580 GEORGE STREET

SYDNEY, NSW

PEDESTRIAN WIND ASSESSMENT

RWDI # 2306981

1 SEPTEMBER 2025

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SUBMITTED TO

Icon Project Management
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DOCUMENT CONTROL

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B	Updated Sections 1, 5 and 6	17 June 2025	RL	JGG
C	Final	29 July 2025	RL/AMC	JGG
D	Updated Sections 2 and 5 for Existing Site Conditions	1 September	RL	JGG

NOTE

QUALITY ASSURANCE

RWDI Australia Pty Ltd operates a Quality Management System which complies with the requirements of AS/NZS ISO 9001:2015. This management system has been externally certified by SAI Global and Licence No. QEC 13457 has been issued for the following scope: The provision of consultancy services in acoustic engineering, air quality and wind engineering; and the sale, service, support and installation of acoustic monitoring and related systems and technologies.

Certified System Quality ISO 9001 SAI GLOBAL

1. INTRODUCTION

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RWDI Australia Pty Ltd (RWDI) was retained to undertake a pedestrian wind assessment for the indicative development submitted as part of the Planning Proposal, at 580 George Street, Sydney. The project site lies in proximity to Town Hall Station, Sydney Town Hall and St. Andrews Anglican Church. The site is bordered by Bathurst Street to the north, George Street to the west and abuts existing high-rise buildings to the east and south. The location of the project site within its broader existing surrounding context is shown in Image 1.

The Planning Proposal seeks to increase the height on the site, to enable a 10-storey building form which connects into the existing podium and tower form, established on the southern part of the site. The proposed podium is connected to the existing podium of the 580 George Street building to the south and aligned in height. Similarly, the proposed tower is aligned in height with the existing podium of the 115 Bathurst building to the east. Pedestrian access points to the future development are provided along George Street. A 3D model of the indicative design submitted as part of the Planning Proposal is shown in Image 2.

This desk-based report discusses the potential impacts of the massing of the Proposed Envelope on the local wind microclimate and assesses the outdoor wind comfort based on the usability of spaces. The findings of the report are informed by Computational Fluid Dynamics (CFD) simulations for the prevailing wind directions that show the likely wind flow patterns around the proposed massing. Conceptual wind control measures and design advice has also provided, where necessary, to alleviate any adverse wind conditions.

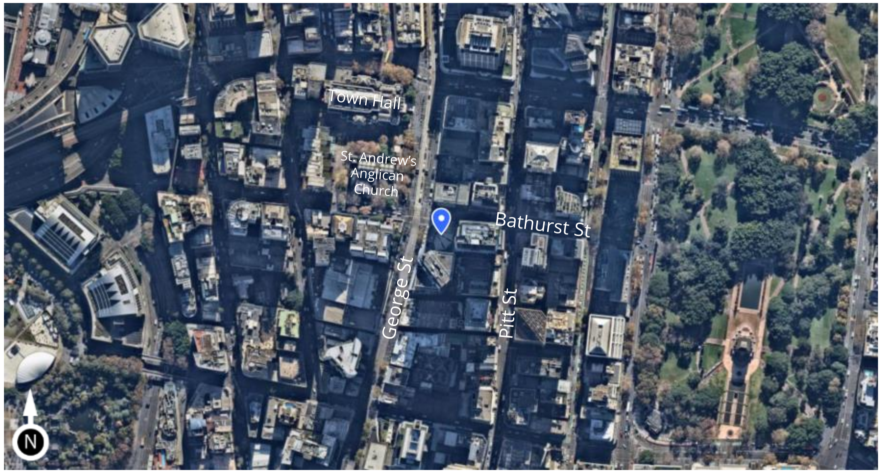

Image 1: Project Location and Surrounding Context

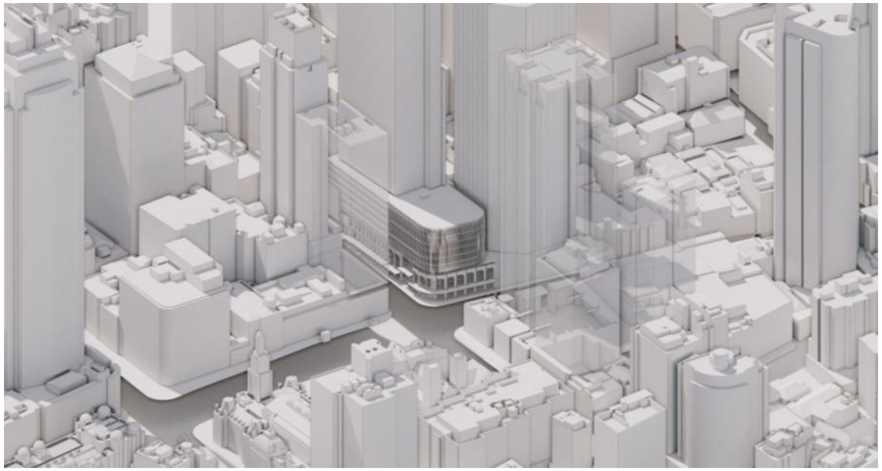

Image 2: 3D Model of Indicative Design within Context

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 information provided to RWDI during May and June 2025.
- 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:

- Existing Configuration: Existing 580 George Street Development with Existing Surrounding Buildings (see Image 3a).
- Proposed Configuration: 580 George Street Proposed Development with Existing Surrounding Buildings (see Image 3b).

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For this computational study, the 3D models were simplified to focus on elements most likely to influence local wind flows and solar exposure in and around the site. Landscaping, as per AWES Guidelines[1], and 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 larger variations of 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 modeled 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 AWES CWE QAM (2024)[2].

1. Australasian Wind Engineering Society (AWES), 2024, "Guidelines for Pedestrian Wind Effects Criteria".
2. Australasian Wind Engineering Society, QAM-3, 2024, "AWES Computational Wind Engineering Quality Assurance Manual".

