Downtown Carpark Site Development

ENVIRONMENTAL WINDS REPORT
Fast Track Consent Application

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EXECUTIVE SUMMARY

This report provides a summary of the assessment of the wind conditions around the proposed Downtown Carpark Site Development in Auckland, for the purpose of supporting a Fast Track Consent application. The aim of the study is to quantitively assess the wind effects of the proposed development on the pedestrian comfort in the surrounding area.

This report is based on architectural drawings, provided by Warren and Mahoney in July 2025 and wind tunnel tests completed at RWDI in August 2025. It makes use of the wind comfort criteria of the Auckland Unitary Plan (AUP) to describe wind conditions in terms of safety and comfort acceptability for a range of activities.

Methodology

For the wind tunnel tests, a 1:400 scale model of the proposed development and its surroundings located within approximately 500m of the target site were constructed from rigid material. Measurements were taken at approximately 90 locations around the site. Design workshops were organised in collaboration with the design team to adjust the design of the proposed development for wind.

Existing Wind Conditions

While conditions immediately around the existing site were shown to be relatively calm, at the north end of Lower Hobson Street, adjacent to the M-Social Building Category D or E conditions were measured along with an exceedance of the distress criteria.

Wind Conditions in and around Proposed Development - Without Mitigation Measures

The proposed Downtown Carpark Site Development tends to act like one large massing forcing more winds in the side streets. Wind conditions around the proposed development without mitigation measures were found to be windier than existing, with exceedances of the safety criteria. Mitigation measures were found to be required to improve conditions.

Wind Design Process

A series of architectural and wind tunnel workshops occurred to develop a suitable set of wind mitigation measures, including landscaping, screens, free roof extension and canopy as shown in Figure 2.

Wind Conditions around Proposed Development - With Mitigation Measures

The wind conditions in and around the proposed development with the mitigation measures are diagrammatically shown in Figure 1. Overall, wind conditions were found to be within Category C or calmer and acceptable for the intended use. There were however a few areas of Category D conditions as detailed below.

Areas of Category D Conditions

The Category D conditions and the local exceedance of the distress criteria at the north end of Lower Hobson Street remain similar or calmer than existing, though the area of peak windiness shifts slightly southward toward Podium P2.

There is a local area of Category D under the bridge between Podium P1 and P2. However, these conditions remain local, marginal and occur in a walking transitional space.

There is also a local area Category D condition in Customs Street, which remains local only.

Concluding Remarks

Overall, wind conditions in the public spaces at ground level generally comply with the AUP requirements for wind effects. Local and marginal exceedance are either similar to existing or occurring in less sensitive places.

Future Opportunities

This assessment included the Lower Hobson Street fly-over. Further improvements could be made with landscaping as the fly-over is demolished in the future and the area is re-developed.

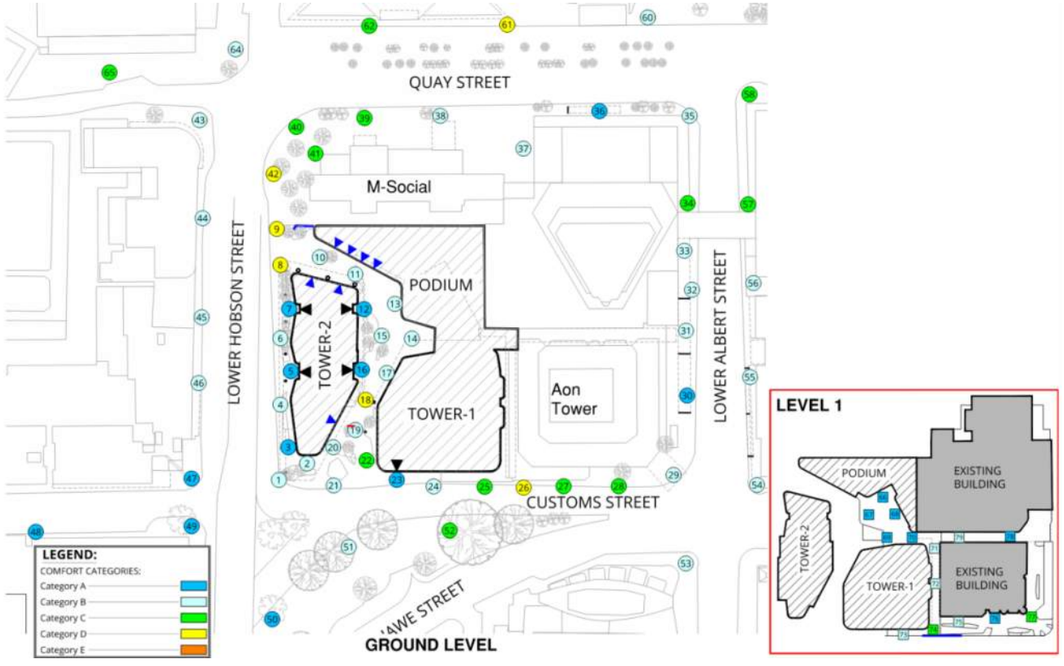

Figure 1: Wind Conditions for the Proposed Development with Mitigation Measures

Figure 2: Mitigation Measures (Summary)

1. INTRODUCTION

This report provides a summary of the assessment of the wind conditions around the proposed Downtown Carpark Site Development in Auckland, for the purposes of supporting a Fast Track Consent application. The aim of the study is to quantitively assess the wind effects of the proposed development on the pedestrian comfort in the surrounding area.

This report is based on architectural drawings, provided by Warren and Mahoney in July 2025 and wind tunnel tests completed at RWDI in July 2025. It makes use of the wind comfort criteria of the Auckland Unitary Plan (AUP) to describe wind conditions in terms of safety and comfort acceptability for a range of activities.

Several rounds of wind tunnel tests and workshops were completed to develop a suitable design for wind. This report presents the key wind mitigation measures implemented and tested in the wind tunnel, and the wind conditions for the final configuration tested.

Conclusions from this report may be affected if appreciable changes to the building massing and architectural features, from that considered in this study, are made as part of the project design development.

1.1 Limitations

This report is for the sole use of Precinct Properties New Zealand Ltd (Precinct). The information and findings presented are not intended for use by other parties and may not contain sufficient information for the purposes of other parties or other uses. Our professional services are performed using a degree of care and skill normally exercised, under similar circumstances, by reputable consultants practicing in this field at this time. No other warranty, expressed or implied, is made as to the professional advice presented in this report.

2. PROJECT DESCRIPTION

The proposed Downtown Carpark Site Development includes two new towers and a series of podium buildings as shown in Figure 3 below.

2.1 Scope of Work

The purpose of the report is to summarise the results of the wind tunnel tests for three configurations:

- Existing site
- Proposed Development without mitigation measures
- Proposed Development with mitigation measures

Figure 3: Architectural Rendering
(View from North)

3. BACKGROUND

3.1 Methodology Overview

The wind tunnel tests were carried out at the boundary layer wind tunnel of RWDI in accordance with the Quality Assurance Manual for Wind Engineering Studies of Buildings Ref [1]. A 1:400 scale model of the proposed development and its surroundings located within approximately 500m of the target site were constructed from rigid material. The was also included in the surrounding model. A general view of the wind tunnel model is shown in Figure 5

3.2 Atmospheric Boundary Layer

The characteristics of the oncoming wind speed and turbulence are generated in the wind tunnel by using roughness elements upwind of the wind tunnel model. These elements create a boundary layer wind speed profile similar to one that occurs in the natural atmosphere.

An analysis of the terrain roughness was carried out using the ESDU methodology Ref [2]. This methodology is based on the Deaves and Harris wind model, which is also the model used in the New Zealand Standard for Wind Loading. The wind profiles for the wind tunnel tests were then selected to match that occurring in the natural boundary layer.

3.3 Measurements

Gust and mean wind speeds were measured at approximately 90 locations using Irwin probes placed within and around the site. The locations of the probes were chosen either due to sensitivity of the expected activity in the area or because the proposed site geometry suggested the possibility of undesirable wind conditions. The location of the probes is shown in Figure 7.

Figure 5: RWDI Wind Tunnel

Figure 6: Measurement Probe (Sensor)

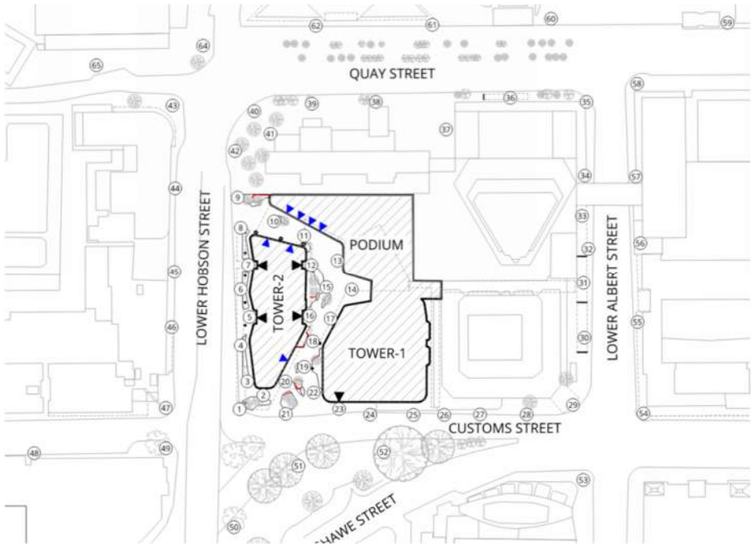

Figure 7: Measurement Location Plan

3.4 Wind Climate in Auckland

A dataset of 19 years (1999-2017) of 10min-average wind speed data from Auckland International Airport was acquired from the MetService. The dataset was sorted by range of wind speeds and directions to obtain the annual wind rose for Auckland International Airport.

The prevailing winds in Auckland originate from a quadrant centred on the south-west wind direction as illustrated in Figure 8. A secondary wind component blows from the north-east direction and can be strong at times.

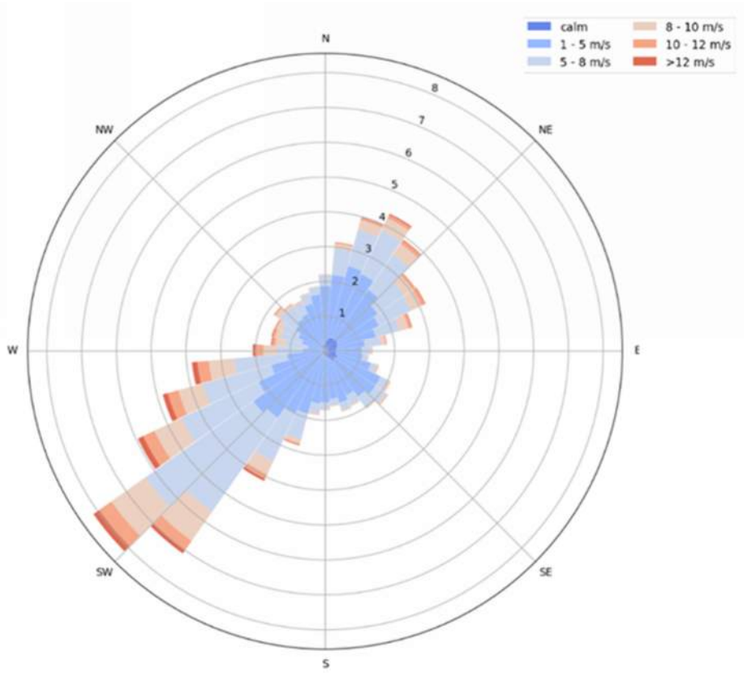

Figure 8: Auckland Airport Wind Rose

3.5 Wind Comfort and Safety Criteria

This section describes the Comfort and Safety criteria the wind study uses.

