REPORT

SHAFSTON ESTATE

23 CASTLEBAR STREET, KANGAROO POINT, QLD

PEDESTRIAN WIND STUDY
RWDI # 2410315
October 3, 2024

SUBMITTED TO

MSL Project Solutions

SUBMITTED BY

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DOCUMENT CONTROL

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A	Initial	26 Sept 2024	MW	AMC/JG
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NOTE

RWDI

RWDI is a team of highly specialised consulting engineers and scientists working to improve the built environment through three core areas of practice: building performance, climate engineering and environmental engineering. More information is available at www.rwdi.com.

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.

EXECUTIVE SUMMARY

RWDI Australia Pty Ltd. (RWDI) was retained to conduct a pedestrian wind environment assessment for the proposed Shafston Estate redevelopment located at 23 Castlebar Street, Kangaroo Point, Queensland Kangaroo Point, Queensland. The pedestrian level wind tunnel microclimate assessment was conducted for the following configurations of the site:

Existing Configuration:	Existing site with existing surrounding buildings
Proposed Configuration:	Proposed Redevelopment with existing surrounding buildings

The pedestrian level wind conditions within and around the proposed development were predicted using the results from a boundary-layer wind tunnel test combined with historical meteorological wind records for the region. The wind speed results have been evaluated against the recommended criteria from AWES (2024) to assess pedestrian safety pertaining to infrequent but strong gusts that could affect a person's footing and against the RWDI Criteria for Pedestrian Comfort pertaining to common wind speeds conducive to different levels of human activity.

The results of the test can be summarised as follows:

Pedestrian Wind Safety
The wind speeds in the study area were found to meet the wind safety criterion at all measured locations for both configurations of the site.

Pedestrian Wind Comfort

- **Existing Configuration**: The existing wind environment was noted to be calm, primarily due to the shielding effect of nearby mid-rise buildings. Conditions around the site were observed to range from suitable for sitting and standing use, with strolling use conditions observed near mid-rise structures along Shafston Avenue. The wind environment is generally appropriate for the intended uses of the various areas within the site.
- **Proposed Configuration**: The addition of the tower and proposed redevelopment is expected to result in only minor alterations to the overall wind environment. Hence, most spaces, including footpaths, the riverfront boardwalk, and the primary estate lawn, are expected to remain comfortable for their intended use. However, elevated wind speeds are anticipated at the northern ground level under the tower where conditions could exceed the target criteria. Private balconies (Levels 2 to 26) and the communal terrace on Level 27 are projected to experience suitable wind conditions overall.

Recommendations
Based on the findings of the wind tunnel study, the following in-principal wind mitigation strategies can be incorporated in the design of the development:

- The proposed dense landscaping should be retained within and around the tower on the ground and lower ground levels to mitigate winds under the tower cover.
- Operable screens along the perimeter of the communal terrace on Level 27 should be deployed to enhance overall wind comfort, if required. The proposed landscaping within the space should also be retained.

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1 INTRODUCTION

RWDI Australia Pty Ltd. (RWDI) was retained to conduct a pedestrian wind assessment on and around the proposed Shafston Estate redevelopment located at 23 Castlebar Street, Kangaroo Point, Queensland. This report presents the project objectives, background, and approach, and discusses the results from RWDI's wind tunnel assessment. Commentary on conceptual wind control measures is also provided, if necessary.

The project site, shown within its existing surrounding context in Image 1, is situated approximately 1.2km east of the Brisbane CBD, bounded by Castlebar Street on the western edge and Thorn Street along sections of the eastern boundary. The proposed development seeks to re-establish Shafston Estate as a prominent riverine estate; accommodating a bespoke residential offering, underpinned by the site's rich cultural heritage. The proposal involves changing the existing development approval on the land (Council reference: A005933994), via an 'Other Change' process under Section 82 of the Planning Act 2016.The proposed changes to the approved development are generally summarised as follows:

- Adaptive reuse of heritage places to create unique residential amenities and recreation facilities;
- Establishing a residential apartment building comprising 25 residential levels, containing 51 exclusive residences;
- Consolidation of the approved southern river homes to provide a single home in the same location fronting the river;
- Establishing an additional river home in the north-western area of the site fronting the river;
- Accelerated delivery of the river walk;
- Inclusion of a 6-berth private marina.

Image 1: Aerial View of the Site and Existing Surroundings

The objective of the study is to assess the wind comfort and safety conditions along pedestrian areas within and around the study site and provide recommendations for minimising adverse wind effects, if needed. This quantitative assessment is based on wind speed measurements on a scale model of the Proposed Development and its surroundings in one of RWDI's boundary-layer wind tunnels. These measurements were combined with the local wind records and compared with the appropriate criteria to gauge the wind comfort and safety in pedestrian areas. The key outdoor pedestrian-accessible areas of interest associated with the development include the pedestrian footpaths around the site, entrances to the building, and the various outdoor amenity spaces.