2. BACKGROUND AND METHODOLOGY

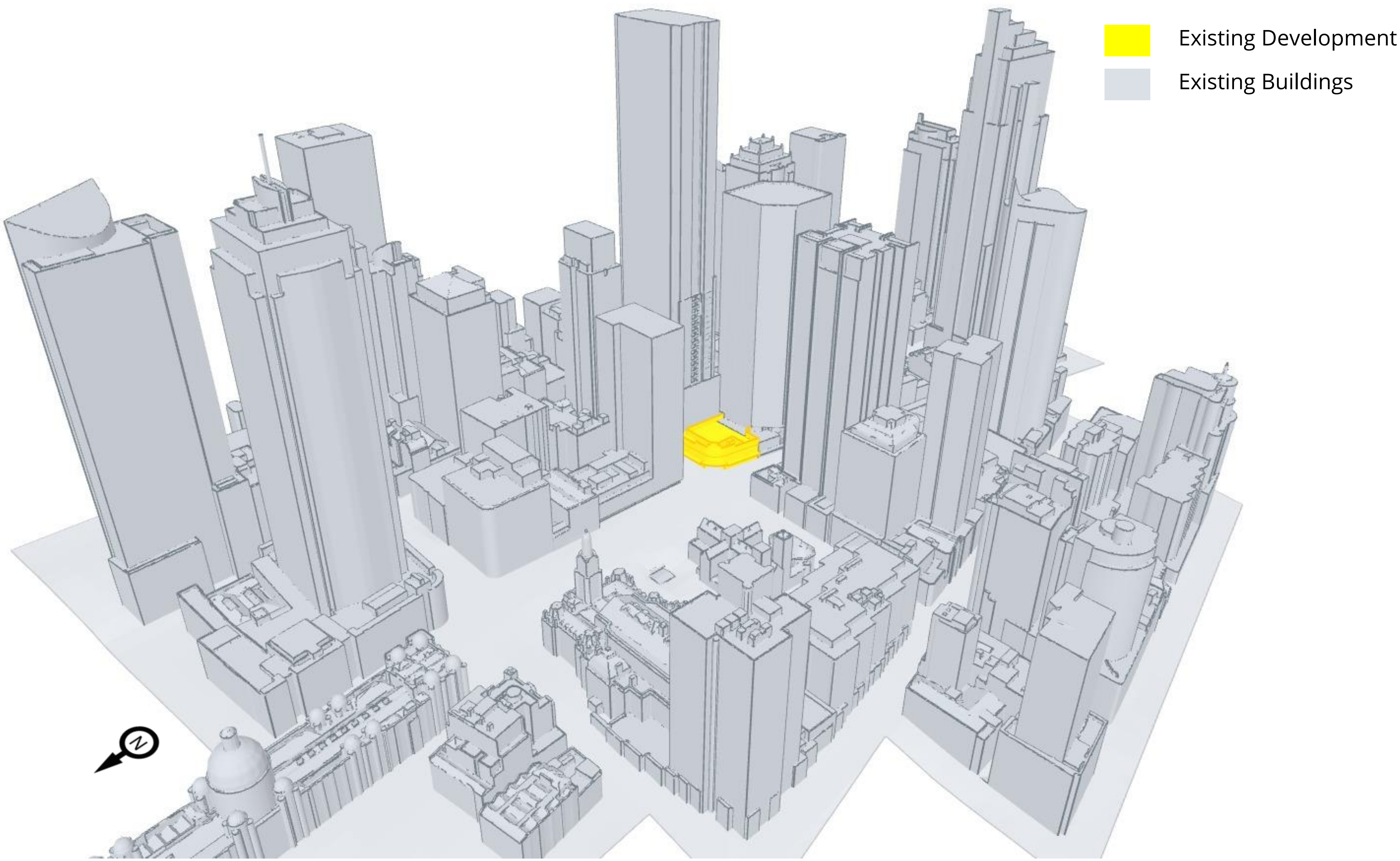

Image 3a: Computer Model of the Existing Development

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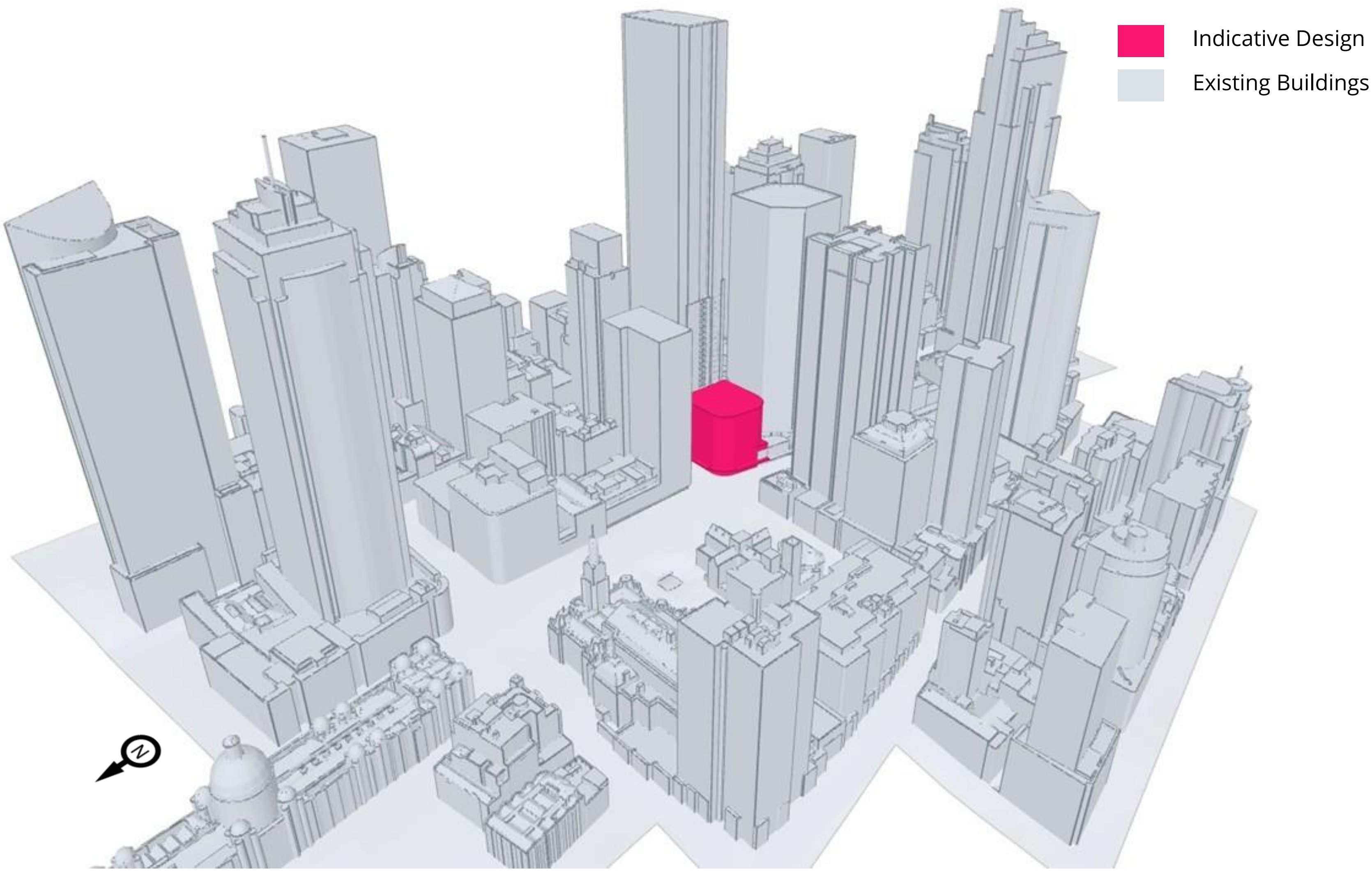