3.5.1 Outdoor Comfort

The acceptability of windiness is subjective and depends on several factors, most importantly the activities to be performed in the area being assessed. A person sitting at a terrace reading a newspaper and wanting to enjoy a coffee would be more sensitive to wind conditions than someone walking along the footpath to the office.

There are many sets of wind criteria used worldwide to assess the acceptability of wind conditions in an urban context. All these criteria generally tend to be similar in that they account for the statistical variation of the winds and the activity to be performed in the area being assessed.

The wind criteria or categories used in this assessment are those from the Auckland Unitary Plan (AUP) Ref [1]. The AUP wind categories account for the intended activity performed, as summarised in Table 1. More details can be found in Ref [1].

Category	Description Summary
A	External area of long-term recreational or relaxation use. Public squares and parks.
B	Area for short-term recreation and relaxation. Streets with significant groupings of landscaped seating features
C	Footpath
D	Areas of roads for service or vehicle transit
E	Conditions potentially dangerous, unacceptable

Table 1: AUP Wind Categories (Summary)

The assessment of wind conditions in relation to the categories above are based on mean wind speeds only. A strong gust also has the potential to make someone stumble or fall. The AUP takes this into account by introducing a limit on the annual maximum gust speed (25m/s).

The results of the wind tunnel tests at each measurement location are combined with long-term statistics for Auckland to quantify the wind conditions at each point according to the AUP Wind Category of Table 1. The mean wind speeds are calculated and compared with that extracted from the curves shown in Figure 9.

3.5.2 Other Comfort Parameters

Comfort also depends on other climatic parameters such as temperature, sun and humidity, as well as clothing. There will be days, especially in winter when conditions outside would naturally be unsuitable for external seating.

Finally, it should be noted that a light breeze may improve comfort during hot summer days.

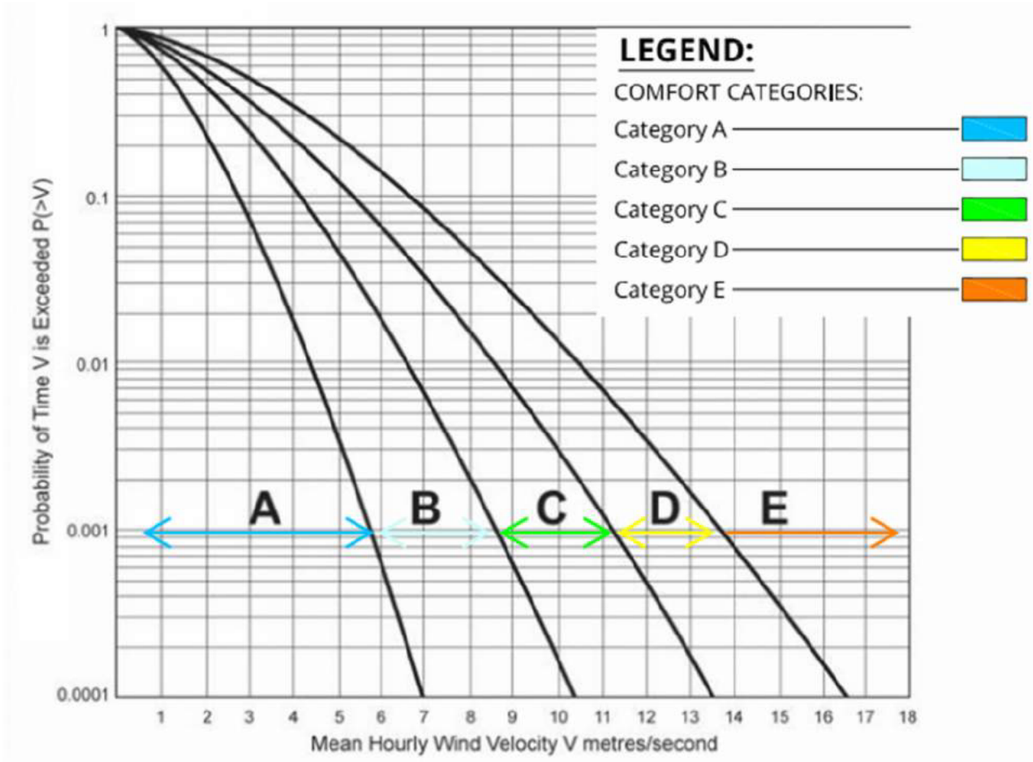

Figure 9: AUP Statistical Distribution & Quantification of Wind Conditions

4. EXISTING SITE

The existing site includes a large rectangular multi-storey car park accessed from its south side. It is situated in close proximity to Auckland Harbour in the north and west direction. Most of the tall buildings of Auckland CBD, including the Commercial Bay building, are situated on the east and south-east directions, while the areas to the west and south-west feature low or medium-rise buildings as shown in Figure 10. The site is bordered by Lower Hobson Street to the west and Customs Street to the south. Significant surrounding buildings include the Aon Tower immediately to the east and the M-Social building immediately to the north.

Pictures of the wind tunnel model of the existing site are shown in the figures on the right-and side.

The existing site model included the fly-over in Lower Hobson Street, the pedestrian bridge at the north end of the Lower Hobson Street and the car ramp on the south side.

Figure 10: Aerial View of the Existing Site

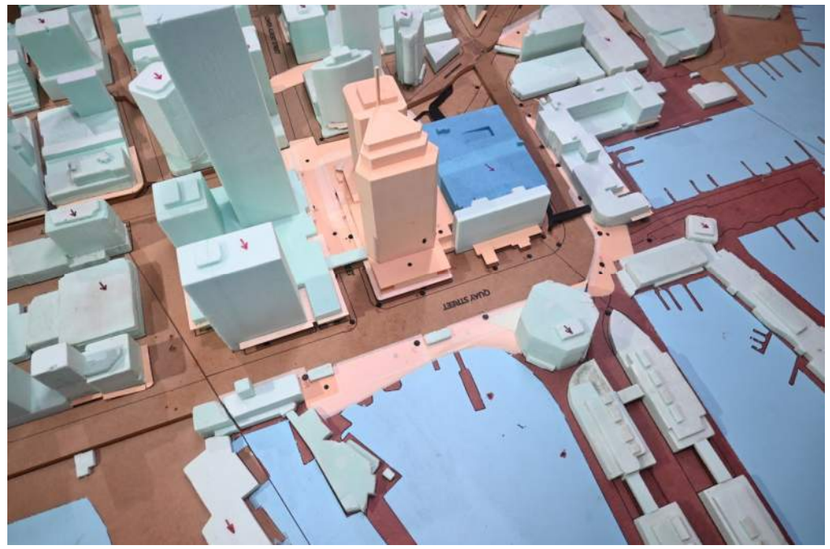

Figure 11: Model of Existing Site (1:400 Scale). View from North-East

Figure 12: Model of Existing Site (1:400 Scale). View from West.

Figure 13: Model of Existing Site. View from South-East.

4.1 Existing Wind Conditions

4.1.1 Safety

The safety criteria is shown to be exceeded at one location (Sensor 42) in Lower Hobson Street as shown in Figure 14. This is due to the wind airflow acceleration around the M-Social building and possibly a local effect under the pedestrian bridge.

Elsewhere around the existing site, the safety criteria was not found to be exceeded, although a few locations in Lower Albert Street (Sensor 30) or in Quay Street (Sensor 61, 62) already feature relatively high gust speed, i.e. close to exceeding the safety criteria.

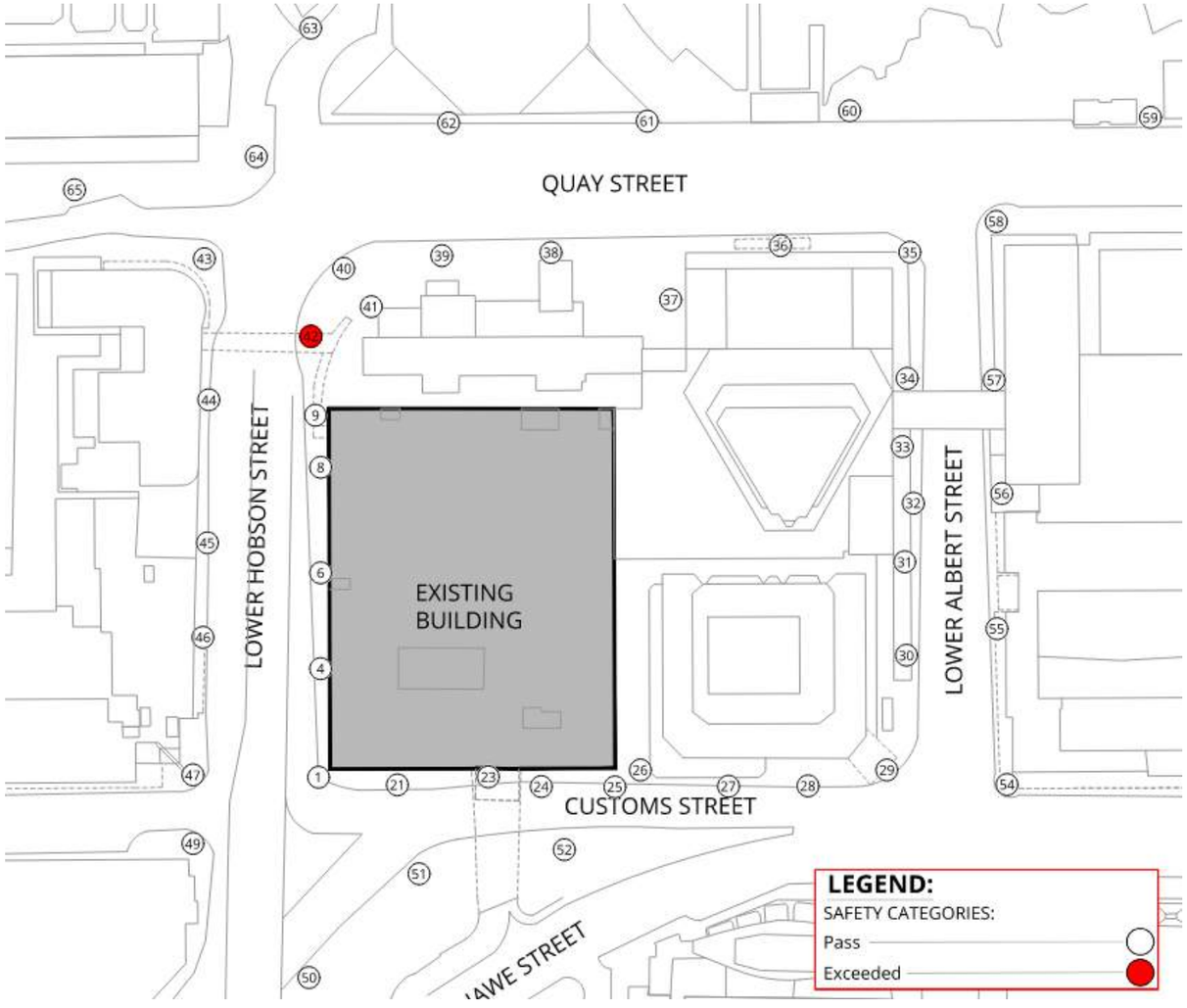

Figure 14: Exceedances of Safety Criteria around Existing Site (RWDI Extract)

4.1.2 Comfort

The wind conditions around the existing site are shown in Figure 15.