2 BACKGROUND AND APPROACH

2.1 Wind Tunnel Study Model

To assess the wind environment within and around the Proposed Development, a 1:300 scale model of the project site and surroundings was constructed for the wind tunnel tests of the following configurations:

Existing Configuration: Existing Site with Existing Surrounding Buildings (Image 2A); and
Proposed Configuration: Proposed Development with Existing Surrounding Buildings (Image 2B).

The study building included the operable screens in their stowed position through the heigh of the tower. These and other permeable surfaces were modelled with a porosity of approximately 50% in the wind tunnel model. The wind tunnel model included all relevant surrounding buildings and topography within a radius of 360m around the project site. This encompassed both existing structures and those currently under construction, with an expectation that these would likely be present or completed by the time the proposed subject development concludes. Additionally, the wind and turbulence profiles in the atmospheric boundary layer beyond the modelled area were simulated in RWDI's wind tunnel, incorporating spires and roughness blocks.

The wind tunnel model was instrumented with 89 specially designed wind speed sensors to measure mean and gust speeds at a typical chest height in full-scale in pedestrian areas throughout the study site. The placement of wind measurement sensors was based on our experience and understanding of the pedestrian usage for this site. Wind speeds were measured for 36 directions in 10-degree increments. The measurements at each sensor location were recorded in the form of ratios of local mean and gust speeds to the mean wind speed at a reference height above the model.

Note that no vegetation was included as part of the configuration tests in accordance with AWES Guidelines (2024). The method for testing scale models in the wind tunnel is consistent with internationally recognised good practice, and meets the requirements set out in the Australasian Wind Engineering Society Quality Assurance Manual (AWES-QAM-2019).