Image 3b: Computer Model of the Indicative Design

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.

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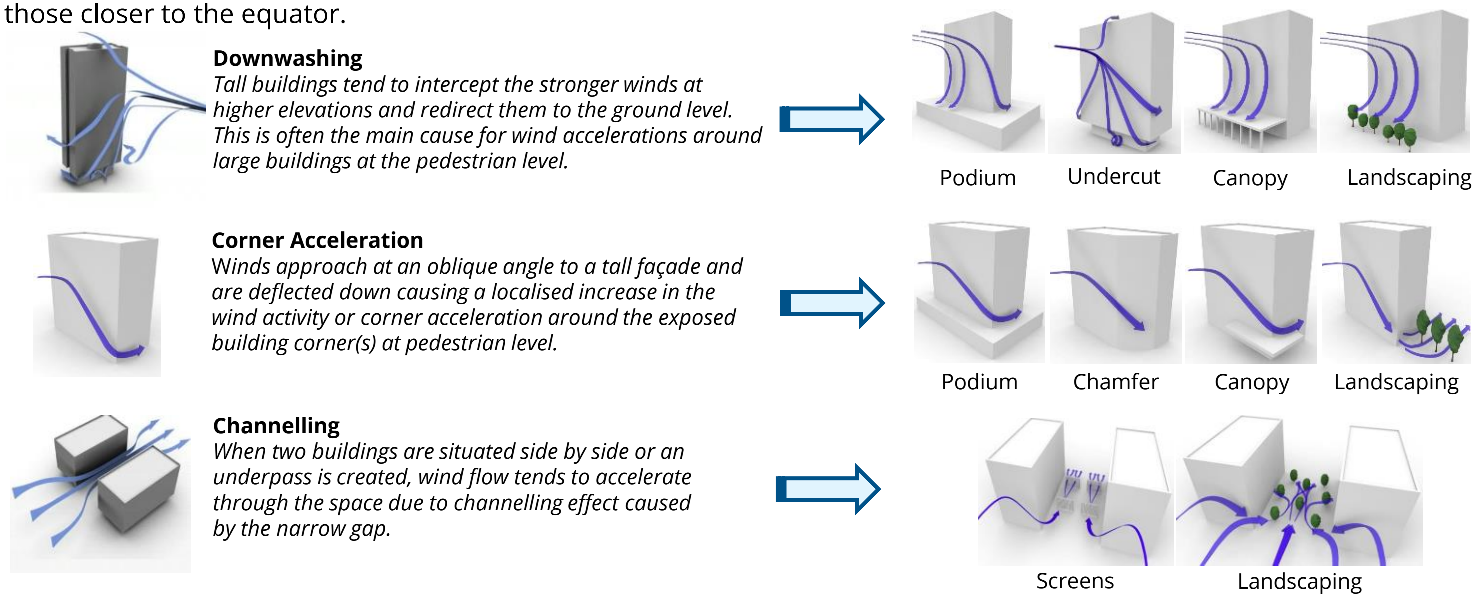

Image 4: General Wind Flow around Buildings with Examples of Common Wind Measures

3. METEOROLOGICAL DATA

Meteorological data recorded at Sydney International Airport from 1995 to 2022 were used as a reference to assess wind conditions in the study area. The distributions of wind frequency and directionality for this period are shown in Image 5.

The records indicate that winds from the northeast, south and west to northwest directions are predominant in region throughout the year. Strong winds predominantly originate from the south while winds from the northeast are common in summer and winds from west to northwest are common in winter. These winds can potentially be the source of uncomfortable / unsafe wind conditions, depending on the site exposure or development design.

