

The approximate boundary dimensions are as follows:

- 52.45 metres to Waterloo Road
- 97.35 metres to Cottonwood Crescent
- 50.6 metres to adjoining residential properties
- 100.9 metres to Elouera Reserve

The site is fully serviced, with existing connections to water, sewer, electricity, gas and telecommunications, and is therefore capable of supporting redevelopment without the need for major external servicing upgrades

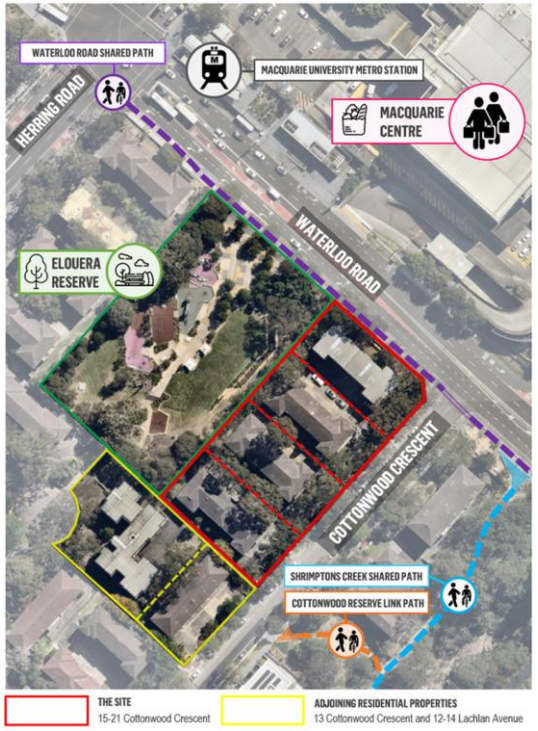


Image 1: Aerial Photo
Source: Urbis (Nearmap)

1.4 Proposed Development

The proposal comprises of residential development comprising two residential flat buildings above a common basement car park / sleeved podium incorporating residential, car parking, and a retail component within the Waterloo Road frontage. The overall height of the towers is approximately 205 m. Image 2 shows the 3d model of the Proposed Development.

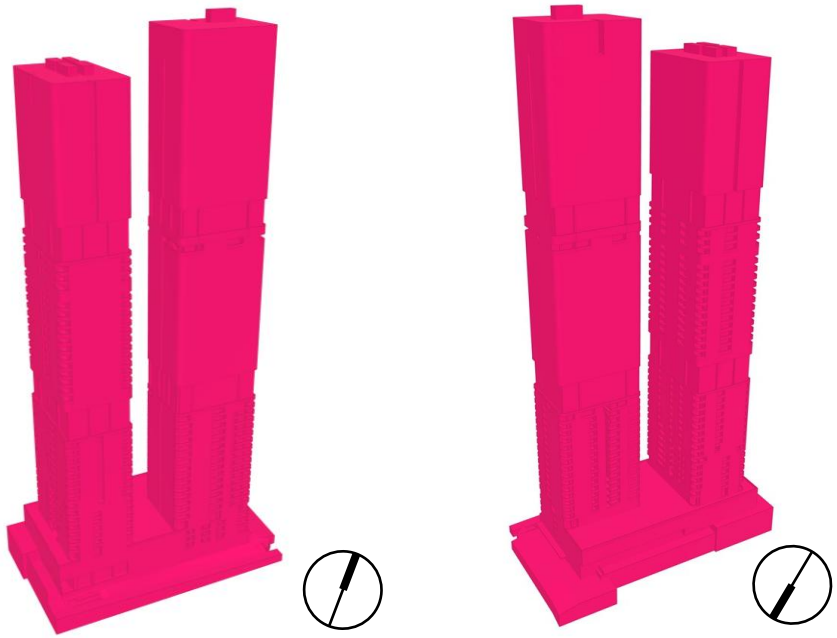


Image 2: 3D Model of Proposed Development

2. BACKGROUND AND METHODOLOGY

2.1 Objectives and Scope

The objective of this assessment is to provide an evaluation of the wind comfort conditions around the Proposed Development site using a 1:1 scale computational model. Predicting outdoor wind conditions is a complex process that involves the combined assessment of building geometry, orientation, position and height of surrounding buildings, upstream terrain and the local wind climate. Computational Fluid Dynamics is a useful tool for this as it not only combines the impact of these various parameters but can also provide a visual reference for the merits of a particular design of the building.

This analysis was, therefore, based on the following:

- A review of the regional long-term meteorological data.
- Use of the Orbital Stack Direct, an in-house CFD tool, to provide numerical estimation of potential wind conditions around the site for the prevailing winds. The simulation models have been based on the initial information provided to RWDI between November 2025 to February 2026.
- RWDI's engineering judgement, experience, and expert knowledge of wind flows around buildings including wind tunnel studies undertaken for similar projects in the region.

Note that other microclimate issues such as those relating to cladding and structural wind loads, door operability, building air quality, noise, vibration, etc. are not part of the scope of this assessment.

2.2 CFD in Urban Wind Modelling

CFD is a numerical technique that can be used for simulating wind flows in complex environments. For this analysis, CFD techniques were used to generate a virtual wind tunnel where flows around the site and its surroundings were simulated in full scale. The computational domain that covered the site and its surroundings was divided into millions of small cells where calculations were performed, yielding a prediction of wind conditions across the entire study domain. CFD excels as a tool for wind modelling, presenting early design advice, comparing different design and site scenarios, resolving complex flow physics, and helping diagnose problematic wind conditions.

While the computational modelling method used in the current assessment does not explicitly simulate the transient behaviour of turbulent wind, its effects were estimated based on other calculated quantities. RWDI has found this approach to be appropriate for the assessment of typical wind comfort conditions. Wind safety issues, which relate to transient, higher-speed gusts, are discussed qualitatively, based on the CFD predictions and RWDI's extensive wind-tunnel experience for other projects in the area. In order to quantify the transient behaviour of wind and refine any conceptual mitigation measures, a more detailed assessment would be required using either boundary-layer wind tunnel or more detailed transient computational modelling.

2.3 Simulation Model

Wind flows were simulated using Orbital Stack, an in-house computational fluid dynamics (CFD) tool that has been validated using RWDI's historical wind tunnel test data and experience. Simulations were conducted for the following site configurations:

- Config 1: Proposed Development with the inclusion of existing and under-construction buildings (see Image 3).

For this computational study, the 3D models were simplified to focus on elements most likely to influence local wind flows in and around the site. Hence, smaller architectural and accessory features on the surrounding buildings, were excluded from the model. Local topographic variations were modelled to account for the changes in the wind speeds that can occur due variations in topography.

2.4 Methodology

Winds approaching from sixteen cardinal directions were simulated accounting for the effects of the atmospheric boundary layer and terrain impacts upwind of the project site. The wind field was assumed to be steady in time and, as such, the transient effects of strong wind gusts and vortex shedding was not included directly. Turbulence was modelled in the wind simulations by a Reynolds Averaged Navier-Stokes (RANS) approach using the k-epsilon (RNG) turbulence closure. These results were then combined with the meteorological data (Section 3) to determine the variation of wind speeds in the areas of concern at typical pedestrian chest height (i.e., 1.5 m above local grade). These conditions were then assessed against the wind criteria for pedestrian comfort (Section 4) and, the spaces were categorised accordingly.