Image 2A: Wind Tunnel Study Model – Existing Configuration

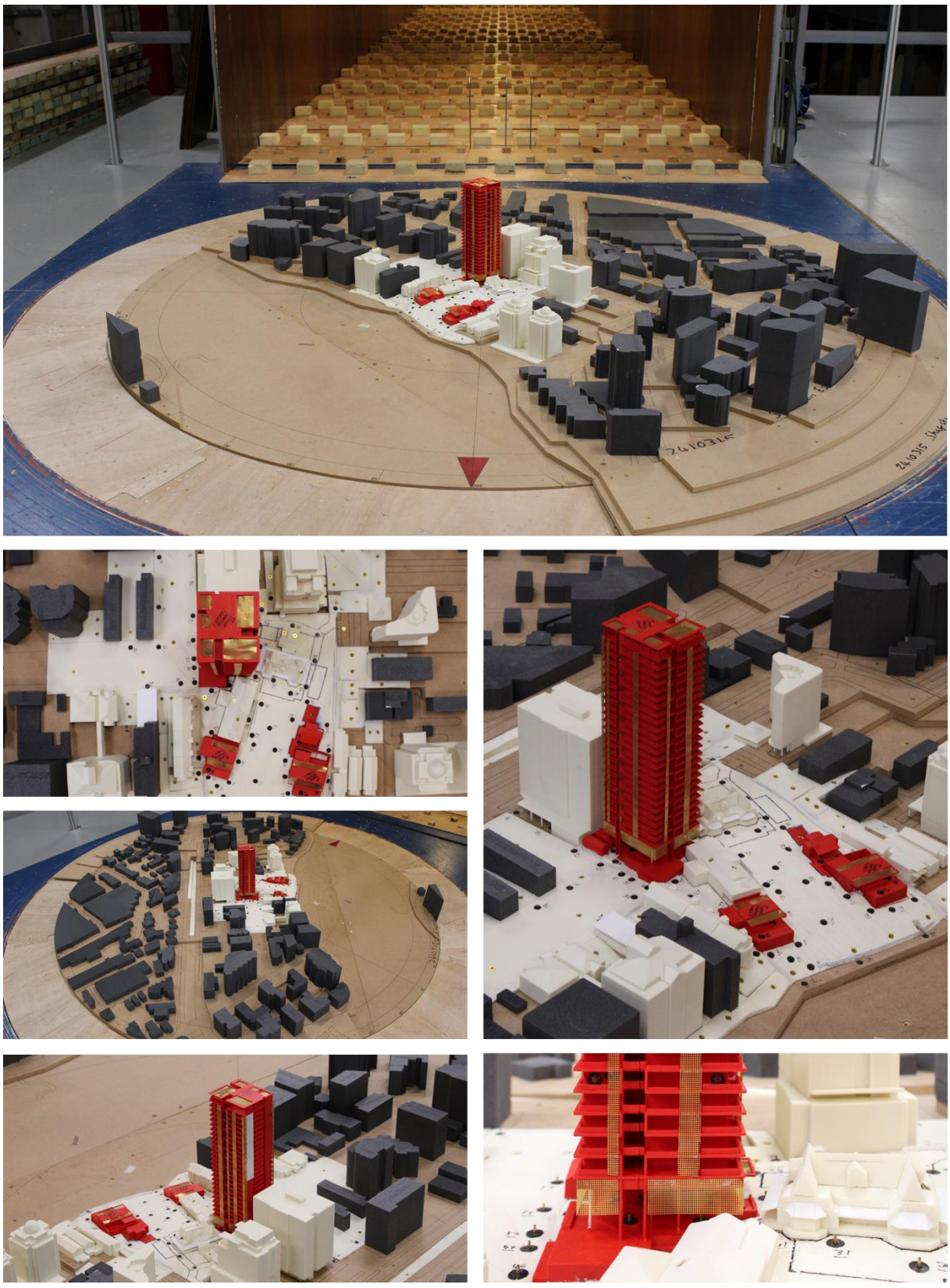

Image 2B: Wind Tunnel Study Model – Proposed Configuration

2.2 Meteorological Data

Wind statistics recorded at Brisbane International Airport between 1995 and 2021 (inclusive) were analysed on an annualised basis. Image 3 graphically depicts the combined directional distributions of wind frequencies and speeds. Winds from the north, southeast and south-southwest directions are predominant throughout the year as indicated by the wind rose. Strong winds of a mean speed greater than 30 km/h measured at the airport (at an anemometer height of 10 m) occur for 5.7 % of the time annually.

Wind statistics were combined with the wind tunnel data to predict the frequency of occurrence of full-scale wind speeds using the time-histories of winds. The full-scale wind predictions were then compared with the wind criteria for pedestrian comfort and safety.

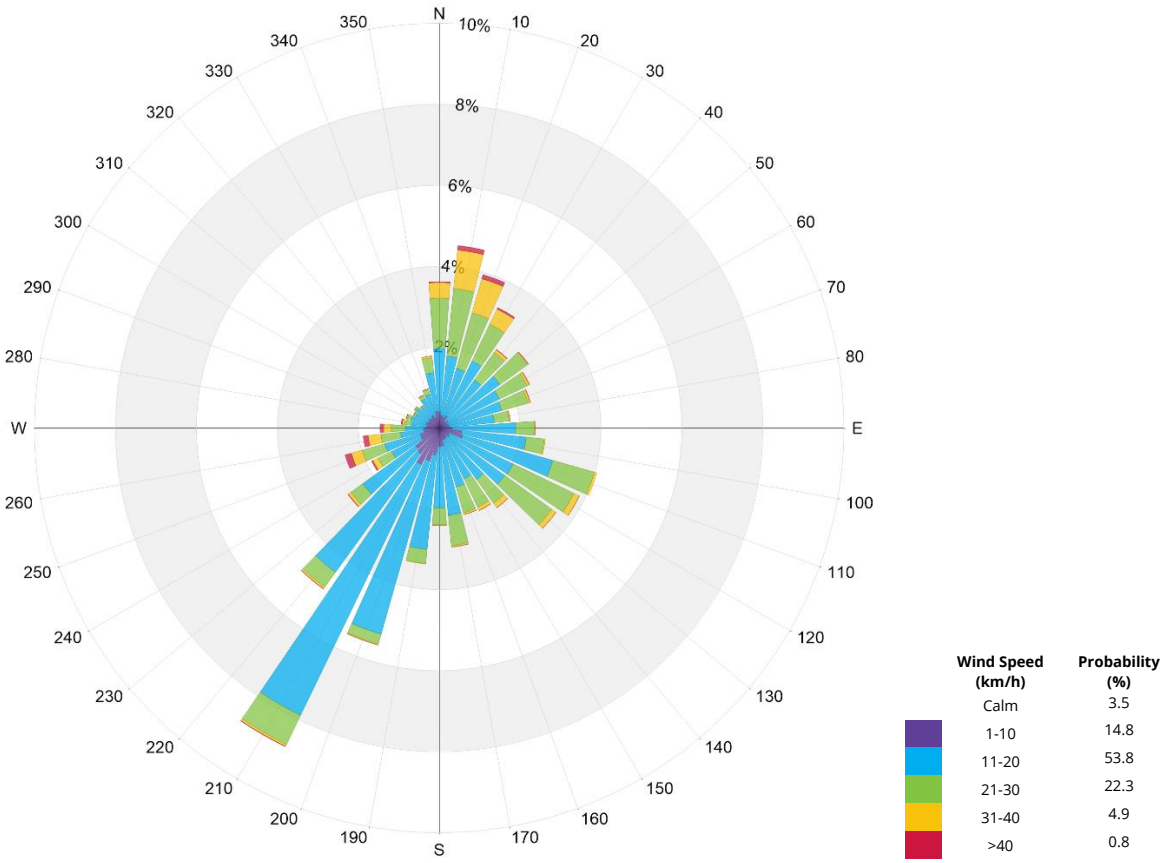

Image 3: Directional Distribution of Winds Approaching Brisbane International Airport (1995 - 2021)

2.3 Pedestrian Wind Criteria

2.3.1 Wind Safety

Pedestrian safety is associated with excessive gusts that can adversely affect a pedestrian's balance and footing. The criterion to assess pedestrian safety is based on the guidelines of the Australasian Wind Engineering Society (2024). The guidelines dictate that if **the maximum average 3-second gust speeds of more than 83 km/h (23 m/s) occur for more than 9 hours (0.1% of the time) on an annual basis**, the wind conditions are considered severe. Wind control measures, in the form of an architectural response, are typically required at locations where wind speeds exceed the wind safety criterion.