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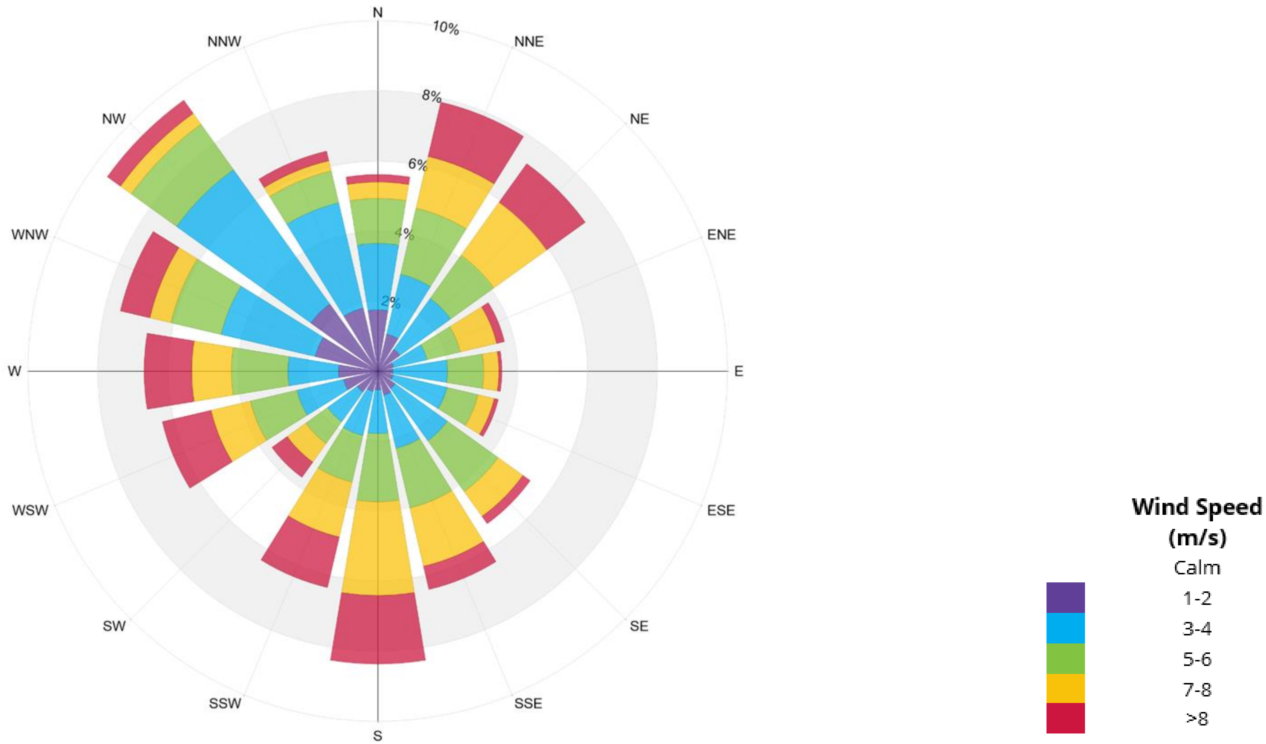

Image 5: Directional Distribution of Winds Approaching Sydney International Airport
Recorded from 1995-2022

4. PEDESTRIAN WIND CRITERIA

The Central Sydney Planning Strategy 2016-2036 and the City of Sydney DCP 2012 (Section 5.1.9 which applies to Central Sydney) set out standards for compliance to facilitate a comfortable environment for designated pedestrian activities. The standards detail the requirements related to pedestrian wind comfort, with the objective of mitigating adverse wind effects generated by tall buildings. The wind comfort levels are categorised based on typical/intended pedestrian activity and are expressed in terms of their suitability for various levels of human activity (shown in Image 6). The categorisation is based on conservative wind speeds; higher the activity level, higher the wind speed one can typically tolerate while engaged in the 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 are assessed qualitatively using the available information from the CFD studies and the wind tunnel data for surrounding sites.

Image 6: Pedestrian Wind Comfort Criteria

5. RESULTS AND DISCUSSIONS

The predicted annual wind comfort conditions are presented in Image 7a and 7b for the Existing and Proposed configurations ground level of the site. Wind comfort results are presented as colour contours based on the criteria discussed in Section 4. The contours represent the conditions predicted at a horizontal plane approximately at 1.5m above the local level. Note that landscaping has not been included in the current round of simulations. Interaction of the prevailing winds with the Existing and Proposed Configurations are shown in Images 8a to 8c and 8d to 8f respectively.

A summary of the wind comfort conditions is noted below:

- Wind conditions around the site are primarily dictated by the surrounding high-rise context. Overall, the wind environment around the site is expected to be well within the comfort and safety thresholds.
- All trafficable areas along the ground level around the Proposed Development are expected to be suitable for their intended use and range from sitting to standing use. This is primarily due to the shielding the site benefits from the surrounding context and the relatively small massing of the Proposed Development which is not likely to influence the local wind environment.
- Slightly windier conditions, suitable for active walking use, are expected along the opposite site of George Street. These are existing wind events caused by the surrounding high-rise buildings which redirect the southerly winds into the street corridor (see Image 8b).
- The new entry along George Street and the exiting entrance at the corner of George Street and Bathurst Street are expected to be calm and suitable for sitting to standing use.

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Image 7a: Annual Wind Comfort Conditions – Existing Configuration - Ground Floor

5. RESULTS AND DISCUSSIONS

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Image 7b: Annual Wind Comfort Conditions – Proposed Configuration – Ground Floor