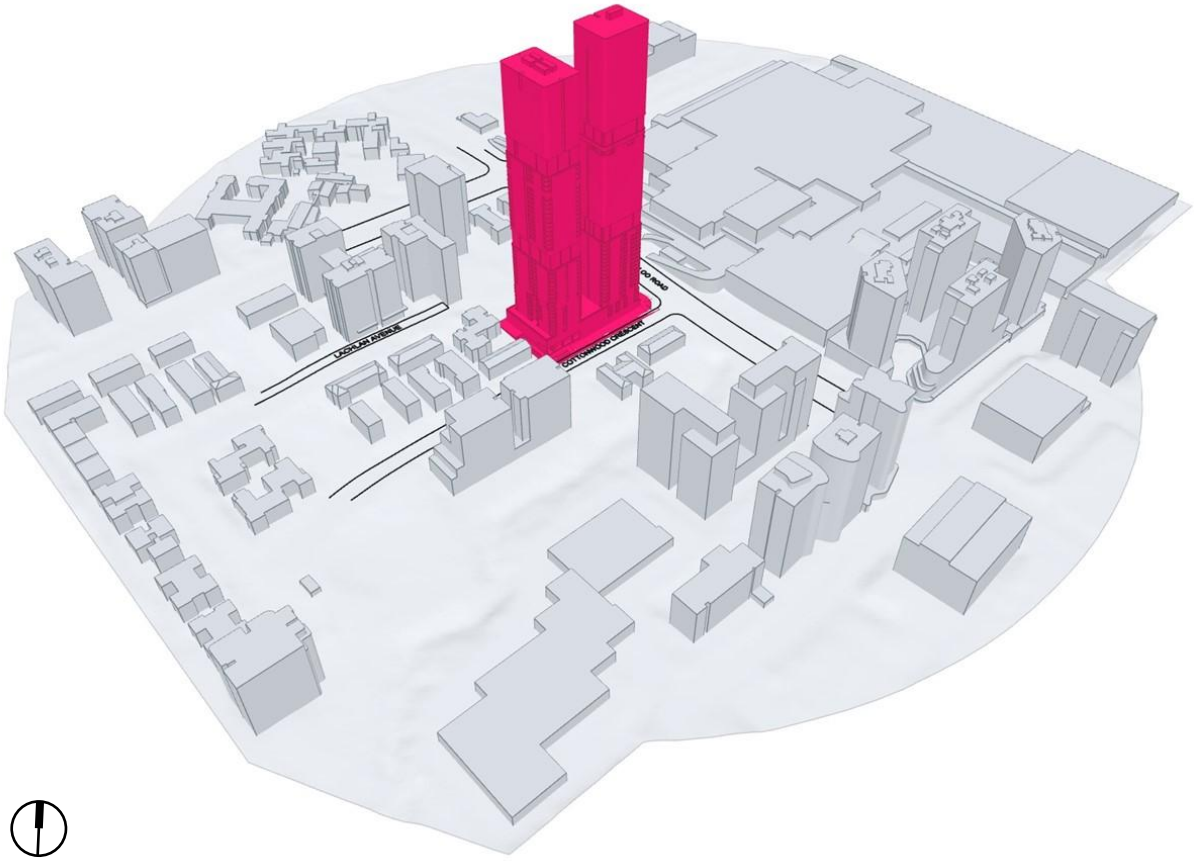
The method for CFD simulation is consistent with internationally recognised good practice, and meets the requirements set out in the Australasian Wind Engineering Society Computational Wind Engineering Quality Assurance Manual (2024).

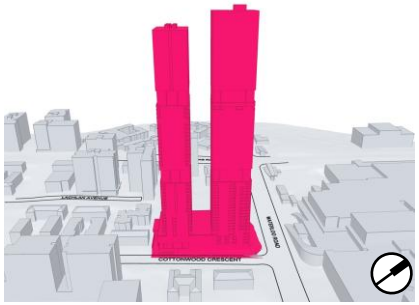
Qualitative reviews have also been provided for the existing site based on past simulations and wind tunnel tests of neighbouring developments.

2. BACKGROUND AND METHODOLOGY

Proposed Development

Existing Buildings





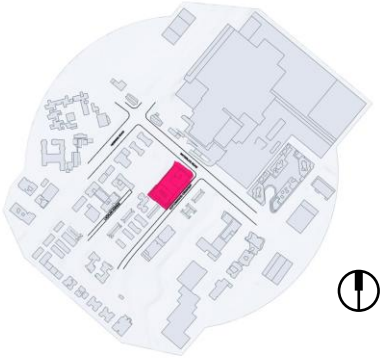


Image 3: Computer Model of the Config 1
Proposed Configuration

2.5 Factors Affecting Wind Flows

In the discussion of wind conditions on and around the Proposed Development, reference may be made to the following generalised wind flows (see Image 4). If these building / wind combinations occur for prevailing winds, there is a greater potential for increased wind activity and uncomfortable or potentially unsafe conditions. Design details such as setting back a tower from the edges of a podium for a prevailing wind direction, deep canopies close to ground level, wind screens / tall trees with dense landscaping, etc. can help reduce high wind activity. The choice and effectiveness of these measures would depend on the exposure and orientation of the site with respect to the prevailing wind directions and the size and massing of the proposed buildings.

Conversely, in areas where higher wind velocities are desired for increased thermal comfort, design measures can be implemented to enhance wind flow. For instance, channels aligned with prevailing wind directions can be integrated into the design to promote increased wind infiltration in regions prone to stagnant conditions. Such measures are particularly beneficial in areas with generally milder wind climates and high humidity levels, such as those closer to the equator.

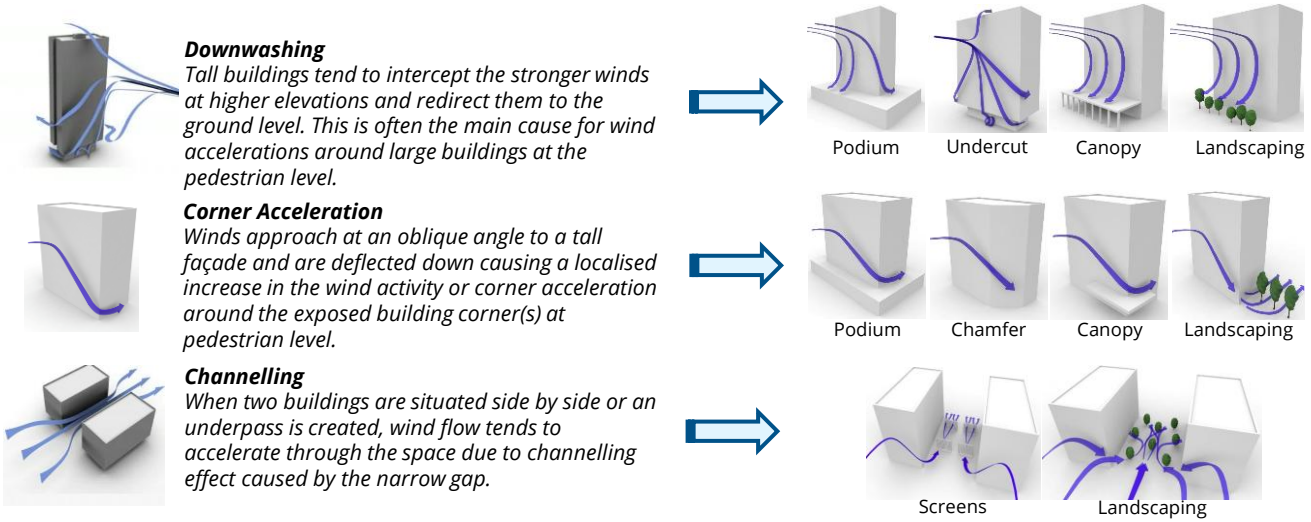


Image 4: General Wind Flow around Buildings with Examples of Common Wind Measures

3. METEOROLOGICAL DATA

Meteorological data recorded at Sydney Internation Airport from 1995 to 2022 were used as a reference to assess the wind conditions in the study area. Image 5 graphically depicts the directional distributions of wind frequencies and speeds recorded at the station over this time.

Winds from the northeast, south and west to northwest sectors are predominant throughout the year with secondary winds from south-southeast. Strong winds are observed from the northeast, south and west sectors throughout the year. These winds can potentially be the source of uncomfortable wind conditions, depending on the site exposure or development design.

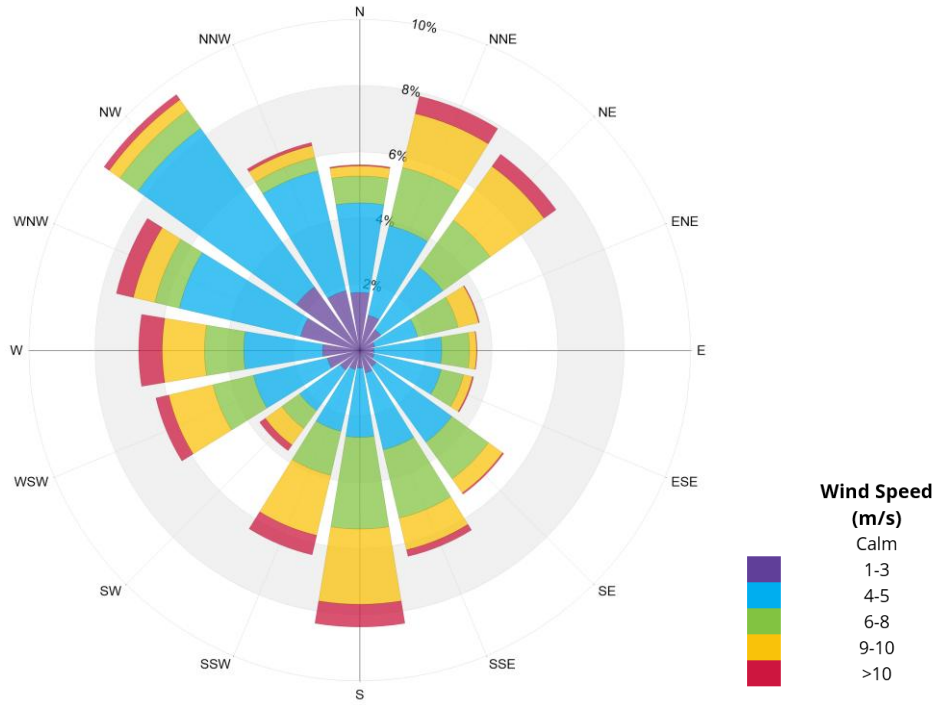


Image 5: Directional Distribution of Winds Approaching Sydney International Airport
(1995 - 2022)

4. PEDESTRIAN WIND CRITERIA

Pedestrian wind comfort is assessed using the criteria described in *City of Ryde Development Control Plan (2014),* illustrated in Image 6. The wind comfort levels are classified based on typical/intended pedestrian activity and are expressed in terms of their suitability for various levels of human activity. The categorisation is based on conservative wind speeds such that higher the activity level, the higher the wind speed one can typically tolerate while engaged in that activity.