2.3.2 Wind Comfort

The RWDI pedestrian wind comfort criteria, which have been developed through research and consulting practice since 1974, have been utilised for the current assessment. These criteria, shown in the Table 1 below, have gained widespread acceptance among municipal authorities, building designers, and city planners globally. Pedestrian wind comfort is assessed using Gust Equivalent Mean (GEM) wind speeds which quantifies the combined impact of mean and gust speeds on pedestrian comfort making it a reliable predictor for assessing wind conditions in built-up environments. The wind comfort levels are categorised based on intended pedestrian use and are expressed in terms of their suitability for various levels of human activity. Wind control measures are typically required at locations where the occurrence frequencies of wind speeds exceed the threshold values for the specific pedestrian activity intended for the space.

Table 1: Pedestrian Wind Comfort Criteria

Comfort Category	GEM Speed (km/h)	Description
Sitting	≤ 10	Calm or light breezes are desired for outdoor restaurants and seating areas where one can read a paper without having it blown away
Standing	≤ 14	Gentle breezes suitable for main building entrances, bus stops, private balconies / terraces, and other places where pedestrians may linger
Strolling	≤ 17	Moderate winds that would be appropriate for window shopping and strolling along a downtown street, plaza, or park
Walking	≤ 20	Relatively high speeds that can be tolerated if one's objective is to walk, run or cycle without lingering
Uncomfortable	> 20	Strong winds of this magnitude are considered a nuisance for all pedestrian activities, and wind mitigation is typically recommended

Notes:
(1) GEM Speed = max (Mean Speed, Gust Speed/1.85)
(2) Gust Speed = Mean Speed + 3*RMS Speed
(3) Wind conditions are comfortable if the predicted GEM speeds are within the respective thresholds for at least 80% of the time between 6:00 and 23:00. Nightly hours between 0:00 and 5:00 are excluded from the wind analysis for comfort since limited usage of outdoor spaces is anticipated.

Note that these criteria for wind forces represent average wind tolerance and can be subjective with regional differences in wind climate and thermal conditions as well as variations in age, health, clothing, etc. also impacting an individual's perception of the wind climate. Hence, comparison with existing site conditions presents the most objective method to assess the impact of the development on the local wind microclimate.

3 RESULTS AND DISCUSSION

The predicted wind conditions are shown on site plans in Figures 1A through 2B located in the "Figures" section of this report. These conditions and the associated wind speeds are also represented in Table 1, located in the "Tables" section of this report. The following is a detailed discussion of the suitability of the predicted wind conditions for the anticipated pedestrian use of each area of interest. Note that wind tunnel tests have been carried out without any form of wind ameliorations or vegetation/landscaping to establish a baseline understanding of the wind conditions around the site, as per guidelines.

3.1 Generalised 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, deep canopies close to ground level, windscreens / tall trees with dense landscaping, etc. as shown in Image 4 can help to reduce the 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, 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 climates and high humidity levels, such as those closer to the equator.

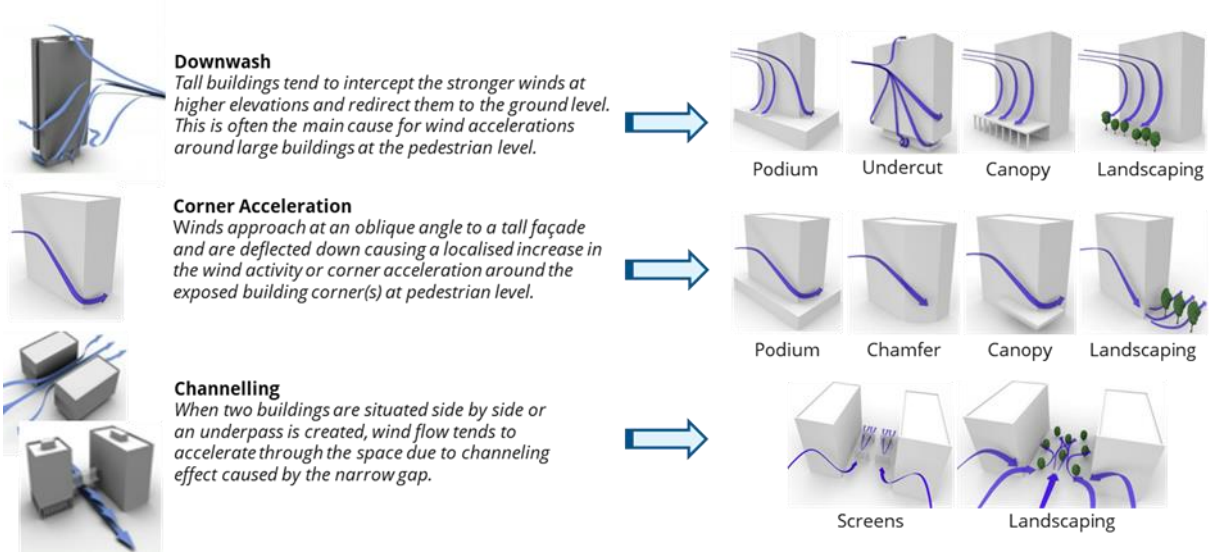

Image 4: General Wind Flows around Buildings and Examples of Wind Control Measures