Lower Hobson Street

Existing conditions in most of Lower Hobson Street are shown to be in Category A or B, with local Category C conditions (Sensor 9), around the north-west corner of the existing building. These conditions are acceptable for the current use as a footpath.

Conditions are shown to be windier at the north end of Lower Hobson Street, just by the M-Social Building, with Category D or even E conditions measured in this area. These conditions are due to the effects of the prevailing south-west and north-east winds accelerated around the M-Social building.

Quay Street

Conditions further in Quay Street are shown to be relatively exposed, with Category C or D conditions, including in the area to the north of the M-Social building. While Category D conditions would normally be considered as windy for a use as a footpath, they are not unusual in areas exposed to winds blowing across the sea, i.e. with no or limited shelter upwind, especially close to building corners. It is likely wind comfort expectations in such exposed areas would be lower than for other walking areas in Auckland CBD.

Customs Street

Conditions in the west part of Customs Street, i.e. close to the existing building, are shown to be predominantly in Category B. In the east part of the street, i.e. close to the Aon Tower, conditions are shown to be windier, i.e. in Category C.

Aon Tower Arcade and Laneway

Wind condition in the existing arcade on the south side of the Aon Tower are shown to be in Category B, with a local Category C around the north west corner of the tower.

Lower Albert Street

Wind conditions in Lower Albert Street are shown to be in Category C or D. Note however the series of screens under the bus stops were not included at this stage. It is expected that conditions in Lower Albert Street would be calmer.

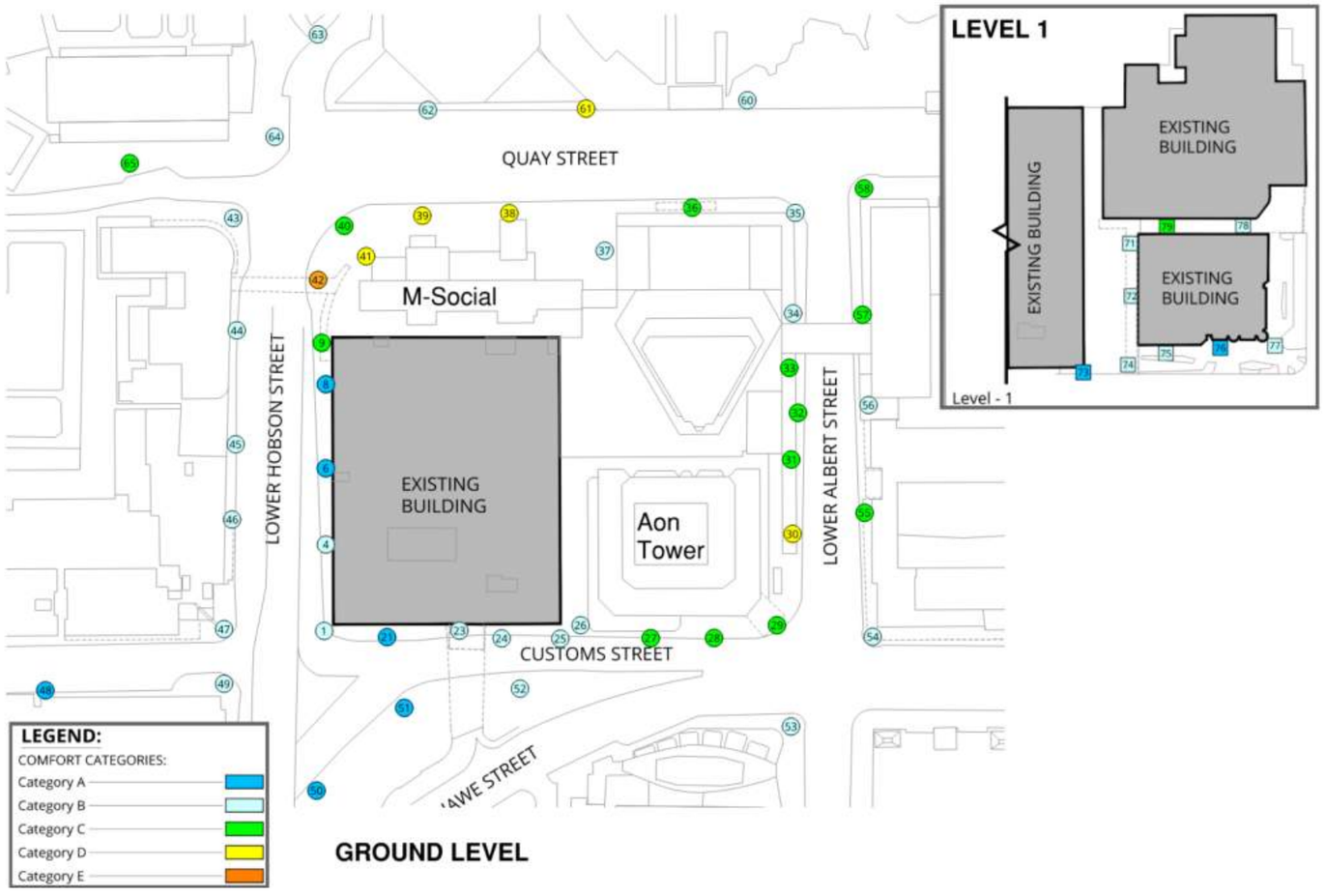

Figure 15: Wind Conditions around the Existing Site

5. PROPOSED DEVELOPMENT

The proposed Downtown Carpark Site Development includes two new towers and a series of Podium buildings as shown in Figure 16

The two towers are tall, prismatic structures that are supported by podiums. The proposed podium P3 block is located on the northern part of the site, adjacent to the M-Social building, and is of a lower height. Tower 1, standing at over 220 meters, is situated just west of the existing Aon tower, while Tower 2, which is over 160 meters tall, is positioned closer to Lower Hobson Road on the western side of the site. Both towers have chamfered corners, or ''cut-outs'', above the podium and at the top. The podiums are linked through bridges, and a free roof covers a portion of the new public space situated between them. This space can be accessed via several laneways, which connect it with Lower Hobson Street, Custom Street West, and the site of the existing Aon Tower building located further east through steps. There is also a link to the eastern pedestrian laneway situated on a podium level of Tower 1 on its east side.

The size of the step between the podiums and towers is an important geometric feature of the proposed development for wind effects. This step varies in size; it is relatively narrow on the north and east sides of the towers but is larger on the west and south sides.

The model also reflected the future laneways around the Aon Tower. Pictures of the wind tunnel model of the proposed development are shown in the figures on the right-hand side.

Figure 16: Architectural Rendering (View from South-west)

Figure 17: Wind Tunnel Model (View from North)

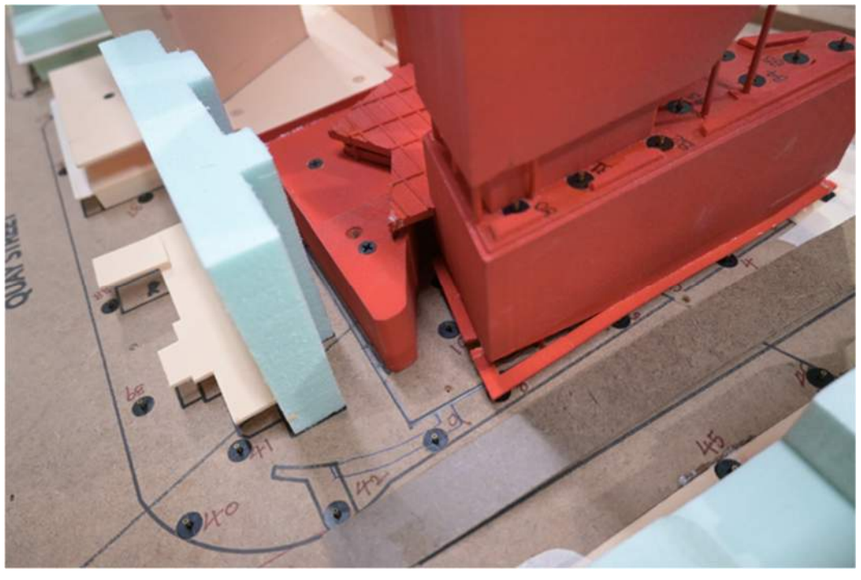

Figure 18: Wind Tunnel Model (View from West)

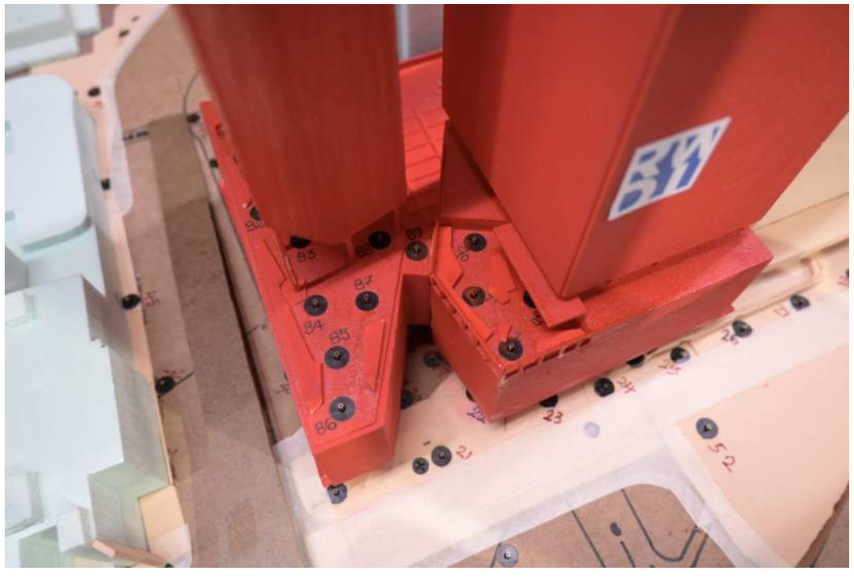

Figure 19: Wind Tunnel Model (View from South)

5.1 Wind Conditions without Mitigation Measures

5.1.1 Safety

The proposed development without landscaping or mitigation measures is shown to have a significant impact on wind conditions in and around the site, with 10 exceedances of the safety criteria, as shown in Figure 20.

The most critical area is at the north end of Lower Hobson Street, where the safety criteria is exceeded at three locations (Sensor 39, 40 and 41). This is due to the massing of the proposed development which deflects and channels the prevailing south-west winds in the street.

Further south in Lower Hobson (Sensor 8 and 9), the exceedances of the distress criteria are generated by the north-east component of the prevailing winds deflected downwards by Tower T2.

The safety criteria is also shown to be exceeded in the gap between Podium P1 and P2 (Sensor 18), which is due to the effect of the air flow accelerated as the gap between the building narrows.

The exceedances of the safety criteria in Quay Street (Sensor 61), Lower Albert Street (Sensor 30) or Customs Street under the Aon Tower Arcade (Sensor 77) are more marginal, just over the 25m/s limit (Appendix B).

As further detailed below landscaping and additional mitigation measures are necessary to improve conditions throughout the site.