Note that wind conditions are assessed at a typical pedestrian chest height (1.5 m above local grade) and are considered suitable for the intended use of the space if the associated winds are not expected to exceed the specified criterion for more than 5% of the time between usual occupancy times (6am to 10pm). Wind control measures are typically required at locations where the occurrence frequencies of wind speeds exceed the threshold values for specific pedestrian activities.

Professional judgement incorporating RWDI's experience of a large number of similar projects both within Australia and internationally has been applied, informed by the CFD results, to identify areas within and around the Proposed Development that are likely to have instances of strong winds. Mitigation measures can be used to improve pedestrian comfort conditions and to reduce the frequency of, or even eliminate, any strong winds.

Note the wind safety conditions in line with the relevant local requirements are assessed qualitatively using the available information from the CFD studies and the wind tunnel data for the development and the surrounding sites.

Image 6: Pedestrian Wind Comfort Criteria

5. RESULTS AND DISCUSSIONS

5.1 Existing Site Conditions (Qualitative Review)

A qualitative review of the wind conditions of the existing site (shown in Image 7 with wind rose overlay) based on wind tunnel tests and computational wind simulations of other projects in the regions is provided below:

- The existing site comprises of low-rise residential buildings that are comparative in height with surrounding neighbouring buildings. Hence, the existing buildings are not likely to impact the overall wind environment with wind effects likely to be governed by the mid-rise buildings surround the site.
- Wind conditions along the surrounding streets are likely to range from standing to strolling use. Areas near the taller mid-rise buildings such as near 25 Lachlan Avenue building (currently under construction) and the existing 10 Cottonwood Crescent can reach walking comfort levels.
- High wind speeds exceeding the comfort or safety limit are not expected within or around the site.

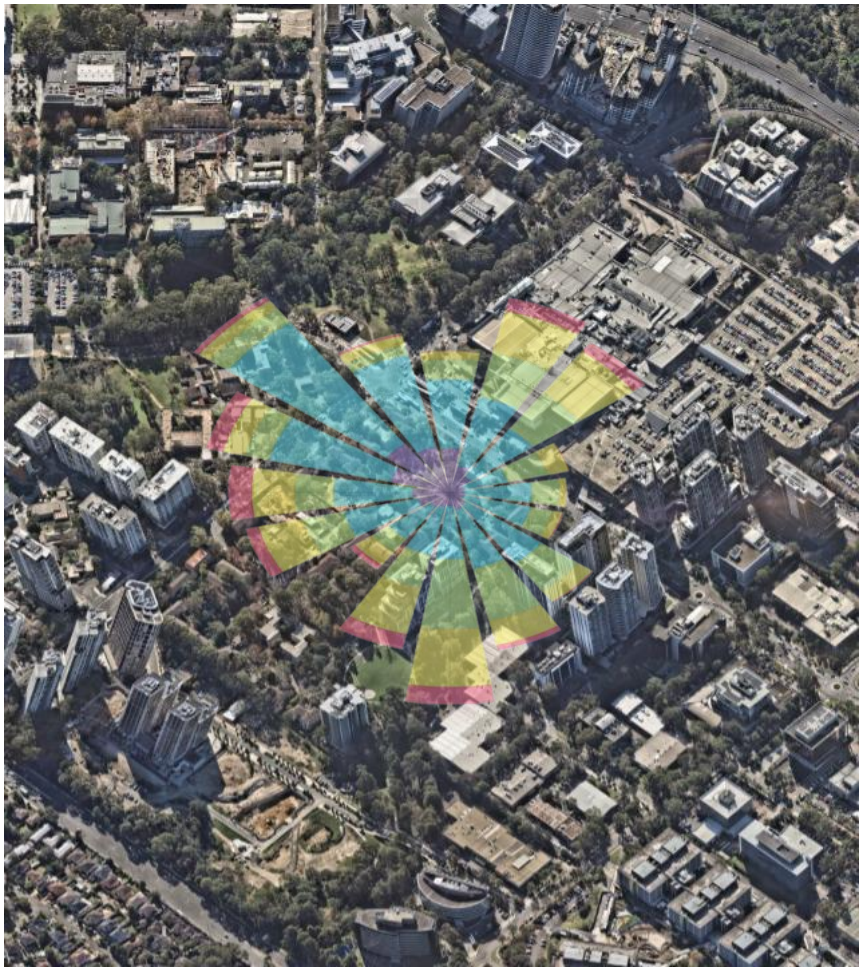


Image 7: Existing Site with Wind Rose Overlay (Source: Nearmap)

5.2 Proposed Site Conditions

The predicted wind comfort conditions are presented in Images 8a to 8d for the Proposed Configuration. Interaction of the prevailing winds with the Proposed Configuration are also shown in Appendix A (Images A1 & A5). A summary of the wind comfort conditions is noted below.

- **Ground Level:** The wind conditions on the ground level are expected to be comfortable for active strolling to walking use in general. Areas near the development including at the primary entrances to the towers and the retail entrances along Waterloo Road expected to be suitable for passive standing use. These conditions are comfortable for the intended use of these spaces. However, it is noted that wind speeds can exceed the safety limit near the corner of Cottonwood Crescent and Waterloo Road due to downwash and subsequent corner acceleration of northeasterly and southerly winds. Similarly, the southern ramp access on Cottonwood Crescent to the south tower may be subject to stronger winds that can exceed the criteria.
- **Elouera Reserve**: Wind environment within the Elouera Reserve is expected to be comfortable for strolling use. However, winds from the south are likely to be redirected by the tower massing leading to conditions near the western corner of the tower to be suitable for walking use. This area can be prone to strong gusts that can also exceed the safety limit. However, it is noted that the corner is not trafficable. The existing dense vegetation at this corner is also likely to reduce winds at the corner and further within the reserve.
- **Level 4 Communal Terrace (Podium):** The wind conditions within the communal terrace on Level 4 podium are expected to range from strolling to walking use in most areas. However, areas near the western corners of both towers are expected to be uncomfortable. Wind speeds can also exceed the safety limits within the terrace near building corners and between the two towers. These are typically caused by the local acceleration of regional winds near corners and channelling of winds between the towers.
- **Level 4 Northwest Court:** High winds are likely to occur around the northwest corner that are expected to impact overall conditions around the corner.
- **Private Balconies:** Wind conditions within inset balconies across both towers are generally expected to be suitable for passive sitting or standing use with spaces near the perimeter likely to be comfortable for strolling use. These are typically suitable wind conditions for private balconies. However, balconies located at and near building corners are subject to significantly stronger winds with conditions likely to exceed both comfort and safety thresholds. These elevated wind speeds are primarily driven by corner acceleration effects.