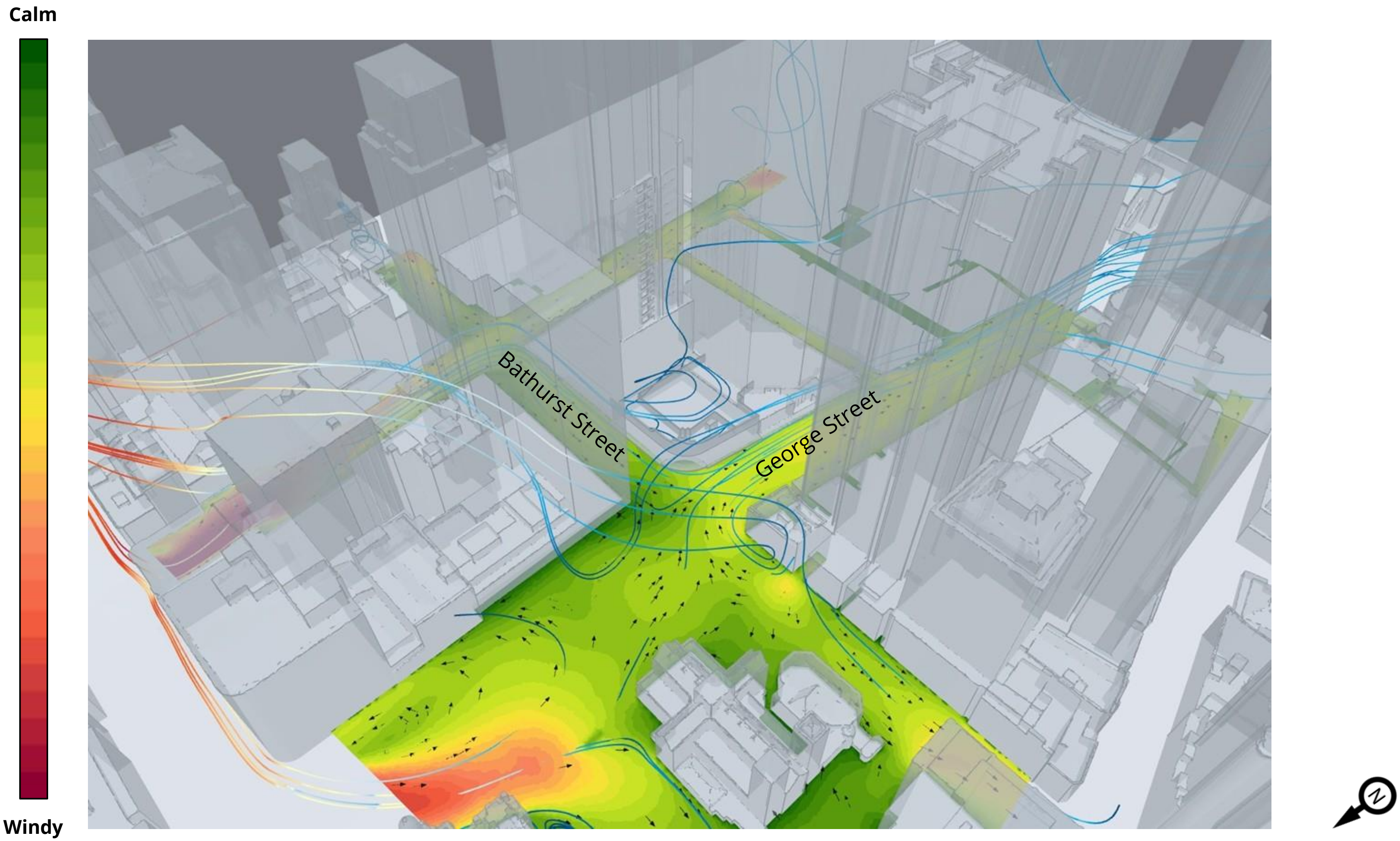

Image 8a: Interaction of Prevailing Northeast Winds with Existing Building
Winds from 45° sector

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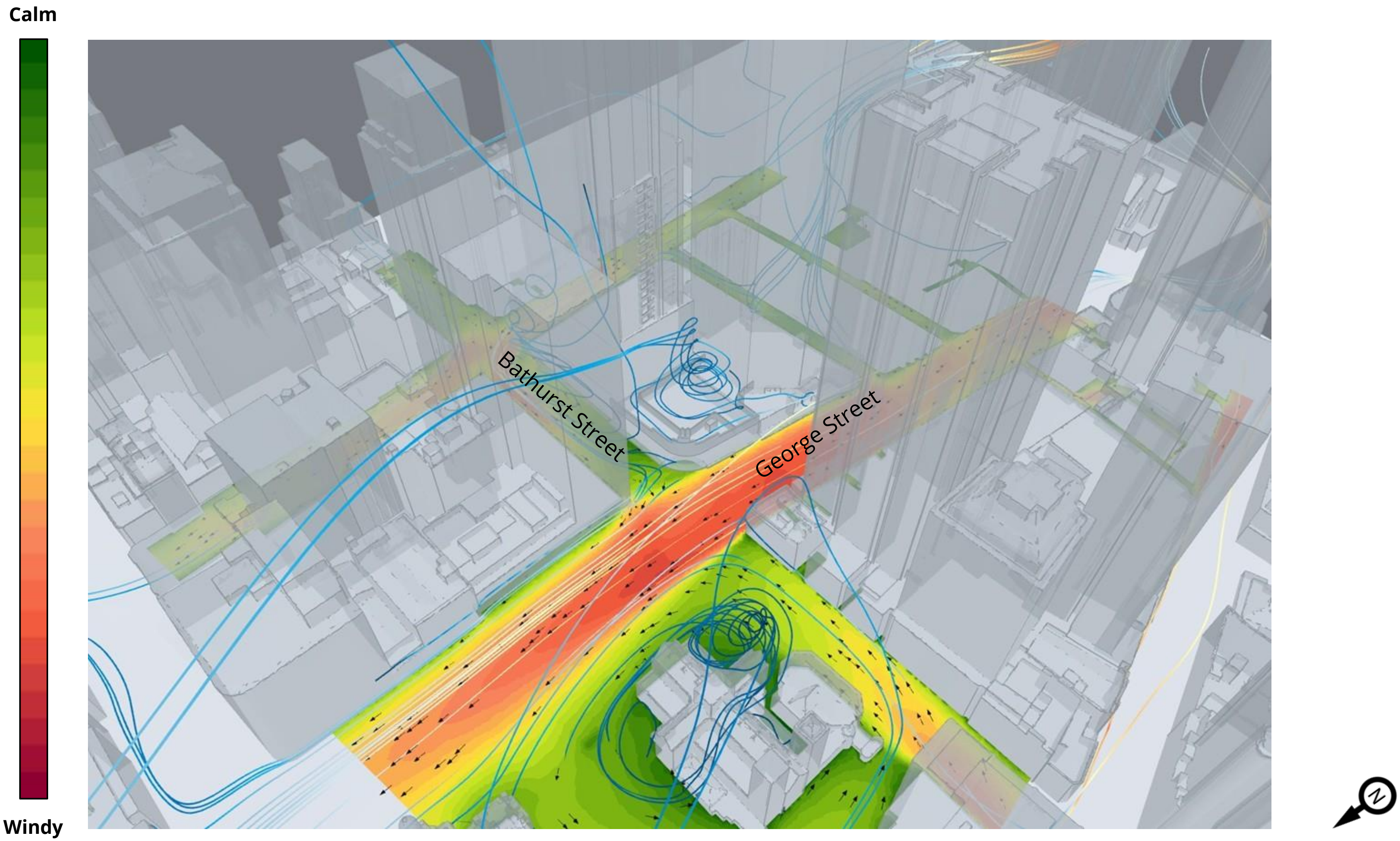