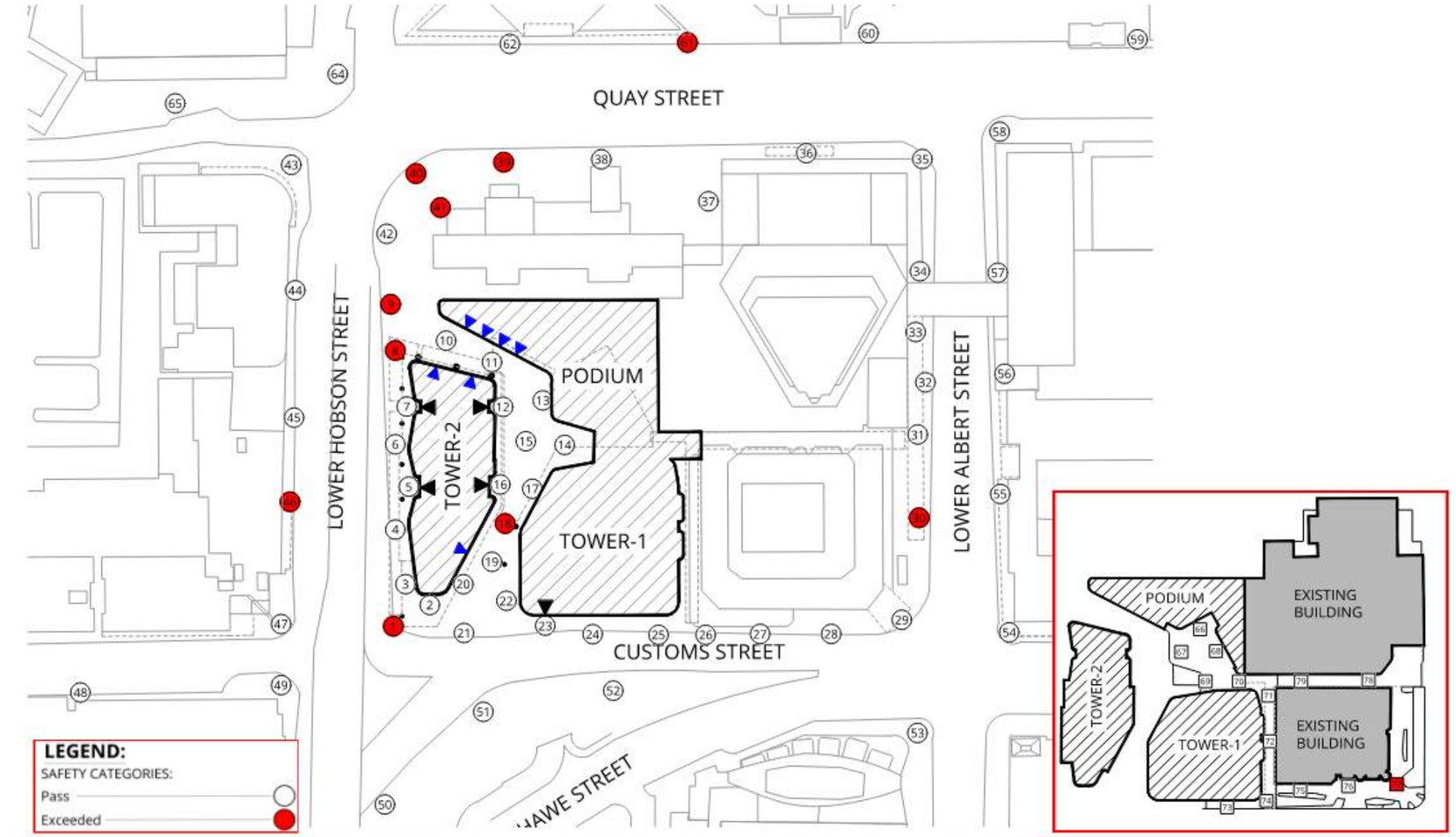

Figure 20: Safety Exceedances in and around the Proposed Development (without Landscaping and Mitigation Measures)

5.1.2 Comfort

Wind Mechanisms

As for the safety conditions described, the proposed development without landscaping or mitigation measures is shown to have an effect on the wind conditions relevant for comfort. For the prevailing south-west winds, the proposed development has the effect of diverting a more significant airflow than existing in Lower Hobson Street and Customs Street. The resulting airflow then tends to accelerate at the two corners around M-Social and Aon Tower respectively.

Wind conditions for the proposed development without mitigation measures are shown in Figure 21.

Lower Hobson Street

Conditions in the south part of Lower Hobson Street are generally in Category A or B, which is similar to existing and acceptable for a use as footpath. However, conditions are shown to become gradually windier as moving north in Lower Hobson Street, with Category D or E measured from the north-west of Podium P2 to the north-west corner of the M-Social building. These conditions are windier than existing and need improvement.

Quay Street

In the west part of Quay Street, conditions are shown to be also slightly windier than existing with Category C conditions measured. Moving further east in Quay Street, conditions are shown to be in Category B or C, which is similar to existing.

Urban Room

Wind conditions in the southern-most area, i.e. close to the entrance from Customs Street, are shown to be in Category A or B. Conditions gradually change to Category C as moving in the north direction and closer to the narrow point between Podiums P1 and P2, with local Category E conditions measured just below the bridge. These conditions would not be acceptable for the intended use and need improvement. The northern part of the space has a combination of Category A, B or C conditions, which would also benefit from some improvement.

Lower Albert Street

In Lower Albert Street, conditions are also shown to be windier than existing, with Category D or E conditions on both sides of the street. Note that the model did not include the vertical screens of the bus stops at this stage.

Customs Street

In Customs Street, conditions close to the proposed development are shown to be generally in Category B, which is similar to existing and acceptable for a use as footpath. Conditions on the opposite side of Customs Street, in the Sturdee St Park and in Sturdee Street, are also found in Category A or B, with Sensor 52 exhibiting Category D conditions. Conditions are also shown to be become gradually windier as moving east with up to Category E conditions around the south-east corner of the Aon Tower.

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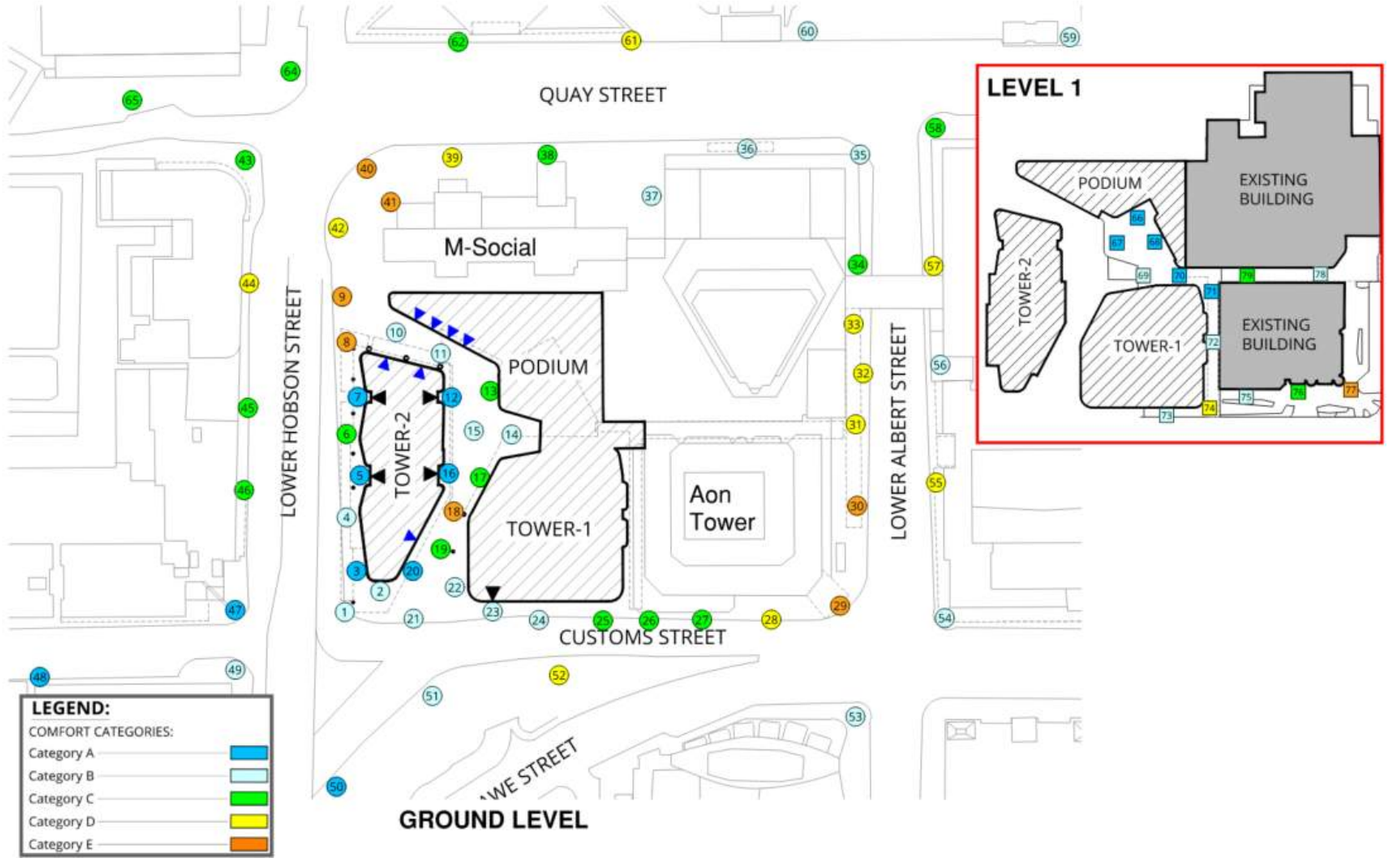

Figure 21; Wind Conditions for the Proposed Development without Mitigation

5.2 Wind Conditions with Mitigation Measures

5.2.1 Mitigation Measures

The initial wind tunnel tests summarised above revealed that wind conditions needed improvement. A series of architectural and wind tunnel workshops (Appendix A) occurred to develop a suitable set of wind mitigation measures. The process generally consisted of trying combinations of canopies, free roof, trees and screens. The model was further slightly refined in some areas to include the existing landscaping and additional features such as the bus stop screens in Lower Albert Street. The final configuration presented in this report is therefore the result of this design process. It is effectively an optimised version of other combinations. The wind mitigation measures are as follows:

- Free roof fully covering the space between Podium's P1 and P2. Note that a 1m-gap is maintained between the free roof and Podium P3.
- 2.5m-screens in the Urban Room just south of the bridge and at the corner of west corner of Podium P3
- 4.5m-canopy north side of Podium P2
- 6-8m mature evergreen trees (in addition of existing trees) around the M-Social building
- 3m-trees in Lower Hobson Street
- 2.5m solid screen at Level 1, at the south-east corner of Podium P1.
- Full canopies covering the laneways around Aon tower.
- Landscaping in the Urban Room.

The mitigation measures are shown in the figures on the right-hand side and diagrammatically shown in Figure 26.

Figure 22: Proposed Development with Mitigation Measures. View from South-west

Figure 23: Proposed Development with Mitigation Measures. View from North around M-Social Building

Figure 24: Proposed Development with Mitigation Measures. View in Customs Street

Figure 25: Proposed Development with Landscaping at North end of Lower Hobson Street

5.2.2 Urban Design Integration

The mitigation measures and the landscaping were integrated into the architecture as illustrated in the figures on the right-hand side.