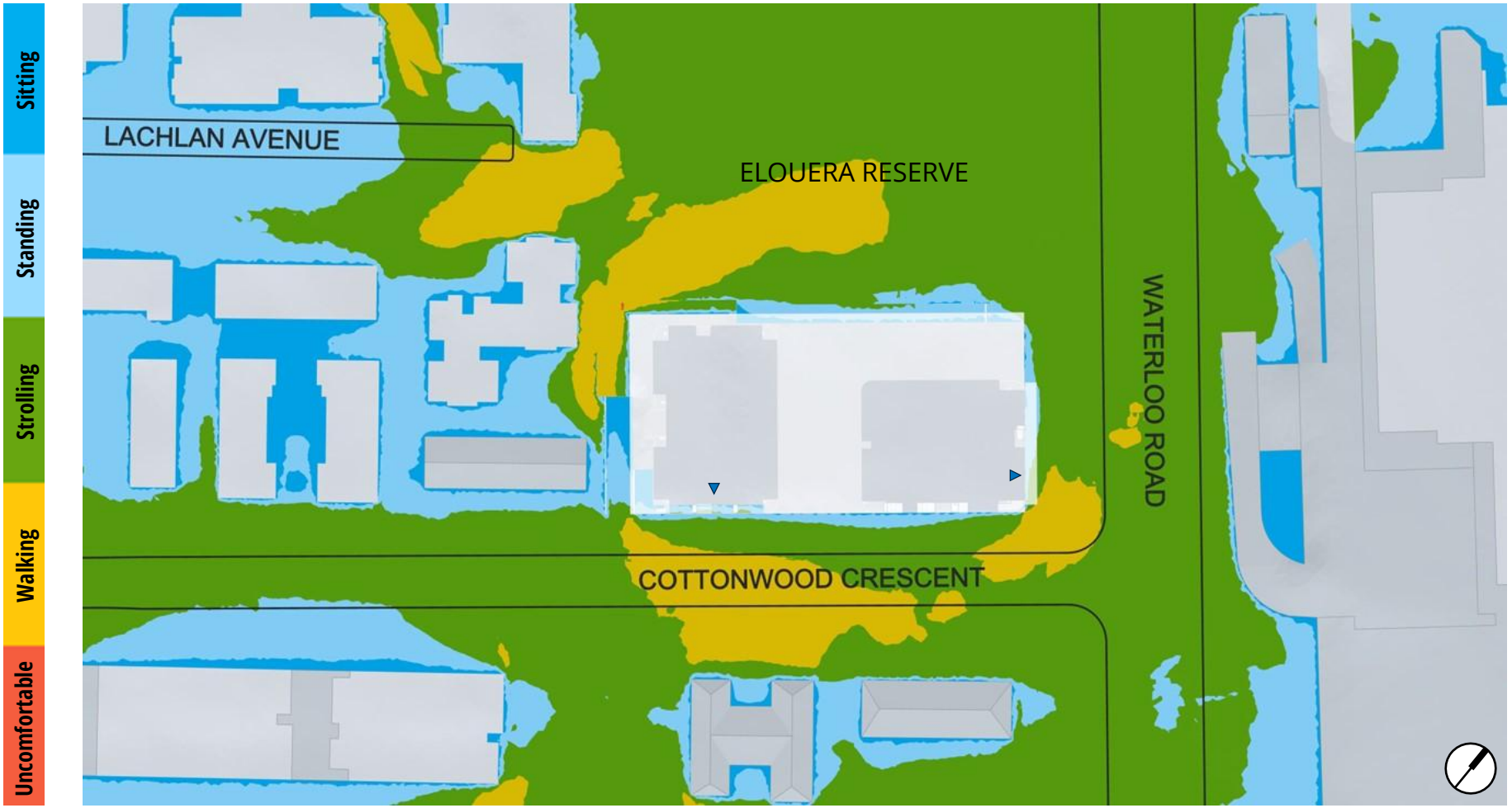


Image 8a: Annual Wind Comfort Conditions – Ground

5. RESULTS AND DISCUSSIONS

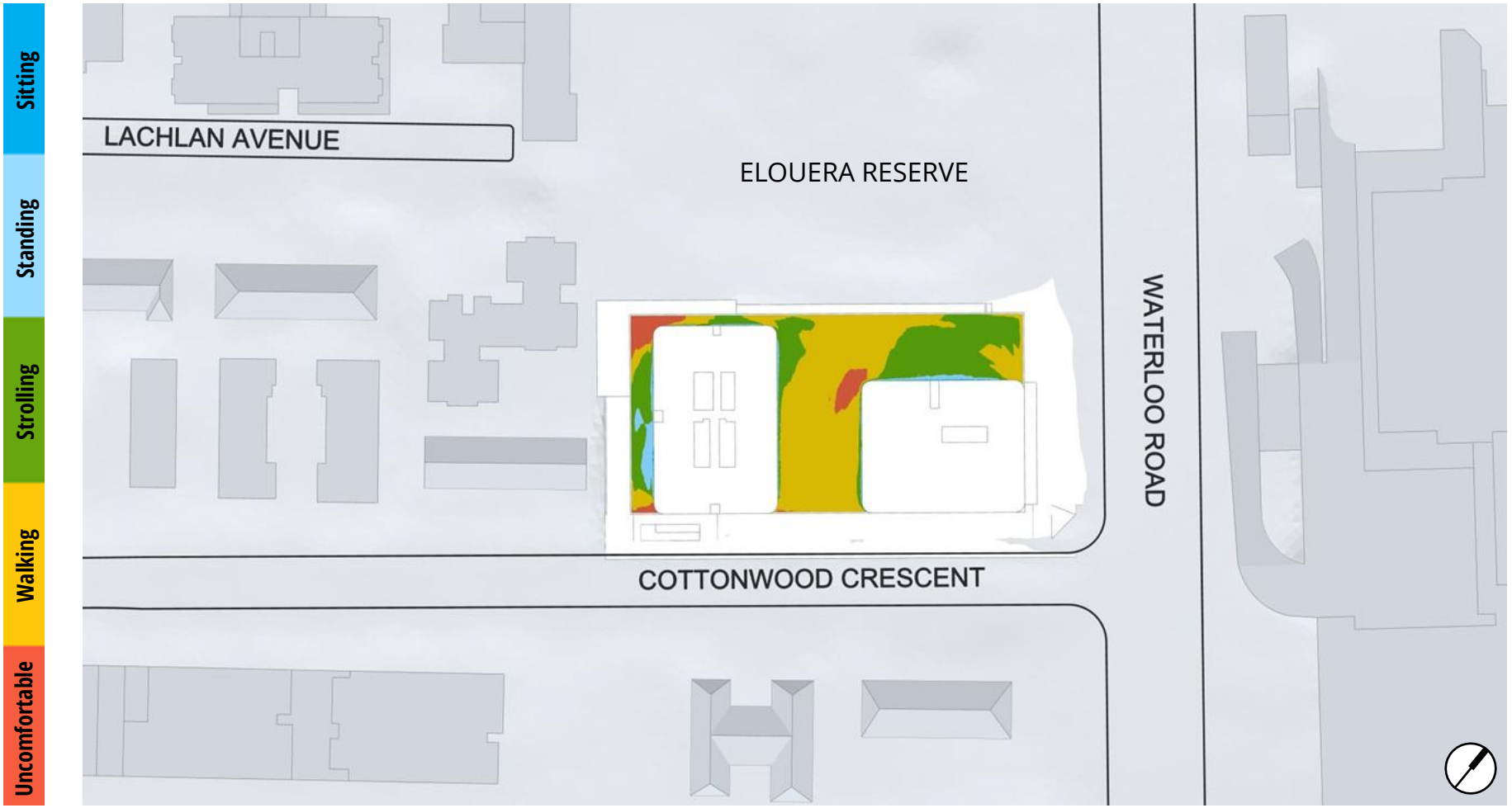


Image 8b: Annual Wind Comfort Conditions – Level 4 Podium

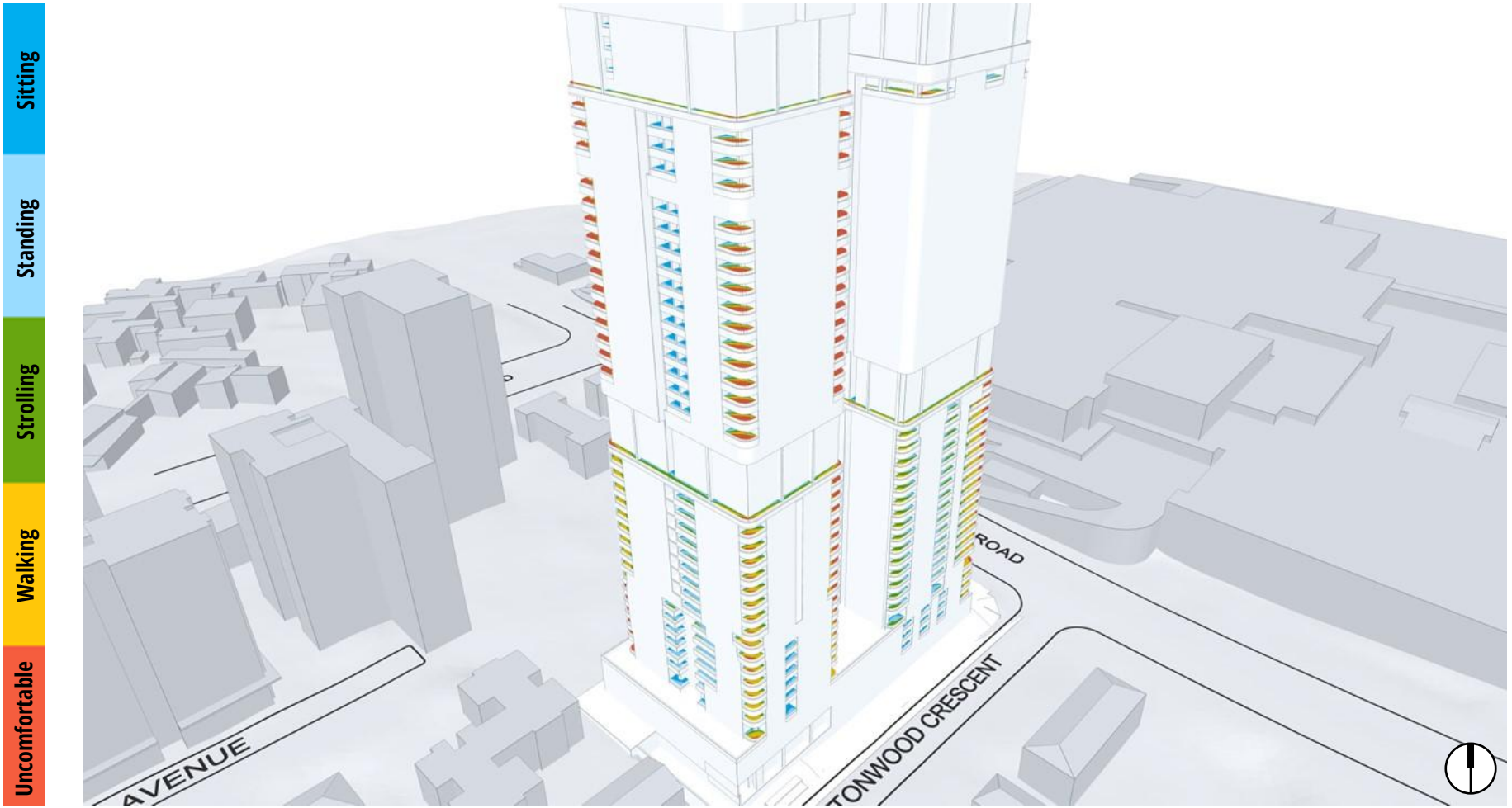


Image 8c: Annual Wind Comfort Conditions – Private Balconies
View from South

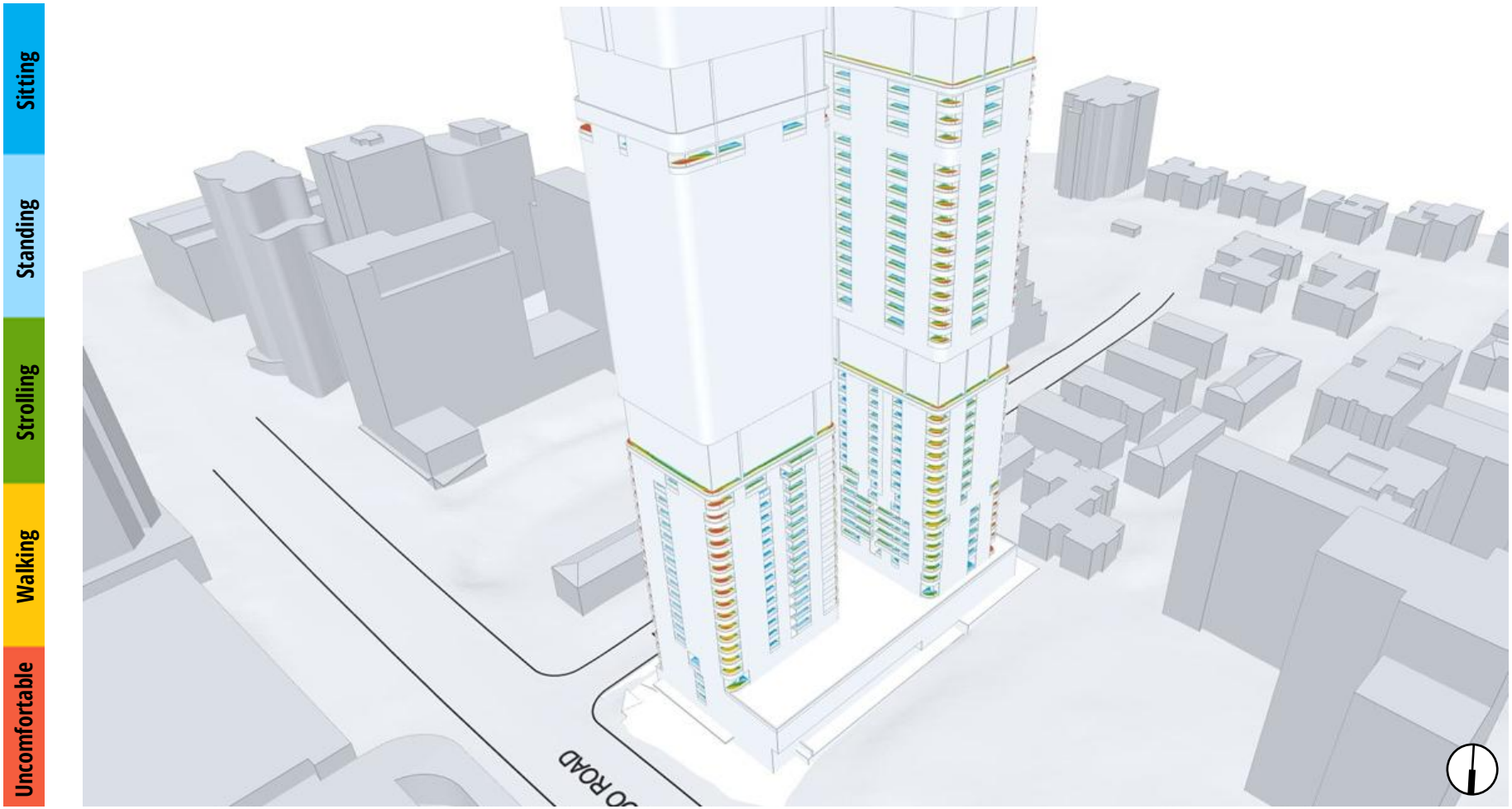


Image 8d: Annual Wind Comfort Conditions – Private Balconies
View from North

5. RESULTS AND DISCUSSIONS

5.3 Cumulative Impact Assessment

Image 9 illustrates the major future developments within an approximately 400 m radius of the project site. These include:

1. 14–16 Cottonwood Crescent, Macquarie Park Development – Single 20 storey tower: The tower is located across the street and is likely to increase wind channelling along the Cottonwood Crescent with conditions likely to increase to walking comfort levels. The future tower may also lead to comfort or safety exceedances near the corner of Cottonwood Crescent and Waterloo Road.