3.2 Pedestrian Safety

The wind speeds were observed to be within the acceptable threshold for pedestrian safety at all locations for both the existing and proposed configurations of the site. Therefore, no safety concerns are anticipated for individuals in and around the site or for the building occupants in relation to the wind force in the areas assessed.

3.3 Pedestrian Comfort

Wind conditions suitable for walking or strolling use are appropriate for footpaths / walkways and areas where pedestrians will be active and less likely to remain in one area for prolonged periods of time. Lower wind speeds conducive to standing are preferred at building entrances & drop-off areas, bus stops and communal outdoor terraces. For private balconies, typically the standing comfort criterion or better is targeted. However, the usage of these spaces is elective with occupants having the option to retreat indoors during events of high winds. Therefore, the spaces can be considered suitable for use if conditions are assessed to be comfortable for strolling to walking use. Wind speeds comfortable for sitting use are preferred for areas intended for passive long-duration activities such as outdoor dining or café seating.

3.3.1 Existing Site Conditions

The overall wind environment around the site is generally characterised by the shielding afforded by the neighbouring mid-rise buildings to the north-west, west, south-west and to the south. Hence, the wind environment for the existing site was observed to be relatively calm with conditions ranging from sitting to standing use within the Estate site. Strolling use conditions were observed near the mid-rise structures Student Accommodation and Residential Building along Shafston Avenue. The conditions are noted to be suitable for the intended use of the various areas around the site.

3.3.2 Proposed Site Conditions

The inclusion of the proposed development leads to a minor shift in wind conditions on the ground level with some areas now more sheltered due to the massing of the building and others slightly windier. Key wind effects and conditions for the proposed configuration of the site are summarised below:

- Wind conditions were typically observed to be suitable for the intended use of the various areas around the site. Hence, wind conditions at all the footpaths on the lower and upper ground levels, along the riverfront boardwalk, within and around the primary Lawn and pool area, and around the Shafston House Proper were noted to be comfortable for their intended use throughout the year.
- Wind conditions at the primary entrance to the proposed residential tower (Sensors 64 and 66) are expected to be calm and comfortable for sitting use.
- Winds ranging from strolling use to uncomfortable are expected at the northern end of the ground level under the tower cover (Sensors 63 and 65). The target criteria in this location is expected to be standing use. Hence, wind conditions are expected to be one and three categories windier than suitable for the intended use.
- All private balconies from the Levels 2 to 26 are expected to have standing use or calmer wind conditions which is suitable for the intended use of these spaces. Note that the assessed conditions were worst case scenario with the operable screens position in stowed positions. Hence, the wind

environment within these spaces is likely to become calmer with the screens fully or partially deployed along the balconies.

- Wind conditions within the communal terrace on Level 27 are expected to range from standing use at the corner of the pool deck and the seating space to strolling use near the centre of the terrace. Strolling use wind conditions (Sensor 84) are considered to be one category windier than suitable for communal spaces. It is to be noted that wind tunnel tests were undertaken without the inclusion of the corner screens along the perimeter of the terrace and hence the results presented are conservative in nature.

Note that the wind tunnel tests were undertaken without any landscaping to obtain a baseline understanding of pedestrian wind conditions. It is expected that the overall wind conditions will generally be relatively calmer with the inclusion of the existing and proposed landscaping within and around the site.

3.4 Design Recommendations

Based on the findings of the wind tunnel study, the following in-principal wind mitigation strategies can be incorporated in the design of the development to improve the overall wind environment:

- Ground and Lower Ground: The proposed landscaping plan includes numerous trees and shrubs around the tower. To further mitigate wind impacts, vegetation with large crowns and dense foliage, along with appropriate underplanting, should be considered. This will assist in reducing the wind acceleration under the building cover and reduce wind impacts within these areas. It is important that dense landscaping around the tower is maintained.
- Level 27: Operable screens along the perimeter of the communal terrace can significantly improve wind conditions within the space. Additionally, the proposed landscaping on the terrace will further reduce wind exposure. The wind tunnel tests were undertaken without the inclusion of these elements and it is expected that the inclusion of these features will create a more sheltered and comfortable environment.

4 STATEMENT OF LIMITATIONS

Limitations

This report entitled *'Shafston Estate Pedestrian Wind Study'* was prepared by RWDI Australia Pty Ltd ("RWDI") for MSL Project Solutions ("Client"). 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.