The additional trees in Lower Hobson Street located off-site were discussed with the landscaping team. The trees need to be evergreen trees capable of growing in exposed places, such as Pohutukawa trees, and already mature when the proposed development is built, which was also recommended in the landscaping documentation Ref [4].

Figure 26: Mitigation Measures (Summary)

Figure 27: Canopy Rendering from Lower Hobson Street

Figure 28: 2.5m Screen View from South

Figure 29: View from Urban Room

5.2.3 Safety

The safety exceedances for the proposed development with mitigation measures are shown in Figure 30.

With the mitigation measures highlighted above, wind conditions were shown to improve significantly, with only one exceedance of the safety criteria (Sensor 9) which should be considered as follows:

- As shown in RWDI table (Appendix B, Table 1), the relevant gust speed was found equal to 26m/s, i.e. marginally above the 25m/s threshold.
- In the existing configuration (ie without the proposed development), the safety criteria was found to be exceeded at Sensory 42, i.e. slightly further north only.
- The existing exceedance at Sensor 42 is more severe than that for the proposed development at Sensor 9.

Based on the above, the proposed development is shown to maintain a similar or calmer level of windiness in Lower Hobson Street, though a slight shift of the area of peak gustiness further south, i.e. closer to the Podium P2.

Several design alternatives were tested in the wind tunnel, including a substantial increase in the size of the free roof area between Podium P2 and P3. These alternatives did not significantly improve wind conditions in this location, as summarised in Appendix A.

For all other areas around the proposed development, there was no exceedance of the distress criteria.

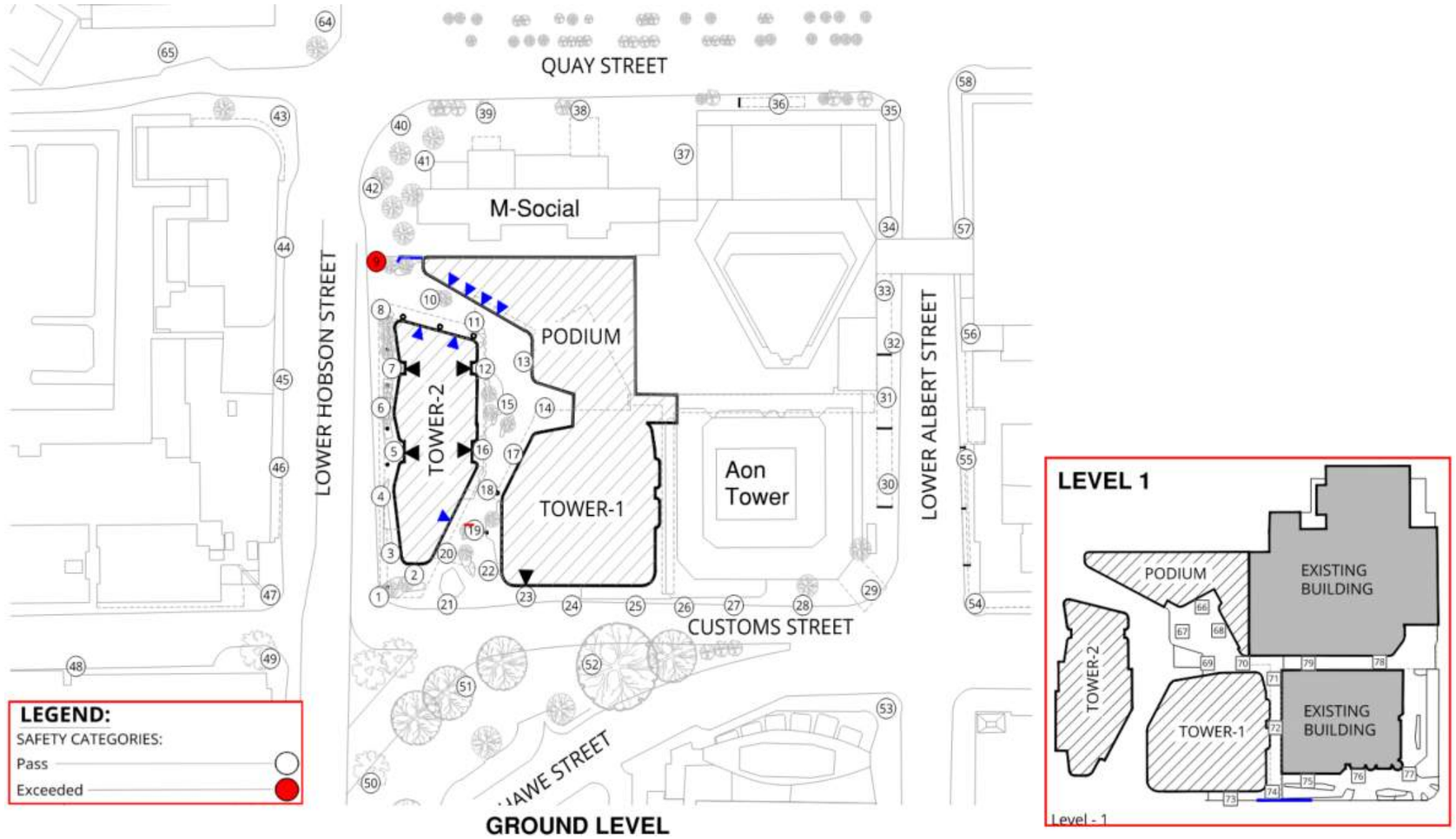

Figure 30 Safety Criteria Exceedances in and around the Proposed Development with Mitigation Measures

5.2.4 Comfort

General

Overall, the mitigation measures were found to improve wind conditions significantly. Conditions in most areas are generally shown to remain within Category C or calmer and acceptable for the intended use of the areas. Wind conditions, including the few Category D conditions, are discussed below in more details:

Lower Hobson Street

With the mitigation measures, conditions at the north end of Lower Hobson Street (Sensor 39-41) are generally in Category C, which is acceptable for a use as footpath, and calmer than existing. Further south in Lower Hobson Street, conditions remain in Category D (sensor 8,9, 42), which is windier than the Category C conditions normally required for a footpath, but similar or calmer than the existing conditions occurring further north.

With the mitigation measures, wind conditions at the north end of Lower Hobson Street remain similar or calmer than existing, though the area of peak windiness shifts slightly southward toward Podium P2. As noted above for the safety exceedance, several design alternatives were tested in the wind tunnel to improve conditions in this area. These alternatives did not significantly improve wind conditions, as summarised in Appendix A. As further discussed in Section 5.2.5, additional future landscaping along Lower Hobson Street would likely improve conditions further. We understand such landscaping would be implemented in the probable future removal of the existing Lower Hobson Street fly-over.

Urban Room

With the mitigation measures, wind conditions in the Urban Room (Sensor 10-17) are shown to be in Category A or B, which would be acceptable for short-term sitting. Conditions under the bridge improved significantly from the Category E conditions reported for the configuration without mitigation measures. Conditions in this area are shown to remain in Category D, i.e. above the Category C conditions normally needed for a walking area.

However, these conditions should be considered as follows:

- As shown in RWDI table (Appendix B, Table 1), conditions are only marginally windier than the Category C conditions.
- These conditions are local only and occur in a walking transitional area. Conditions improve significantly either side of the bridge.
- Additional 2.5m screens either side of the bridge were not found to improve conditions significantly, as summarised in Appendix A. It is expected that additional substantial improvement could only be obtained by screening directly under the bridge. Such measures would prevent pedestrian traffic and are not feasible.

Wind conditions at Level 1 in the Urban Room are shown to be in Category A, which would be calm and acceptable for long-term sitting

Customs Street

In the west part of the Customs Street, conditions are shown to be in Category A or B, which is similar to existing and acceptable for the intended use of the area. As for the existing site, conditions become gradually windier as moving east with most conditions shown in Category C and acceptable for a footpath.

There is a local area of Category D conditions (Sensor 26), due to a local airflow acceleration between the block to the north and the trees to the south. These conditions remain local only.

Again, as further discussed in Section 5.2.5, further improvements could be made in the future with landscaping after the existing Lower Hobson Street fly-over is demolished and the area is re-developed further.

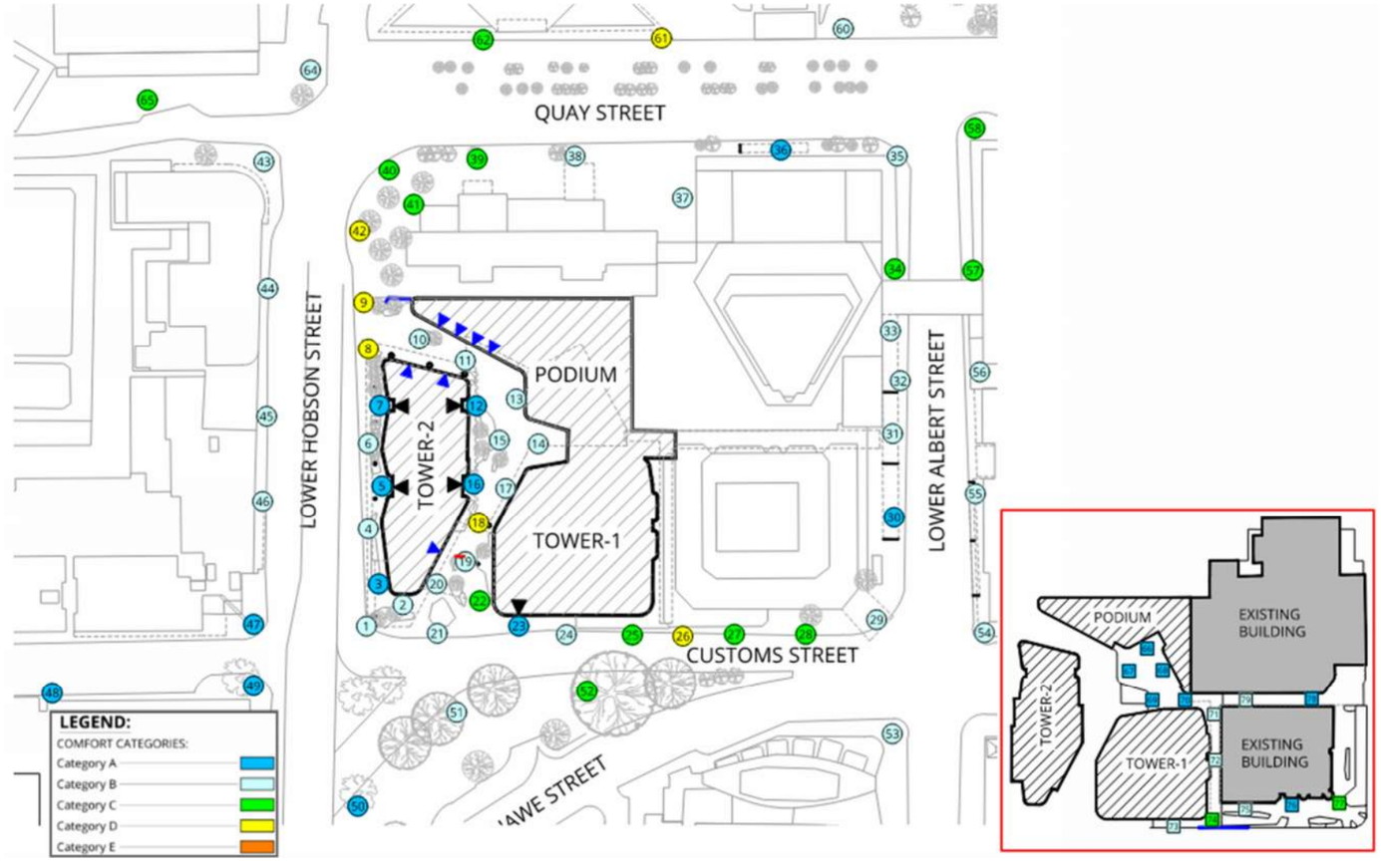

Figure 31: Wind Conditions for the Proposed Development with Mitigation Measures

Quay Street

In the west part of Quay Street, conditions are shown to be in Category B or C, which is acceptable for use as a footpath, and similar to existing

Sturdee Park

Conditions in Sturdee Park are shown to be in Category B, with an area of Category C at the end of the park, i.e. in an area not currently used for sitting.