2. 85-97 Waterloo Road, Macquarie Park – 7 Towers ranging up to a maximum height of 20-storeys: These towers are located further to the east which is not a prevailing wind direction. No significant impact is expected on site conditions.
3. 5-7 Cottonwood Crescent, Macquarie Park – 15 storey tower: Located to the south of the Proposed Development, the future tower is likely to increase wind channelling along Cottonwood Crescent with conditions likely to range from strolling to walking use. Impact around the Proposed Development are likely to be small.
4. 161 Herring Rd, Macquarie Park – 17 storey tower: The future tower can increase wind conditions along Lachlan Avenue combined with 5-7 Cottonwood Crescent building with conditions likely to be suitable for strolling use. Impact around the Proposed Development are likely to be small.

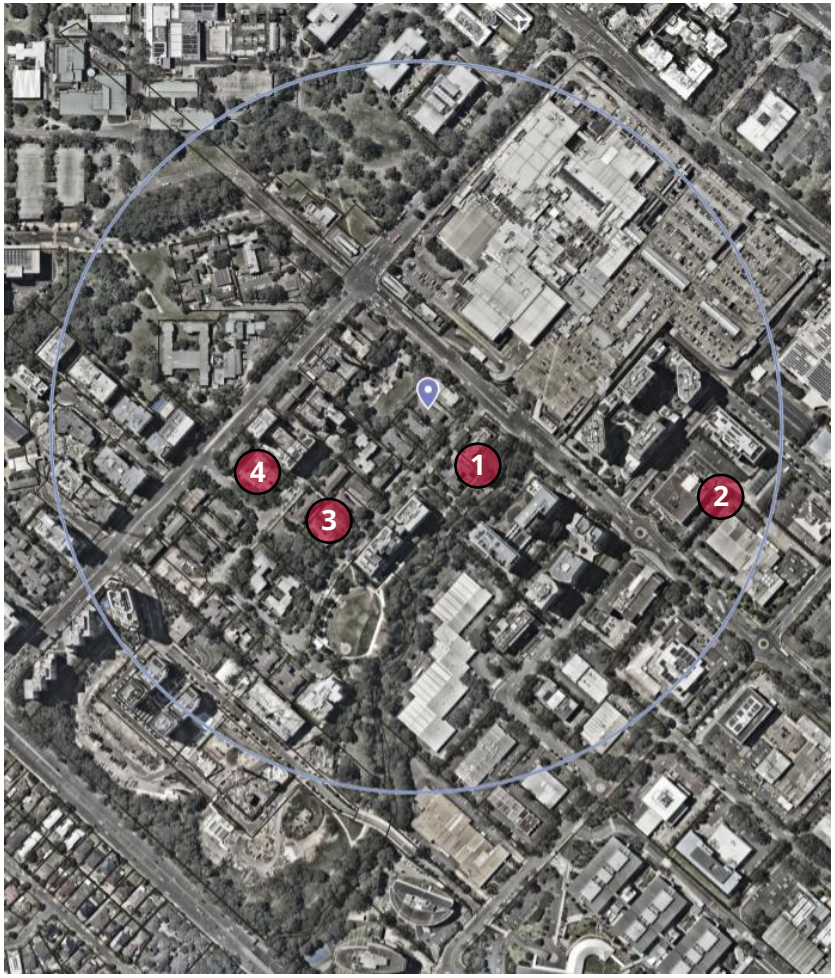


Image 9: Future Surrounding Buildings in a 400m radius (Source: Nearmap)