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.

Design Assumptions

RWDI confirms that the pedestrian wind assessment (the "**Assessment**") discussed herein was performed by RWDI in accordance with generally accepted professional standards at the time when the Assessment was performed and in the location of the Project. No other representations, warranties, or guarantees are made with respect to the accuracy or completeness of the information, findings, recommendations, or conclusions contained in this Report. This report is not a legal opinion regarding compliance with applicable laws.

The findings and recommendations set out in this report are based on the following information disclosed to RWDI. Drawings and information listed below were received from the client and used to construct the scale model of the development **("Project Data**")

File Name	File Type	Date Received
Shafston_Site_Small_Levi_016_Tower update Screen Shifts	SketchUp	13 August 2024
Drawing Package (Plans and Elevations)	DWG	13 August 2024

The recommendations and conclusions are based on the assumption that the Project Data and Climate Data are accurate and complete. RWDI assumes no responsibility for any inaccuracy or deficiency in information it has received from others. In addition, the recommendations and conclusions in this report are partially based on historical data and can be affected by a number of external factors, including but not limited to Project design, quality of materials and construction, site conditions, meteorological events, and climate change. As such, the conclusions and recommendations contained in this report do not list every possible outcome.

The opinions in this report can only be relied up on to the extent that the Project Data and Project Specific Conditions have not changed. Any change in the Project Data or Project Specific Conditions not reflected in this report can impact and/or alter the recommendations and conclusions in this report. Therefore, it is incumbent

upon the Client and/or any other third party reviewing the recommendations and conclusions in this report to contact RWDI in the event of any change in the Project Data and Project Specific Conditions in order to determine whether any such change(s) may impact the assumptions upon which the recommendations and conclusions were made.

5 REFERENCES

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FIGURES

COMFORT CATEGORIES:

- Sitting
- Standing
- Strolling
- Walking
- Uncomfortable

Pedestrian Wind Comfort Conditions

Configuration 1: Existing Site with Existing Surrounding Buildings

Annual

2410315 Shafston Estate - Kangroo Point, QLD

Figure: 1A

COMFORT CATEGORIES:

- Sitting
- Standing
- Strolling
- Walking
- Uncomfortable

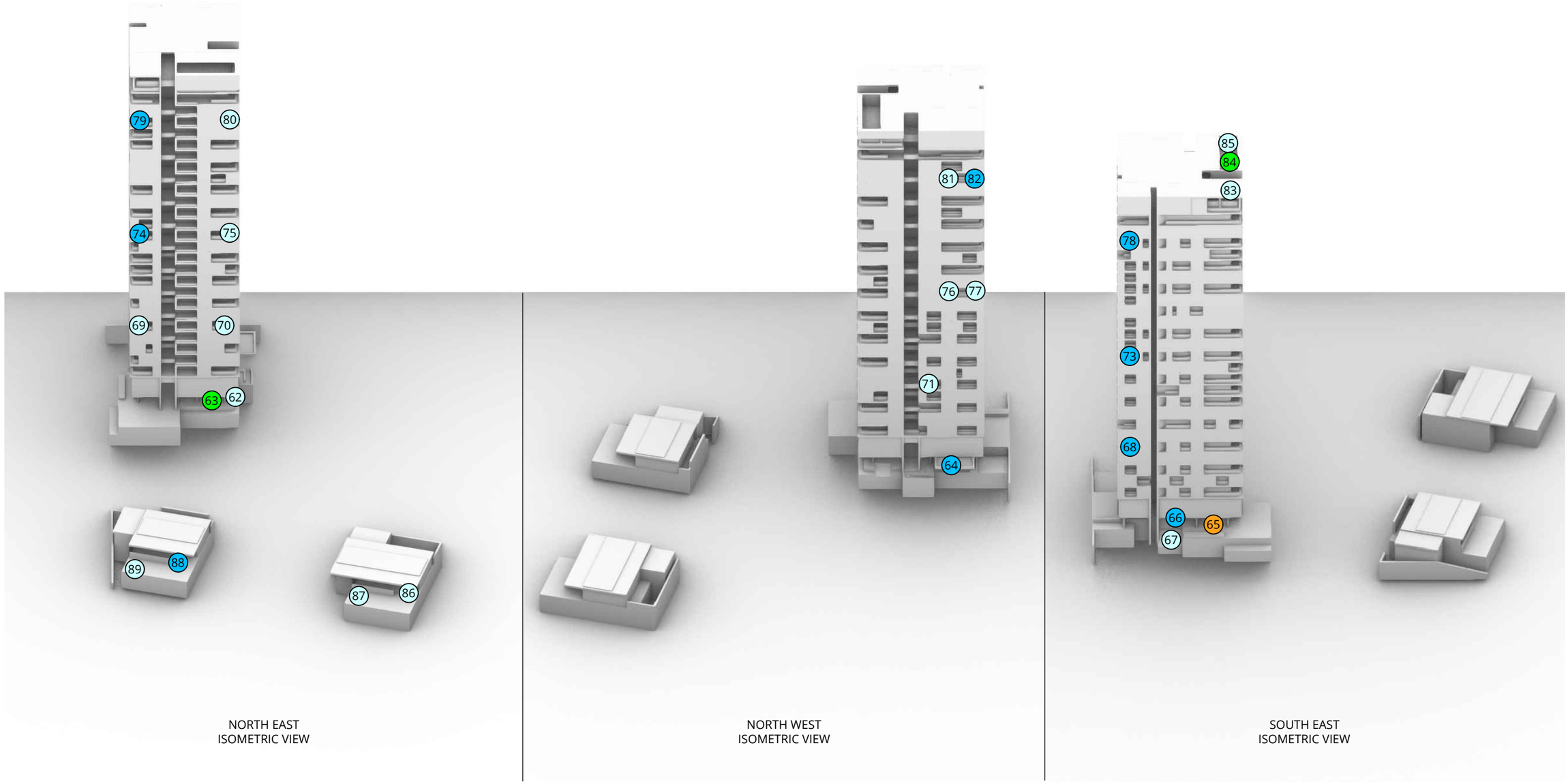
Pedestrian Wind Comfort Conditions - Ground Floor