Image 8b: Interaction of Prevailing South Winds with Existing Building
Winds from 180° sector

5. RESULTS AND DISCUSSIONS

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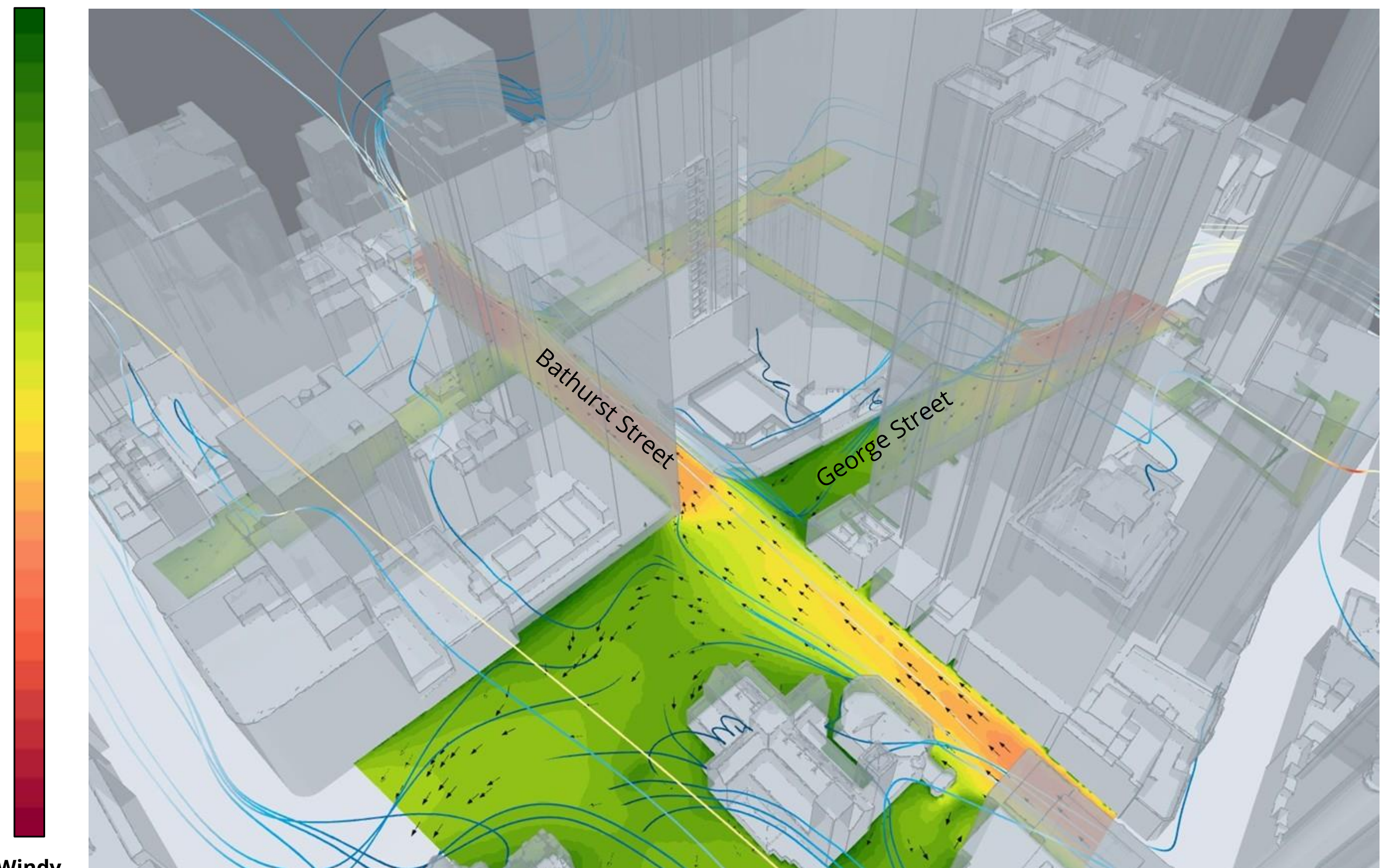