5.4 Wind Mitigation Strategy

Based on the findings of this study, the following wind mitigation measures are recommended to improve the overall wind environment within and around the site:

- **Ground Level Awning:** It is recommended to increase the width of the awning along Waterloo Road. The extents of the awning should also be increased to cover Cottonwood Crescent. The awning should be impermeable to mitigate downwash due to the northeasterly and southerly winds. The awning width will be confirmed during wind tunnel tests.
- **Landscape:** It is recommended to retain trees around the corner of Waterloo Road and Cottonwood Crescent. Additionally, incorporating local vegetation around outdoor seating areas along Waterloo Road is advised. This will provide an extra layer of wind protection for potential retail spill-out spaces and enhance pedestrian comfort.
- **Screening around Ramp:** It is recommended to include impermeable 1.2 m tall screening around ramp access to the south tower to provide protection to individuals using the disability ramp. It is also recommended to include porosity in the screening adjacent to the mail room near the corner.
- **Carpark Porosity:** Introducing porosity in the façade for carpark levels is expected to provide an additional flow path for the winds and can reduce ground level winds further. This should be explored as the design of the development progresses further.
- **Level 4 Communal Terrace:** The wind mitigation strategy for the Level 4 communal terrace and pool area comprises of tall perimeter screening accompanied by intermittent porous screening within the planters to reduce wind buildup. Dense vegetation comprising of tree clusters and undergrowth are also recommended within the space as well as shade structures to further reduce wind reattachment risk. Local screening and landscape buffer are recommended around any outdoor areas intended for long-duration sitting use. Mitigation measures to be further confirmed during the wind tunnel tests.
- **Level 4 Northwest Court:** Taller perimeter screening with dense landscape buffer are recommended to reduce wind acceleration within the Level 4 Northwest Court. Inter-tenancy screening with heights of at least 1.8 m are also recommended within the proposed planters.
- **Private Corner Balconies:** It is recommended to include full-height screening (impermeable or with 50% porosity) along one of the open aspects for all private corner balconies of both towers. Upper-level balconies such as those located above Level 10 may experience strong winds. Hence, wintergardens should also be considered as these will fully mitigate any potential wind comfort or safety issues.

6. STATEMENT OF LIMITATIONS

Wind comfort conditions around the Proposed Development located at 15-21 Cottonwood Crescent, Macquarie Park, NSW are discussed in this report. This assessment is based on the CFD analysis of the proposed massing of the buildings using Orbital Stack. The findings of the report should be assessed based on the limitations listed below:

1. The analysis presented was based on the historical climate conditions for the region.
2. It is noted that the conditions presented herein depict statistical conditions for certain seasons. It would be prudent to be consider that specific seasonal trends (e.g., a heatwave) would be expected to result in ambient conditions which could create longer durations of uncomfortable conditions. Thermal comfort studies provide a more a holistic assessment of perceived comfort.
3. The effect of climate change (i.e., forward predictions of trends in meteorological conditions) has not been considered in the analysis. However, the use of the latest meteorological information should give some indication.
4. The CFD simulations were conducted using a steady-state analysis. This means that the wind speed predictions represent an 'average' of the expected conditions within and around the development. As such, RWDI would expect the comfort conditions to be more dynamic in reality than the 'static' images presented herein.
5. Gusts are an important part of the overall wind microclimate that can impact safety, and these have only been considered qualitatively in the current assessment. A more detailed assessment would be required using a boundary-layer wind tunnel to evaluate the gust response of the development.

7. APPLICABILITY OF ASSESSMENT

This report entitled "*15-21 Cottonwood Crescent: Pedestrian Wind Assessment*", dated 9 February 2026, was prepared by RWDI Australia Pty Ltd ("RWDI"). The findings and conclusions presented in this report have been prepared for the Client and are specific to the project described herein ("Project"). The conclusions and recommendations contained in this report are based on the information made available to RWDI between November 2025 and February 2026. In the event of any significant changes to the design, construction or operation of the building or addition of surroundings in the future, RWDI could provide an assessment of their impact on the wind conditions discussed in this report. It is the responsibility of others to contact RWDI to initiate this process.

Because the contents of this report may not reflect the final design of the Project or subsequent changes made after the date of this report, RWDI recommends that it be retained by Client during the final stages of the project to verify that the results and recommendations provided in this report have been correctly interpreted in the final design of the Project.

The conclusions and recommendations contained in this report have also been made for the specific purpose(s) set out herein. Should the Client or any other third party utilise the report and/or implement the conclusions and recommendations contained therein for any other purpose or project without the involvement of RWDI, the Client or such third party assumes any and all risk of any and all consequences arising from such use and RWDI accepts no responsibility for any liability, loss, or damage of any kind suffered by Client or any other third party arising therefrom.

Finally, it is imperative that the Client and/or any party relying on the conclusions and recommendations in this report carefully review the stated assumptions contained herein and to understand the different factors which may impact the conclusions and recommendations provided.