Configuration 2: Proposed Development with Existing Surrounding Buildings

Annual

2410315 Shafston Estate - Kangroo Point, QLD

Figure: 2A



NORTH EAST
ISOMETRIC VIEW

NORTH WEST
ISOMETRIC VIEW

SOUTH EAST
ISOMETRIC VIEW

COMFORT CATEGORIES:

- Sitting
- Standing
- Strolling
- Walking
- Uncomfortable

Pedestrian Wind Comfort Conditions - Elevated Levels

Configuration 2: Proposed Development with Existing Surrounding Buildings

Annual

2410315 Shafston Estate - Kangroo Point, QLD

Figure: 2B

TABLES

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort		Wind Safety	
		Annual		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating
1	Existing	10	Sitting	36	Pass
	Proposed	10	Sitting	35	Pass
2	Existing	9	Sitting	35	Pass
	Proposed	9	Sitting	35	Pass
3	Existing	9	Sitting	34	Pass
	Proposed	9	Sitting	39	Pass
4	Existing	10	Sitting	38	Pass
	Proposed	8	Sitting	30	Pass
5	Existing	12	Standing	41	Pass
	Proposed	11	Standing	45	Pass
6	Existing	12	Standing	49	Pass
	Proposed	8	Sitting	28	Pass
7	Existing	14	Standing	58	Pass
	Proposed	11	Standing	51	Pass
8	Existing	11	Standing	51	Pass
	Proposed	12	Standing	46	Pass
9	Existing	13	Standing	46	Pass
	Proposed	10	Sitting	53	Pass
10	Existing	12	Standing	43	Pass
	Proposed	12	Standing	43	Pass
11	Existing	13	Standing	44	Pass
	Proposed	12	Standing	45	Pass
12	Existing	12	Standing	41	Pass
	Proposed	12	Standing	46	Pass
13	Existing	13	Standing	46	Pass
	Proposed	10	Sitting	39	Pass
14	Existing	10	Sitting	35	Pass
	Proposed	10	Sitting	35	Pass
15	Existing	13	Standing	48	Pass
	Proposed	12	Standing	40	Pass
16	Existing	9	Sitting	41	Pass
	Proposed	10	Sitting	43	Pass
17	Existing	10	Sitting	38	Pass
	Proposed	7	Sitting	31	Pass
18	-	-	-	-	-
	Proposed	9	Sitting	42	Pass
19	Existing	10	Sitting	42	Pass
	Proposed	8	Sitting	37	Pass
20	-	-	-	-	-
	Proposed	10	Sitting	42	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort		Wind Safety	
		Annual		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating
21	Existing Proposed	12 10	Standing Sitting	44 38	Pass Pass
22	Existing Proposed	12 11	Standing Standing	45 45	Pass Pass
23	Existing Proposed	11 10	Standing Sitting	39 51	Pass Pass
24	Existing Proposed	12 11	Standing Standing	43 45	Pass Pass
25	Existing Proposed	8 8	Sitting Sitting	33 35	Pass Pass
26	Existing Proposed	9 10	Sitting Sitting	36 54	Pass Pass
27	Existing Proposed	11 11	Standing Standing	43 50	Pass Pass
28	Existing Proposed	9 11	Sitting Standing	35 46	Pass Pass
29	Existing Proposed	9 11	Sitting Standing	37 41	Pass Pass
30	Existing Proposed	9 12	Sitting Standing	32 48	Pass Pass
31	Existing Proposed	8 9	Sitting Sitting	34 36	Pass Pass
32	Existing Proposed	11 15	Standing Strolling	47 51	Pass Pass
33	Existing Proposed	12 13	Standing Standing	45 50	Pass Pass
34	Existing Proposed	10 12	Sitting Standing	48 42	Pass Pass
35	Existing Proposed	15 16	Strolling Strolling	55 61	Pass Pass
36	Existing Proposed	12 14	Standing Standing	49 50	Pass Pass
37	Existing Proposed	12 10	Standing Sitting	47 44	Pass Pass
38	Existing Proposed	11 15	Standing Strolling	46 53	Pass Pass
39	Existing Proposed	10 14	Sitting Standing	38 47	Pass Pass
40	Existing Proposed	8 13	Sitting Standing	33 53	Pass Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort		Wind Safety	