Lower Albert Street

Conditions with the mitigation measures, and the screens of the bus stops are shown to be in Category A or B and acceptable for the current use.

Conditions under the arcade of the Aon Tower are shown to range from Category A to Category C, around the corner and generally acceptable for a use as a footpath.

Laneways

Wind conditions in the laneways are shown to be in Category A or B, which is acceptable for the intended use of the area. At the south-east corner of Podium P1, the 2.5m-screen was found efficient to improve conditions to Category C, which is acceptable for walking access.

5.2.5 Future Opportunities

The assessment above included the existing Lower Hobson Street fly-over.

We understand additional landscaping in Lower Hobson Street would be implemented in the probable future removal of the fly-over, which would likely improve conditions further at the north end of Lower Hobson Street (Sensor 8,9, 42),and help mitigate the marginal exceedance of the safety criteria.

6. CONCLUSIONS

This report provides a summary of the assessment of the wind conditions around the proposed Downtown Carpark Site Development in Auckland.

This report was originally based on architectural drawings, provided by Warren and Mahoney in July 2025 and wind tunnel tests completed at RWDI in August 2025. It makes use of the wind comfort criteria of the Auckland Unitary Plan (AUP) to describe wind conditions in terms of safety and acceptability for a range of activities.

The wind tunnel tests were carried out at the boundary layer wind tunnel of RWDI. A 1:400 scale model of the proposed development and its surroundings located within approximately 500m of the target site, were constructed from rigid material. Our key findings were as follows:

Wind conditions around the existing site, were shown to be generally in Category A or B, with Category D or E conditions at the north end of Lower Hobson Street.

The proposed development tends to act like one large massing forcing more winds in the side streets. Wind conditions around the proposed development without mitigation measures were found to be windier than existing, with exceedances of the safety criteria. Mitigation measures were found to be required to improve conditions.

A series of architectural and wind tunnel workshops occurred to develop a suitable set of wind mitigation measures, including landscaping, screens, free roof extension and canopy.

Overall, wind conditions with the mitigation measures in and around the proposed development remain within Category C or calmer, which would be acceptable for the intended use of the areas. There were however areas with Category D conditions as below:

The Category D conditions and the local exceedance of the distress criteria at the north end of Lower Hobson Street remain similar or calmer than existing, though the area of peak windiness shifts slightly southward toward Podium P2.

There is a local area of Category D under the bridge between P1 and P2. However, these conditions remain local, marginal and occur in a walking transitional space.

There is also a local area Category D condition in Customs Street, which remains local only.

Further improvements could be made with landscaping as the existing Lower Hobson Street fly-over is demolished and the area is re-developed further

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REPORT

DOWNTOWN CARPARK REDEVELOPMENT

AUCKLAND, NZ

PEDESTRIAN WIND STUDY
RWDI # 2303718
23 September 2025

SUBMITTED TO

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Document Control

Version	Status	Date	Prepared By	Reviewed By
A	Initial	23 September 2025	FA/AMC	HK

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 License 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 assessment for the proposed Downtown Carpark Redevelopment located in Auckland, New Zealand. The pedestrian-level wind assessment was conducted for the following configurations of the site:

Existing Configuration:	Existing site with Existing Surrounding Buildings.
Proposed Configuration:	Proposed Development with Existing Surrounding Buildings.
Mitigation Configuration:	Post-Workshop Final Configuration with Proposed Development and Existing Surrounding Buildings and with the inclusion of Landscaping and Wind Control Measures.

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 speeds have been evaluated against suitable criteria to assess pedestrian wind safety and comfort conditions. The results of the assessment are summarised as follows:

Existing Configuration

- A wind safety exceedance was identified at the corner of Lower Hobson Street and Quay Street, beneath the existing pedestrian bridge.
- Wind comfort was generally along Lower Hobson and Customs Streets was noted to be calm and suitable for passive pedestrian use at most locations. Elevated wind speeds were observed along Lower Albert and Quay Streets, appropriate for walking but unsuitable for seated areas such as bus shelters.

Proposed Configuration

- With the addition of the Proposed Development, safety exceedances are expected at the grade level, particularly along the Lower Hobson Street, Quay Street, and within the bus shelter near Lower Albert Street. An isolated exceedance was also identified at the southern end of the Urban Room and at the southeast corner of the AON Building. Safety exceedances are also likely within the Tower 2 Levels 7 terrace.
- Wind comfort remained suitable (Categories A–B) at building entrances and key pedestrian zones. However, higher wind speeds (Categories C–D) were noted along street frontages to the east and north and within along Lower Albert Street. High winds (Category E) are typically coincident with high gust areas noted above and can occur near the intersection of Lower Hobson Street/Quay Street and Lower Albert Street/Customs Street, under the link bridge between Towers T1 and T2, and Level 7 terrace of Tower T2.
- Private balconies on Tower T2 showed variable wind comfort (Categories A–C), acceptable for discretionary use.

Mitigation Configuration

- A comprehensive wind mitigation strategy was developed through a detailed workshop and iterative testing that explored a range of mitigation measures. The final approach incorporated key modifications including the extension and enclosure of the north awning, the addition of a free roof element to the south between Towers T1 and T2, and the installation of targeted ground-level screening. Additional details for surrounding buildings were also modelled, and the existing and proposed vegetation were also included for this test.

- These measures significantly improved the wind environment, resolving all critical comfort exceedances and most safety exceedances. However, a localised safety exceedance remained at the northwest corner of the site. This is generally consistent with existing conditions.
- Wind comfort improved across the site, particularly at bus shelters and pedestrian zones. However, elevated wind speeds persist in some areas such as the northwest corner and under the bridge connection between the Towers within the Urban Room. These are suitable for active use but not for long-duration seating or passive use.
- No mitigation was applied to the Level 7 terrace. Hence, wind conditions remain unchanged and will require further design consideration during detailed design stages.

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1 INTRODUCTION

RWDI Australia Pty Ltd (RWDI) was retained to conduct a pedestrian wind assessment on and around for the proposed Downtown Carpark Redevelopment located in Auckland, New Zealand. 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, where necessary.

The project site, shown within its existing surrounding context in Image 1, is located at the corner of Customs Street West and Lower Hobson Street near Princes Wharf. It is also bounded by M Social Hotel to the north, and HSBC Tower and AON Towers to the east. The Proposed Development consists of two high-rise towers with Tower T1 located adjacent to the AON Building with a height of 51-storeys and Tower T2 located along Lower Hobson Street with a height of 44-storeys. The Towers are situated atop a 7-storey high podium. A low-rise building is also included along the north of the site, referenced as Podium 3 or P3 in the drawings.

Image 1: Aerial View of Site and 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 development, and the outdoor amenity spaces on ground and upper levels of the development.

2 BACKGROUND AND APPROACH

2.1 Wind Tunnel Study Model

To assess the wind environment within and around the Proposed Development, a 1:400 scale model of the site and surroundings was constructed for the wind tunnel tests of the following configurations:

Existing Configuration:	Existing Site with Existing Surrounding Buildings (Image 2A).
Proposed Configuration:	Proposed Development with Existing Surrounding Buildings (Image 2B).
Mitigation Configuration:	Post-Workshop Final Configuration with Proposed Development and Existing Surrounding Buildings and with the inclusion of Landscaping and Wind Control Measures – Sept 2025 (Image 2C).

The wind tunnel model included all relevant surrounding buildings and topography within approximately 480 m 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 97 specially designed wind speed sensors to measure mean and gust wind speeds at a full-scale height of approximately 1.5 – 2 m above local ground in pedestrian areas throughout the study site. The placement of wind measurement sensors was based on RWDI's 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 existing and proposed site 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).