APPENDIX A

STREAMLINES AND WIND FLOWS

APPENDIX A

Config 1 – Proposed Configuration

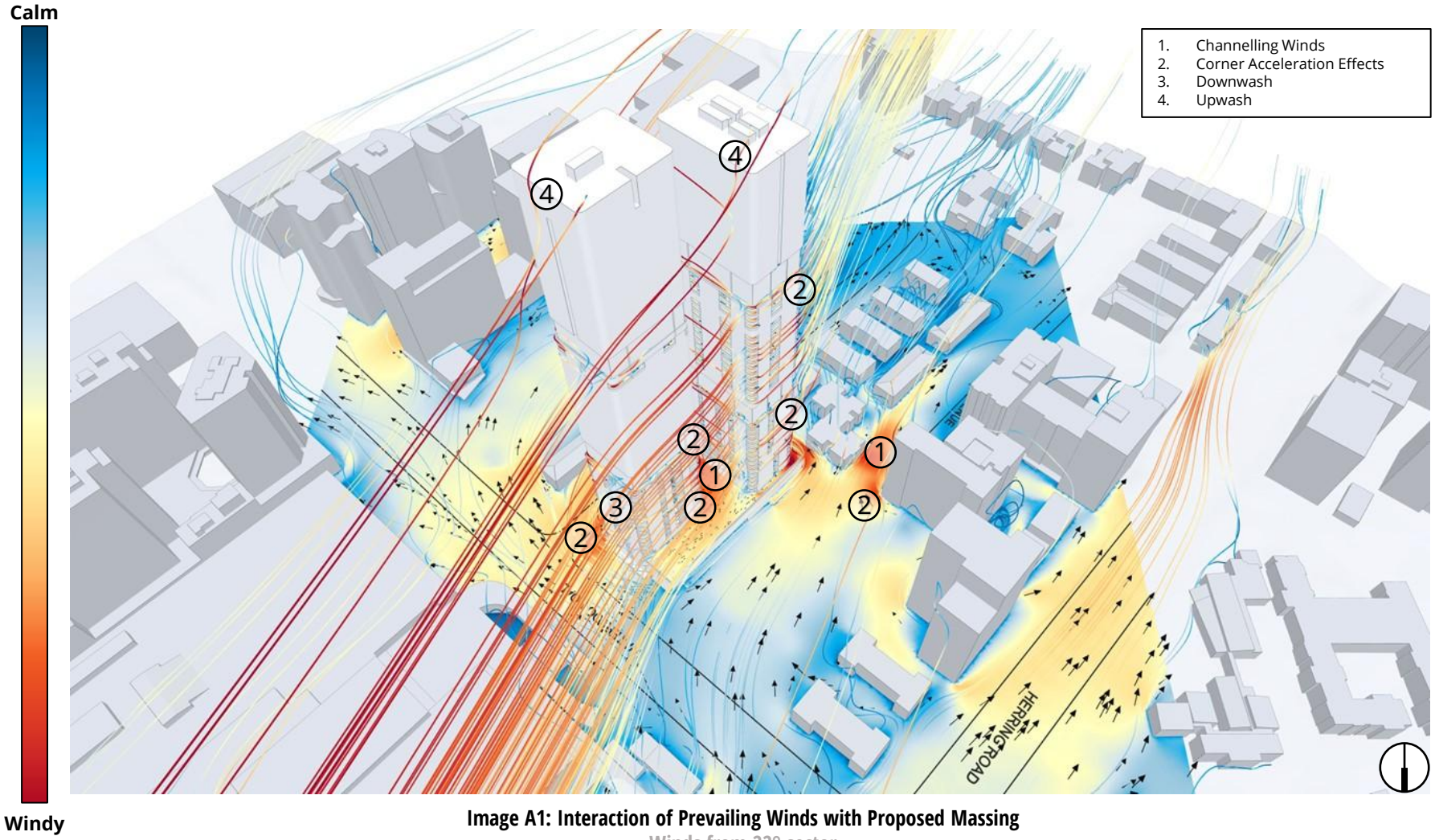


Image A1: Interaction of Prevailing Winds with Proposed Massing
Winds from 22° sector

APPENDIX A

Config 1 – Proposed Configuration

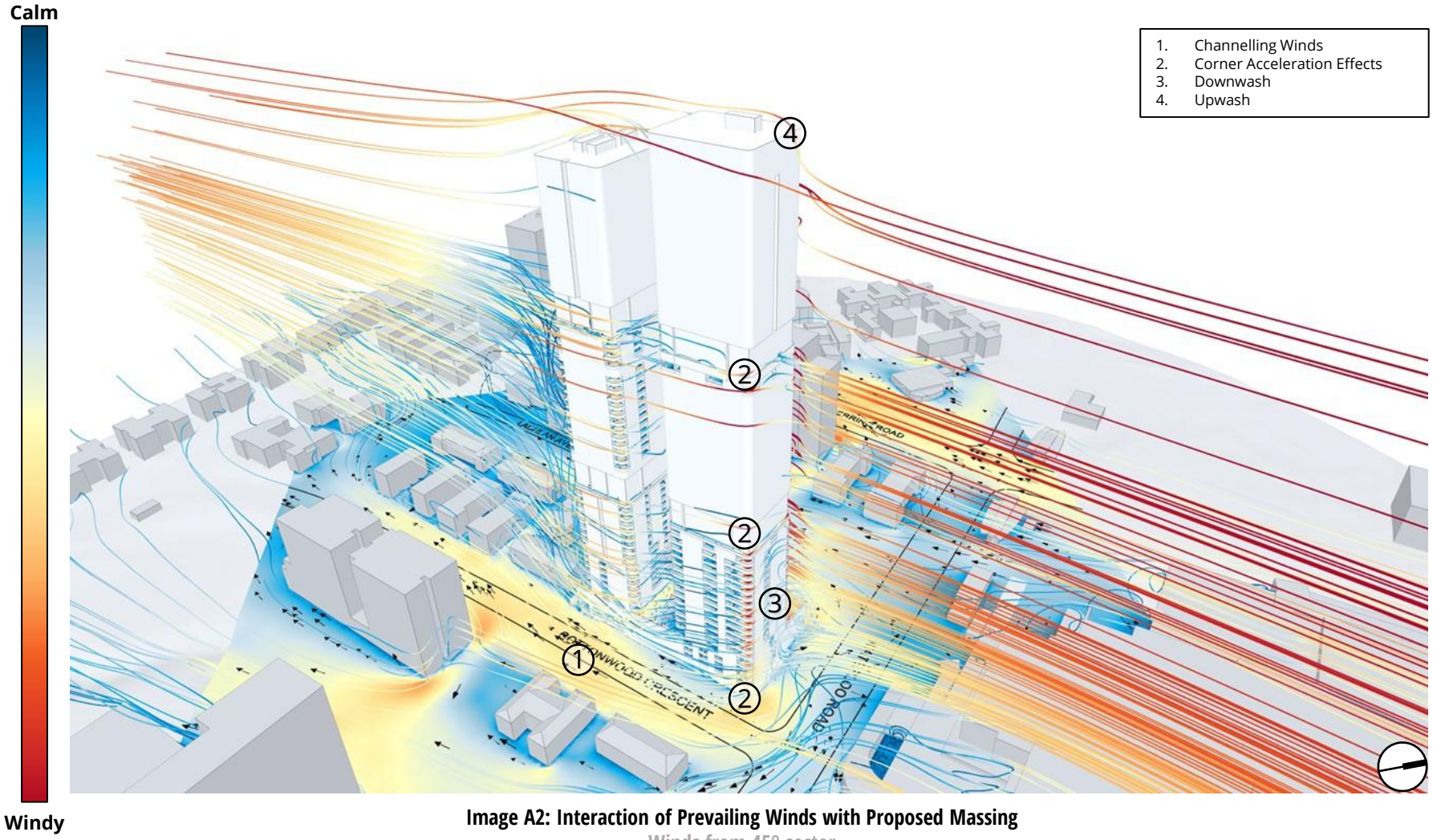


Image A2: Interaction of Prevailing Winds with Proposed Massing
Winds from 45° sector

APPENDIX A

Config 1 – Proposed Configuration

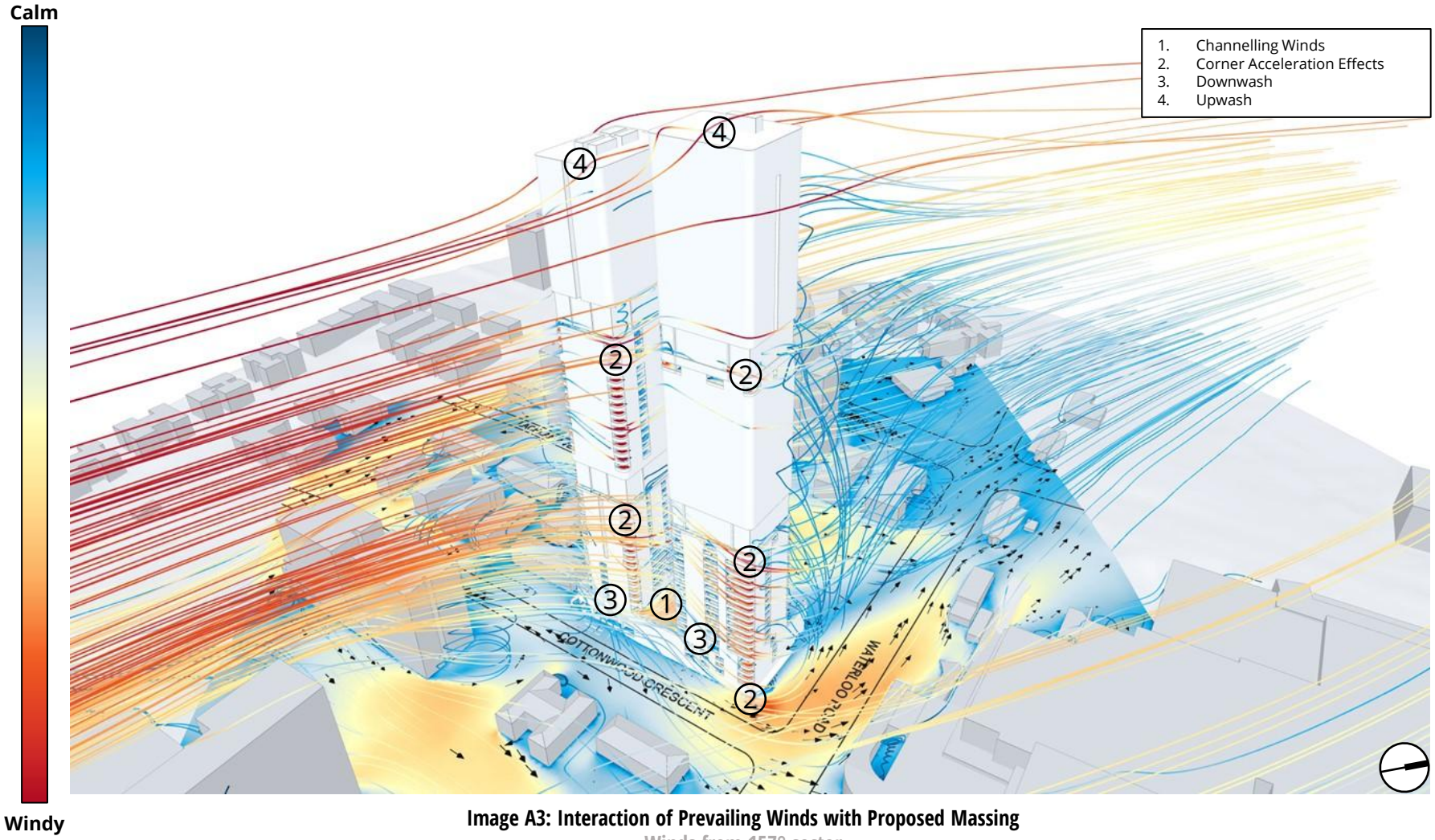


Image A3: Interaction of Prevailing Winds with Proposed Massing
Winds from 157° sector