		Annual		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating
41	Existing Proposed	12 9	Standing Sitting	43 44	Pass Pass
42	Existing Proposed	7 13	Sitting Standing	27 55	Pass Pass
43	Existing Proposed	13 9	Standing Sitting	45 41	Pass Pass
44	Existing Proposed	12 13	Standing Standing	44 48	Pass Pass
45	Existing Proposed	10 10	Sitting Sitting	36 38	Pass Pass
46	Existing Proposed	11 14	Standing Standing	44 48	Pass Pass
47	Existing Proposed	11 13	Standing Standing	44 55	Pass Pass
48	Existing Proposed	9 12	Sitting Standing	41 47	Pass Pass
49	Existing Proposed	8 12	Sitting Standing	36 43	Pass Pass
50	Existing Proposed	9 11	Sitting Standing	36 48	Pass Pass
51	Existing Proposed	11 13	Standing Standing	56 63	Pass Pass
52	Existing Proposed	13 14	Standing Standing	47 60	Pass Pass
53	- Proposed	- 13	- Standing	- 51	- Pass
54	- Proposed	- 11	- Standing	- 53	- Pass
55	Existing Proposed	11 16	Standing Strolling	41 65	Pass Pass
56	Existing Proposed	16 13	Strolling Standing	60 45	Pass Pass
57	Existing Proposed	15 13	Strolling Standing	59 51	Pass Pass
58	Existing Proposed	10 11	Sitting Standing	43 44	Pass Pass
59	Existing Proposed	11 13	Standing Standing	61 59	Pass Pass
60	Existing Proposed	15 17	Strolling Strolling	58 60	Pass Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort		Wind Safety	
		Annual		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating
61	Existing	14	Standing	59	Pass
	Proposed	14	Standing	59	Pass
62	-	-	-	-	-
	Proposed	11	Standing	42	Pass
63	-	-	-	-	-
	Proposed	16	Strolling	55	Pass
64	-	-	-	-	-
	Proposed	7	Sitting	28	Pass
65	-	-	-	-	-
	Proposed	21	Uncomfortable	67	Pass
66	-	-	-	-	-
	Proposed	8	Sitting	28	Pass
67	-	-	-	-	-
	Proposed	12	Standing	41	Pass
68	-	-	-	-	-
	Proposed	9	Sitting	35	Pass
69	-	-	-	-	-
	Proposed	12	Standing	54	Pass
70	-	-	-	-	-
	Proposed	14	Standing	54	Pass
71	-	-	-	-	-
	Proposed	12	Standing	57	Pass
73	-	-	-	-	-
	Proposed	8	Sitting	29	Pass
74	-	-	-	-	-
	Proposed	10	Sitting	42	Pass
75	-	-	-	-	-
	Proposed	14	Standing	53	Pass
76	-	-	-	-	-
	Proposed	11	Standing	64	Pass
77	-	-	-	-	-
	Proposed	12	Standing	58	Pass
78	-	-	-	-	-
	Proposed	10	Sitting	40	Pass
79	-	-	-	-	-
	Proposed	10	Sitting	46	Pass
80	-	-	-	-	-
	Proposed	13	Standing	51	Pass
81	-	-	-	-	-
	Proposed	12	Standing	66	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort		Wind Safety	
		Annual		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating
82	-	-	-	-	-
	Proposed	10	Sitting	52	Pass
83	-	-	-	-	-
	Proposed	11	Standing	46	Pass
84	-	-	-	-	-
	Proposed	17	Strolling	59	Pass
85	-	-	-	-	-
	Proposed	12	Standing	45	Pass
86	-	-	-	-	-
	Proposed	11	Standing	38	Pass
87	-	-	-	-	-
	Proposed	13	Standing	46	Pass
88	-	-	-	-	-
	Proposed	9	Sitting	36	Pass
89	-	-	-	-	-
	Proposed	11	Standing	40	Pass

Season	Months	Hours	Safety Speed (km/h)
Annual	January - December	6:00 - 23:00 for comfort	(0.1% Annual Exceedance)
Annual	January - December	0:00 - 23:00 for safety	≤ 83 Pass
			> 83 Exceeded

Comfort Speed (km/h)	
(20% Seasonal Exceedance)	
≤ 10	Sitting
11 - 14	Standing
15 - 17	Strolling
18 - 20	Walking
> 20	Uncomfortable

Configurations	
Existing	Existing site with Exisitng surroundings
Proposed	Proposed Development with existing surroundings