Image 8c: Interaction of Prevailing West Winds with Existing Building

Winds from 270° sector

5. RESULTS AND DISCUSSIONS

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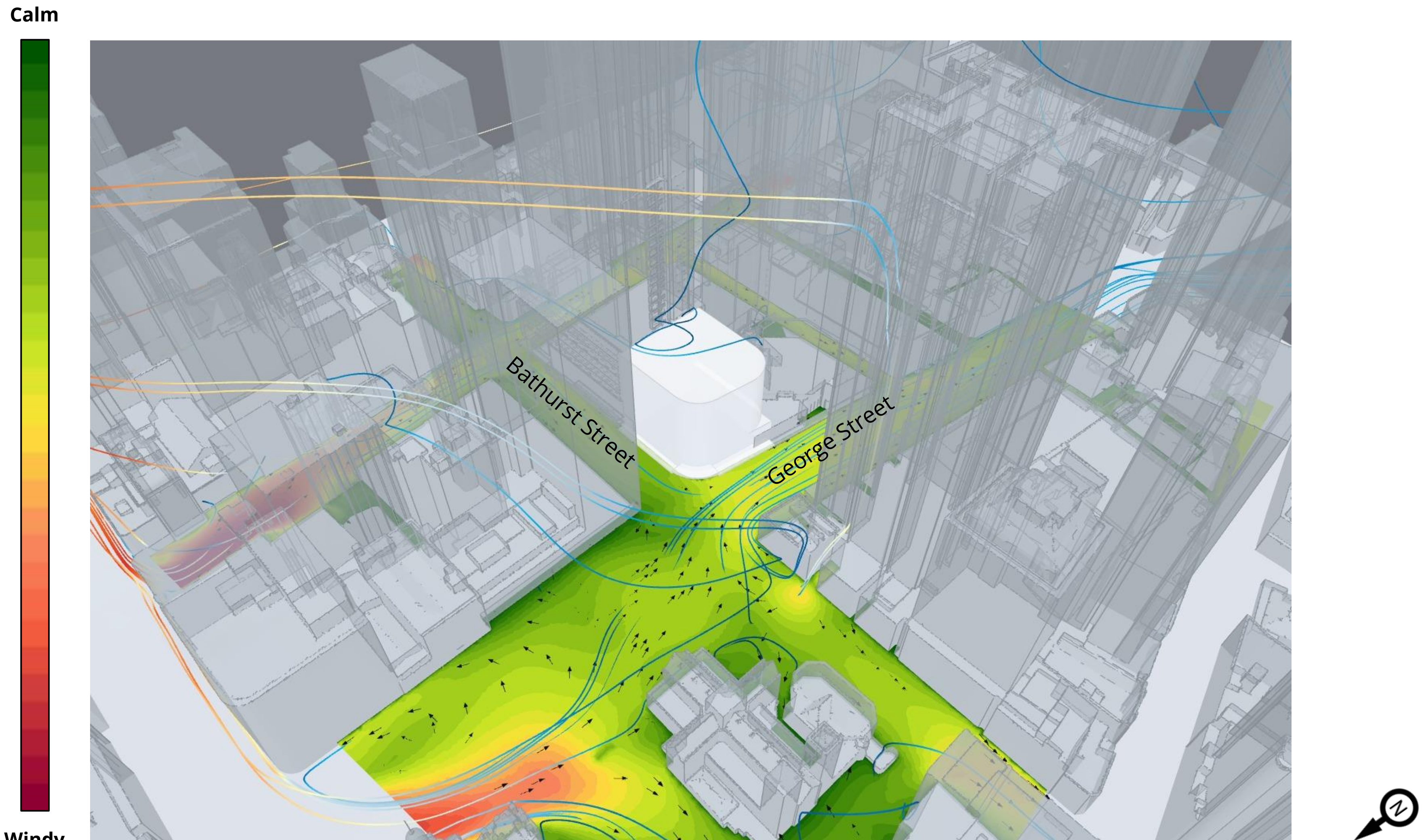

Image 8d: Interaction of Prevailing Northeast Winds with Indicative Design Massing

Winds from 45° sector

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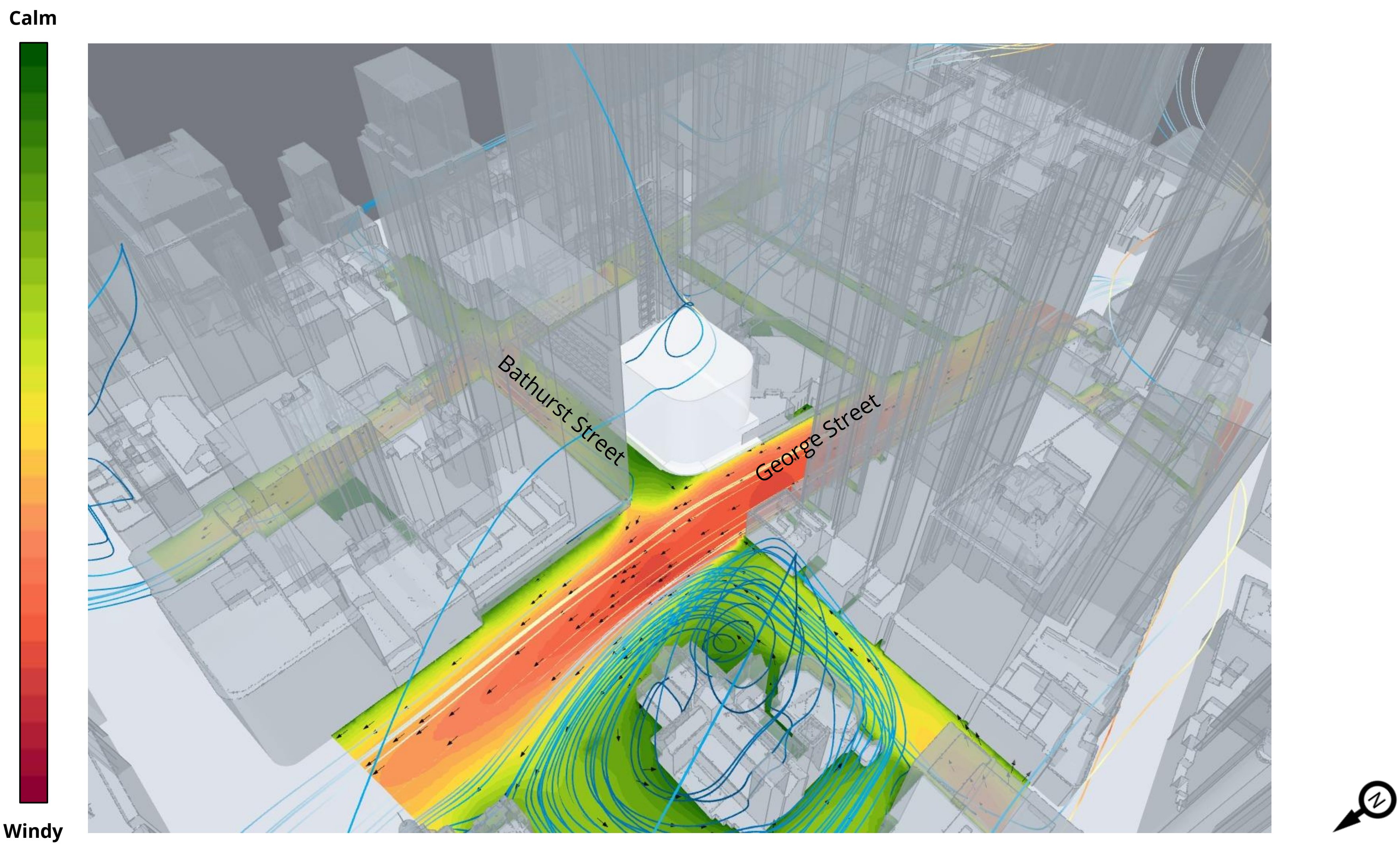