APPENDIX A

Config 1 – Proposed Configuration

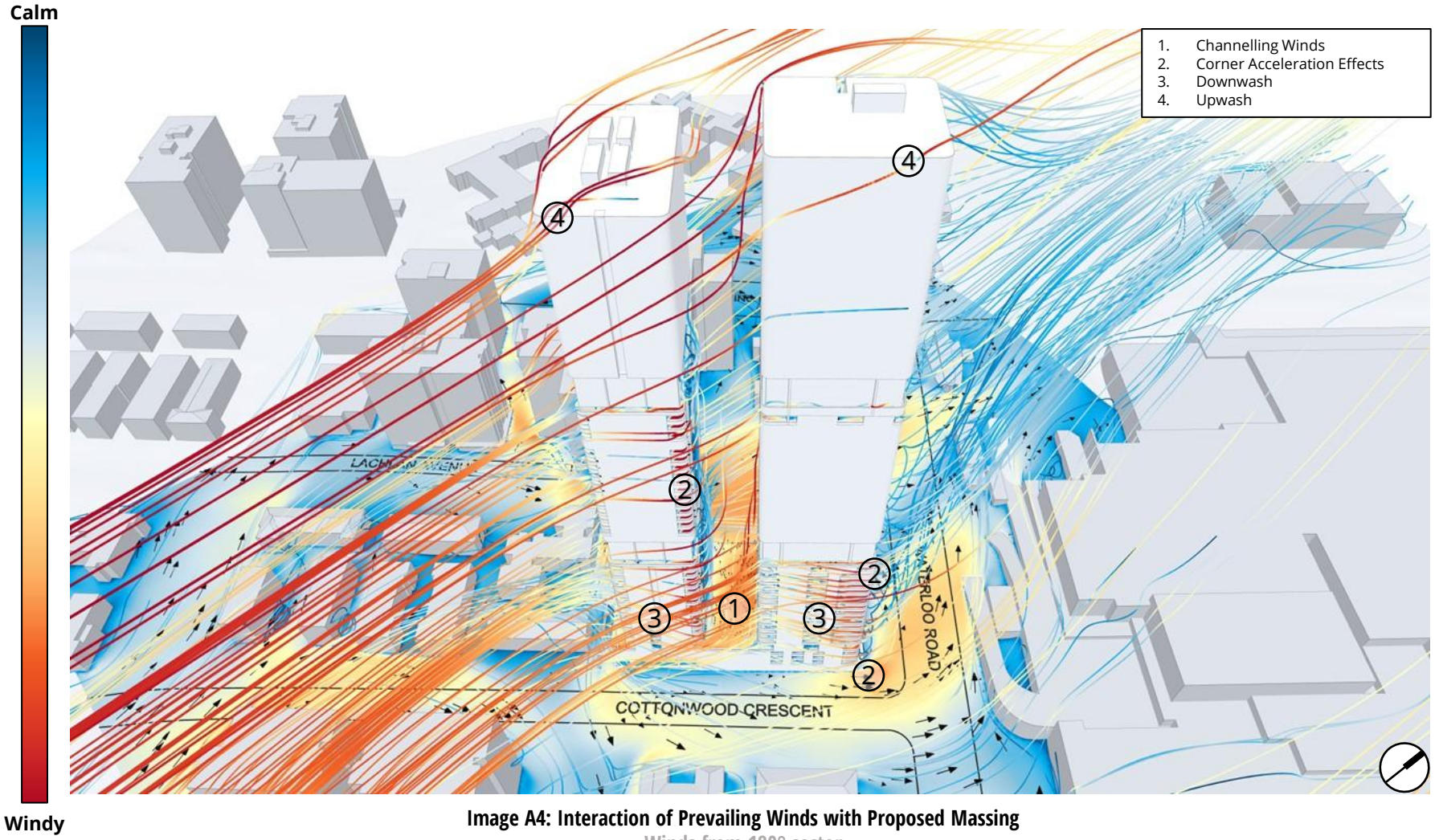


Image A4: Interaction of Prevailing Winds with Proposed Massing
Winds from 180° sector

APPENDIX A

Config 1 – Proposed Configuration

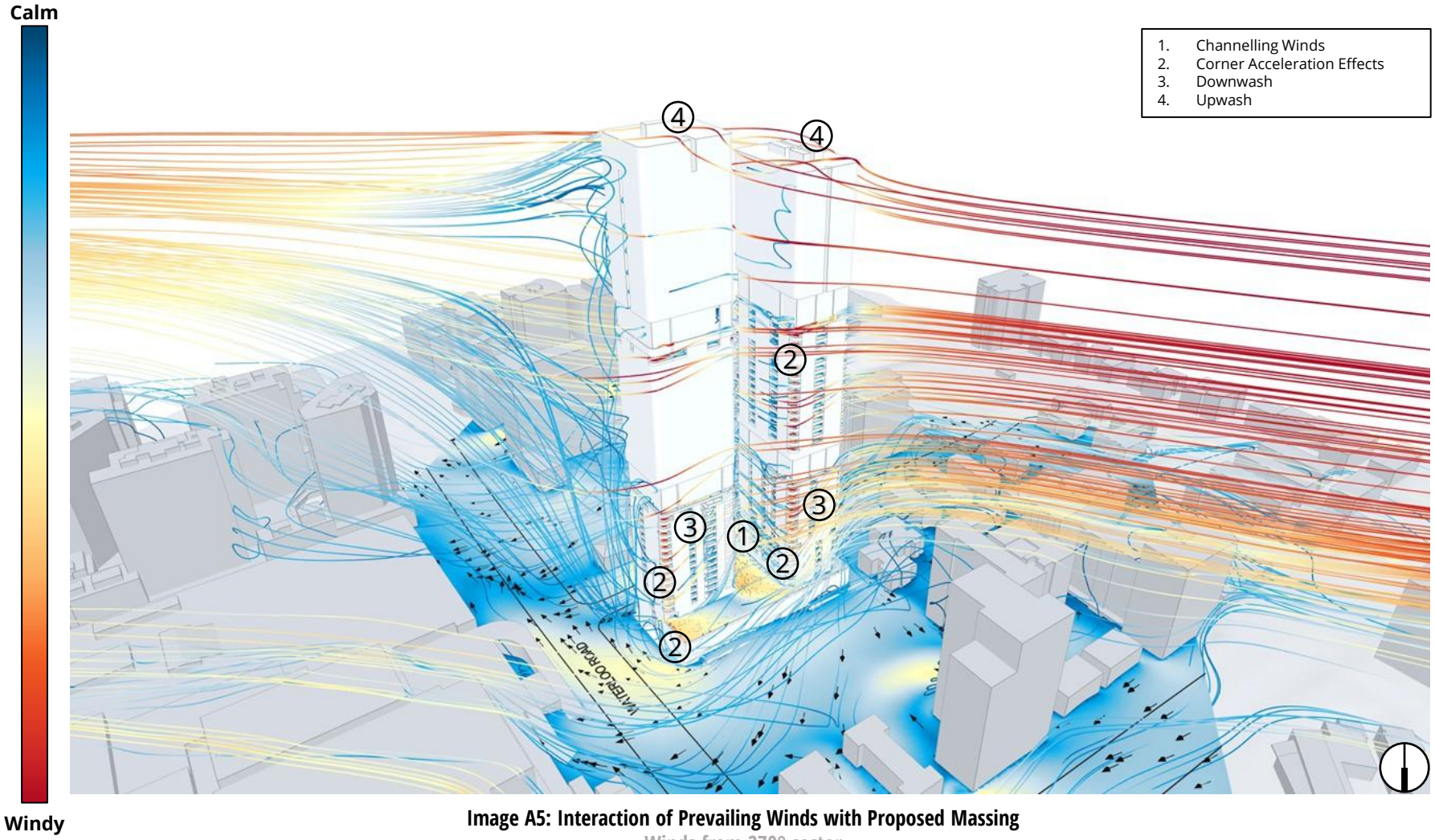


Image A5: Interaction of Prevailing Winds with Proposed Massing
Winds from 270° sector