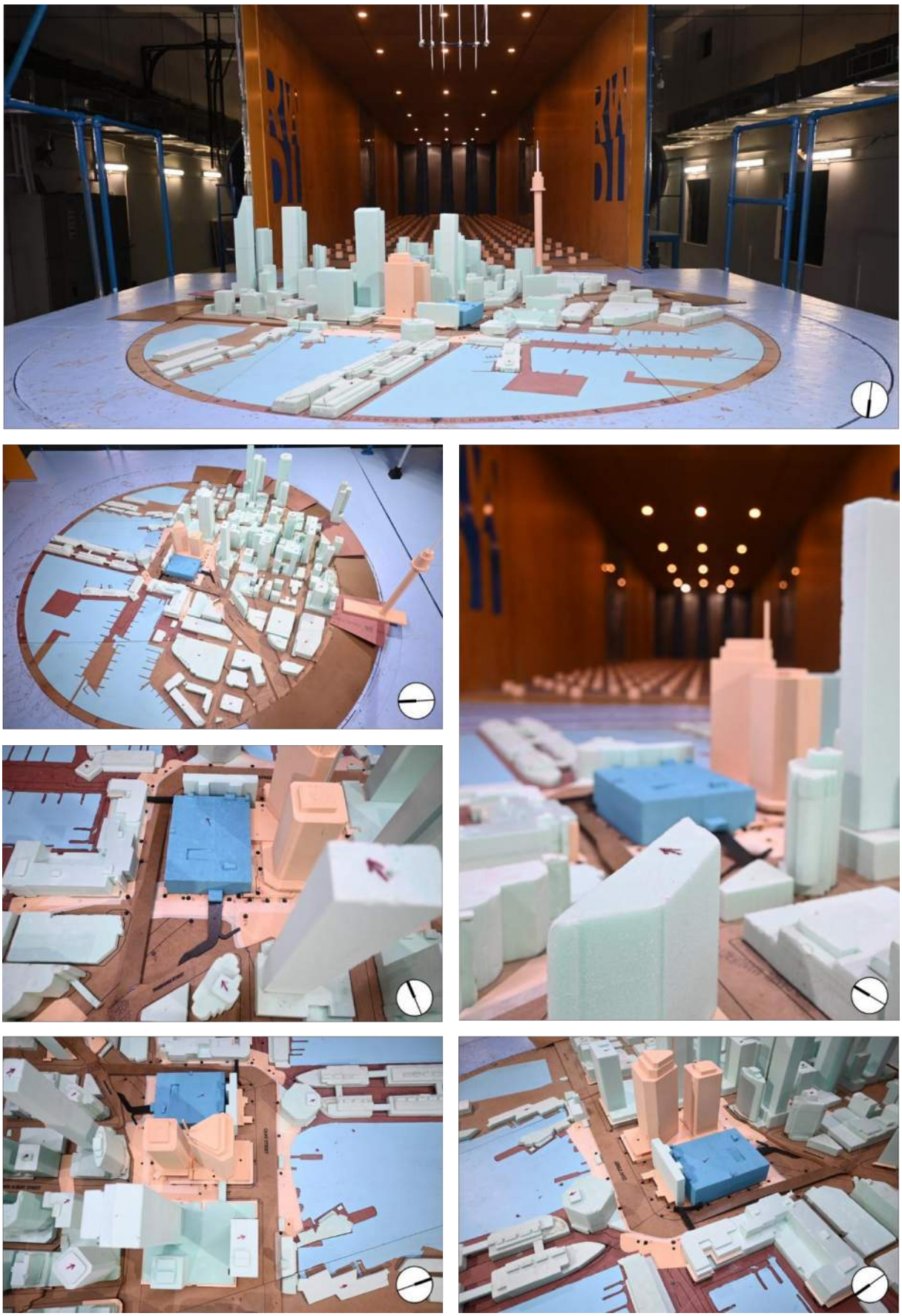


Image 2A: Wind Tunnel Study Model – Existing Configuration

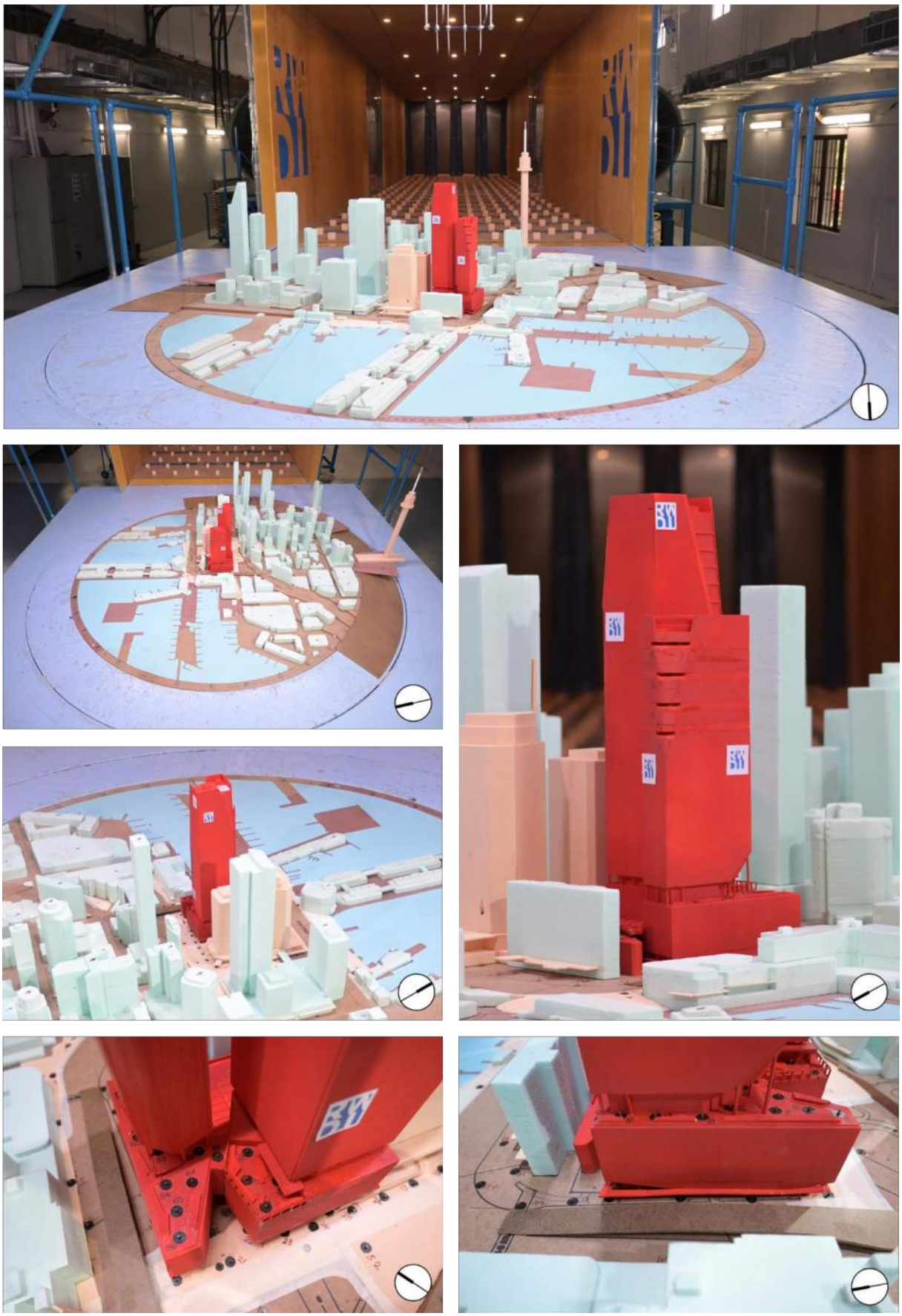


Image 2B: Wind Tunnel Study Model – Proposed Configuration

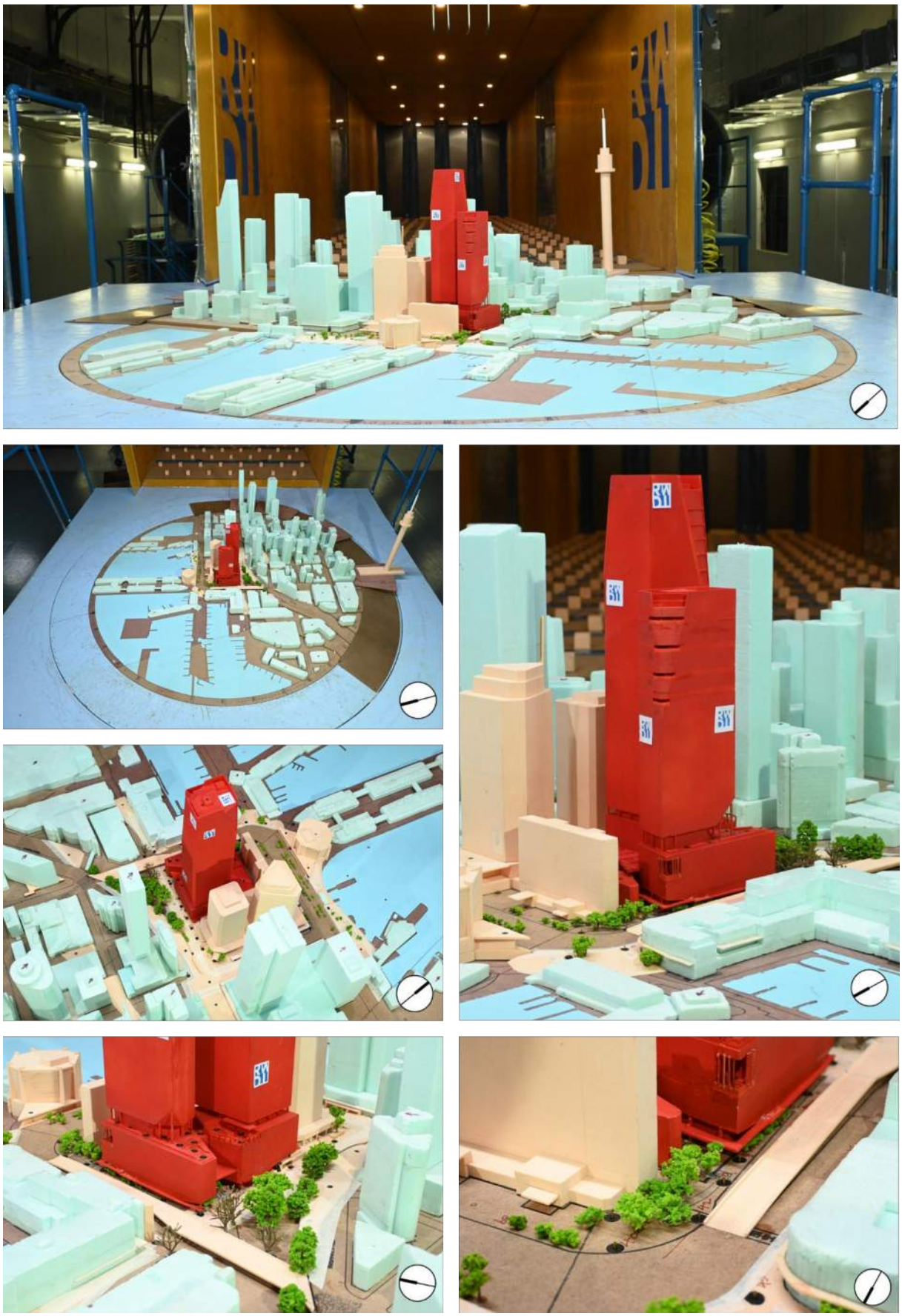


Image 2C: Wind Tunnel Study Model – Mitigation Configuration

2.2 Meteorological Data

Wind statistics recorded at Auckland International Airport between 1999 and 2023, inclusive, were analysed and were used to assess the wind conditions around the site. Image 3 graphically depicts the annual directional distributions of wind frequencies and speeds recorded at the station. Winds from southwest and northeast directions are predominant throughout the year as indicated by the wind rose. Strong winds of a mean speed greater than 6 m/s measured at the airport (at an anemometer height of 10 m) occur for approximately 33% of the time throughout the year.

Time-history of the wind for the period above was combined with the wind tunnel data to predict the frequency of occurrence of full-scale wind speeds at the site. The full-scale wind predictions were then compared with the wind criteria for pedestrian comfort and safety, as described in Section 2.3.

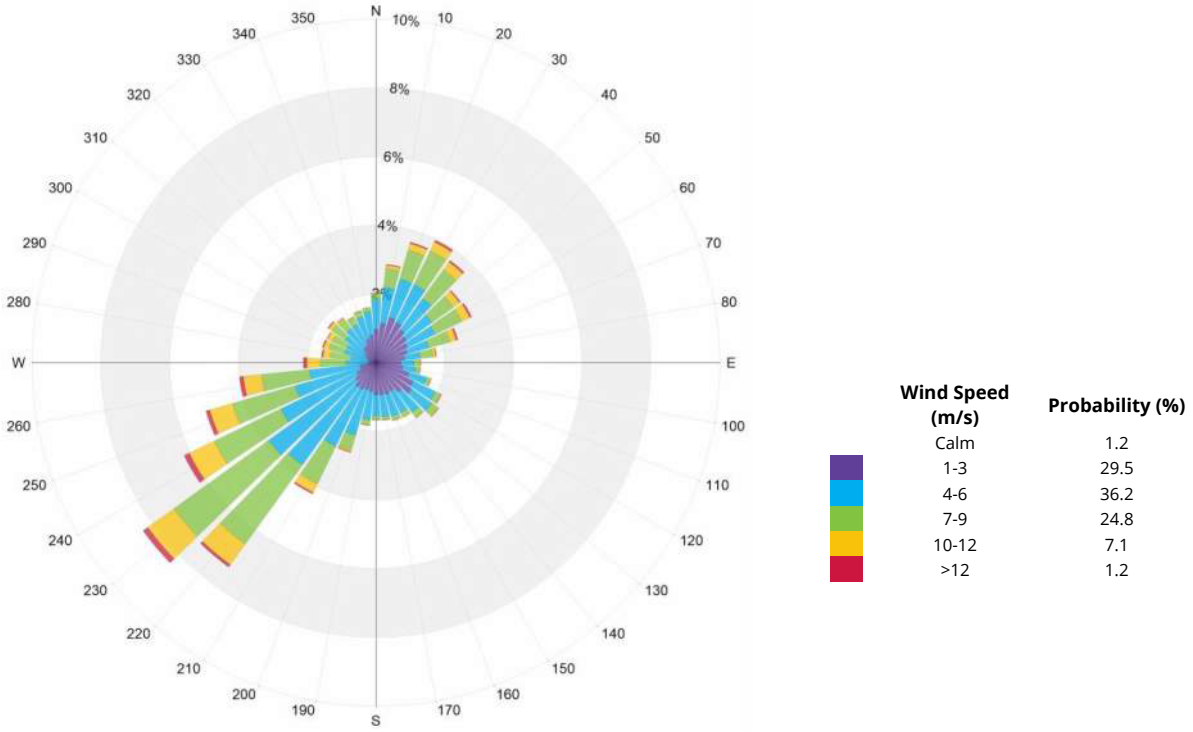


Image 3: Directional Distribution of Winds Approaching Auckland International Airport (1999 - 2023)

2.3 Pedestrian Wind Criteria

The pedestrian wind criteria, described in the Table below, have been used to assess the wind conditions around the development site for the various configurations. Image 4 shows the wind environment controls from the Auckland Unitary Plan used to derive the criteria.