Image 8e: Interaction of Prevailing South Winds with Indicative Design Massing
Winds from 180° sector

5. RESULTS AND DISCUSSIONS

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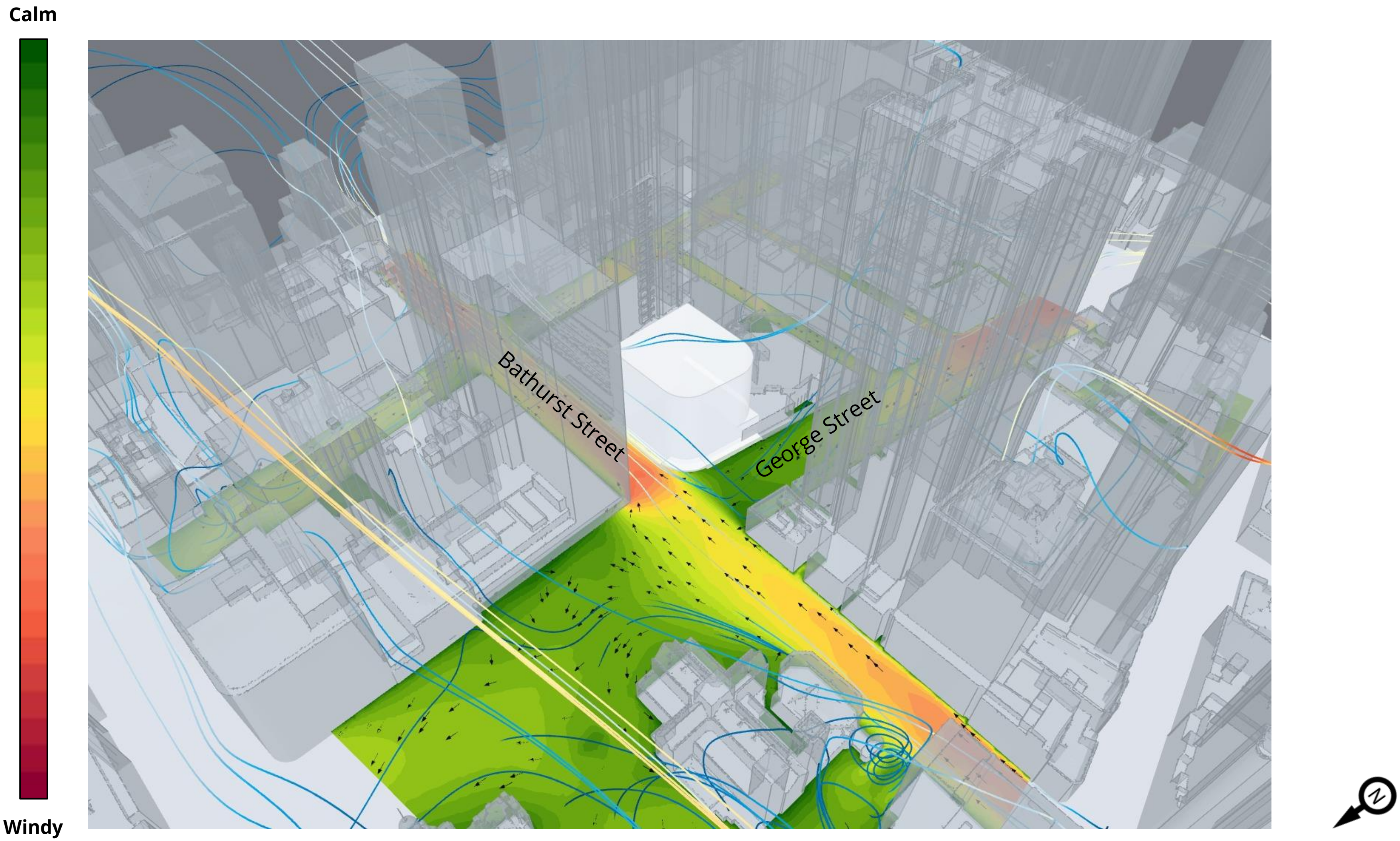

Image 8f: Interaction of Prevailing West Winds with Indicative Design Massing
Winds from 270° sector

6. DESIGN ADVICE AND RECOMMENDATIONS

The overall massing of the development is small in comparison to the surrounding context and is not expected to dictate any significant changes to wind flow patterns within and around the site. As the trafficable areas along the ground level are expected to be suitable for their intended use, no additional mitigation measures are required. The following proposed features of the development along the Ground Level are recommended to be retained for their effect in wind mitigation:

- It is recommended to retain the proposed awnings along the northern and western aspects of the development continuing the overhead coverage from the neighbouring sites.
- It is recommended to retain the recessed entry areas at the rotating door entrances along George Street which are expected to expand the calm region for stationary activities.

Requirement for the wind mitigation to be confirmed during the detailed design stage via detailed wind tunnel testing to confirm compliance with the relevant planning requirements.

7. STATEMENT OF LIMITATIONS

Wind comfort conditions around the indicative development located at 580 George Street in Sydney, New South Wales 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 selected time periods. 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' figures 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 either a boundary-layer wind tunnel or more detailed transient computational modelling to evaluate the gust response of the development as the design evolves.

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8. APPLICABILITY OF ASSESSMENT

The assessment discussed in this report pertains to the planning proposal and outlines future mitigation measures to be included in any detailed design in accordance with the drawings and information received in June and July 2025. 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.

This report entitled "*580 George Street: Pedestrian Wind Assessment*", dated 1 September 2025, 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 available to RWDI when this report was prepared.

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.