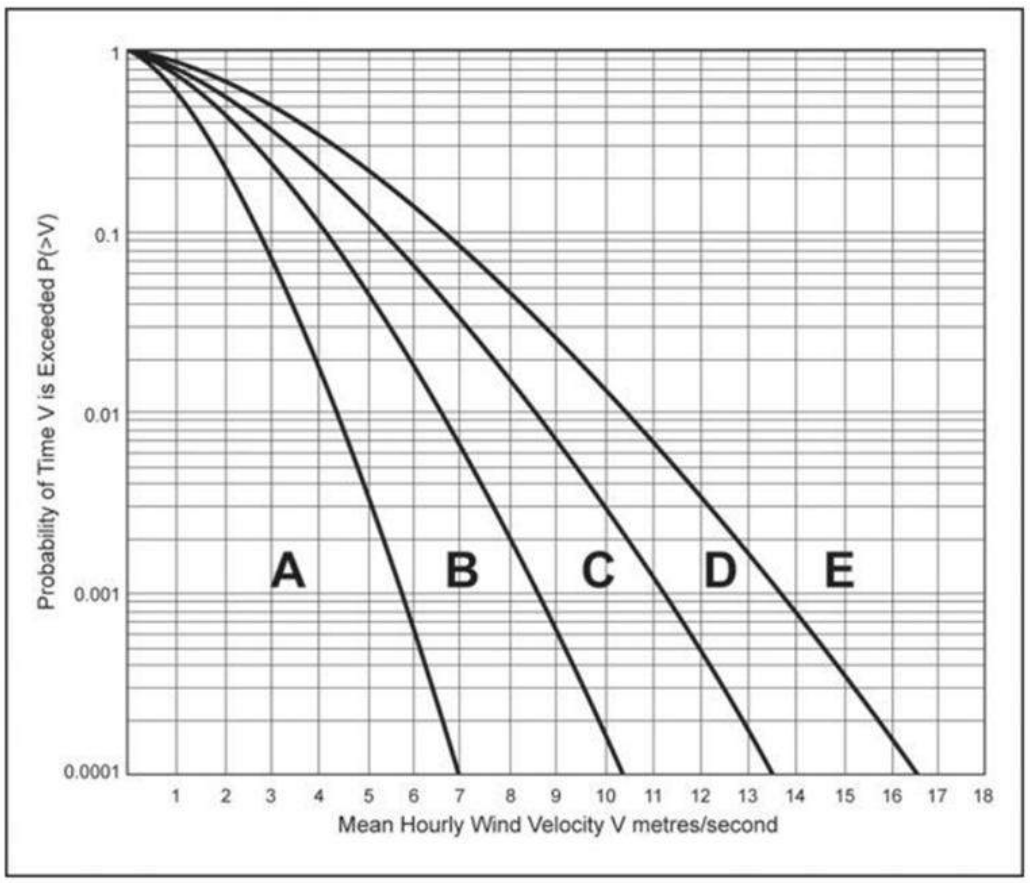
Table: Pedestrian Wind Comfort and Safety Criteria

Comfort Category	Mean Speed (m/s)	Description
Category A	≤ 2.1	Areas of pedestrian use or adjacent dwellings containing significant formal elements and features intended to encourage longer term recreational or relaxation use such as major and minor public spaces, parks and other open space, and adjacent outdoor living spaces.
Category B	≤ 3.3	Areas of pedestrian use or adjacent dwellings containing minor elements and features intended to encourage short term recreation or relaxation, including adjacent private residential properties such as minor pedestrian open spaces, pleasance areas in road reserves, streets with significant groupings of landscaped seating features.
Category C	≤ 4.1	Areas of formed footpath or open space pedestrian linkages, used primarily for pedestrian transit and devoid of significant or repeated recreational or relaxational features, such as footpaths where not covered in categories A or B above.
Category D	≤ 5.2	Areas of road, carriage way, or vehicular routes, used primarily for vehicular transit and open storage, such as roads generally where devoid of any features or form which would include the spaces in categories A - C above.
Category E	> 5.2	Category E represents conditions which are dangerous to the elderly and infants and of considerable cumulative discomfort to others, including residents in adjacent sites. Category E conditions are unacceptable and are not allocated to any physically defined areas of the city.

Notes:
Wind conditions are comfortable if the predicted wind speeds are within the respective thresholds for at least 80% of the time between 0:00 and 23:00.

Safety Criterion	Gust Speed (m/s)	Description
Exceeded	> 25	Excessive gust speeds that can adversely affect a pedestrian's balance and footing. Wind mitigation is typically required.

Notes:
(1) Gust Speed = Mean Speed + 3*RMS Speed
(2) Based on an annual exceedance of one hour per year or 0.0114% of the time for 24 hours a day.



Derivation of the wind environment control graph:

The curves on the graph delineating the boundaries between the acceptable categories (A-D) and unacceptable (E) categories of wind performance are described by the Weibull expression:

$P(>V) = e^{-(v/c)^k}$

where V is a selected value on the horizontal axis, and P is the corresponding value of the vertical axis:

and where:

P(>V) = Probability of a wind speed V being exceeded;

e = The Napierian base 2.7182818285

v = the velocity selected;

k = the constant 1.5; and

c = a variable dependent on the boundary being defined:

A/B, c = 1.548

B/C, c = 2.322

C/D, c = 3.017

D/E, c = 3.715

Image 4: Wind Environment Controls
(Reproduced from Auckland Unitary Plan Operative)

3 RESULTS AND DISCUSSION

The predicted wind conditions are shown on site plans in Figures 1A through 2C located in the "Figures" section of this report. These conditions and the associated wind speeds are also presented 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 the initial tests for the Existing and Proposed Scenarios were conducted without the inclusion of landscaping or other wind control measures. This approach was taken to establish baseline wind conditions. Following these baseline tests, landscaping and additional mitigation elements were incorporated to enable a comprehensive understanding of the local wind environment for the final mitigation strategy presented in this report. The wind control measures included in the final configuration were identified through an extensive wind mitigation workshop led by Holmes and RWDI. This collaborative process focused on developing strategies that delivered optimal performance for the development while carefully balancing practical implementation requirements and other project constraints.

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 5). 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 5 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.

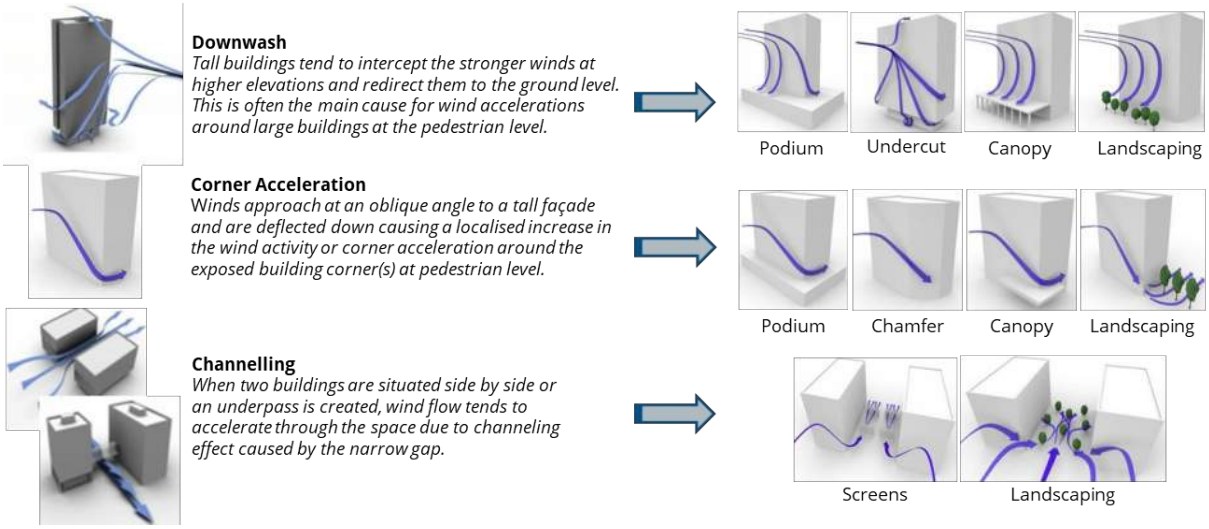


Image 5: General Wind Flows around Buildings and Examples of Wind Control Measures

3.2 Existing Configuration

3.2.1 Wind Safety

A safety exceedance was identified at the corner of Lower Hobson Street and Quay Street, northwest of the project site (Sensor 42), as shown in Figure 2A. This was primarily driven by prevailing northeasterly winds, with secondary contributions from westerly winds, and resulted from localised accelerations under the pedestrian bridge above Lower Hobson Street.

3.2.2 Wind Comfort

The following key observations are noted with regards to wind comfort around the existing site (as shown in Figure 1A):

- Wind conditions were observed to be generally calm along Lower Hobson Street and along the western parts of Customs Street, with comfort levels ranging from Category A to Category B.
- Higher wind speeds, suitable for active pedestrian use (Category C and Category D), were observed along Lower Albert Street and Quay Street. These conditions are generally suitable for the intended use of these areas as pedestrian footpaths. However, for bus shelter seating areas, such conditions are considered too windy (Sensors 30 to 33, 36, 55 & 57).
- High winds exceeding the comfort criteria were observed at the corner of the Lower Hobson Street and Quay under the pedestrian bridge (Sensor 42). This is coincident with the safety exceedance noted above.

3.3 Proposed Configuration

3.3.1 Wind Safety

With the inclusion of the Proposed Development, wind speeds exceeding the wind safety limit were observed at following locations (Figure 2B):

- Along the Lower Hobson Street corridor (Sensors 1, 8, 9, 39 to 41, and 46), along Quay Street (Sensor 61), and within the Lower Albert Street bus shelter (Sensor 30). These were driven by the interaction of southwesterly and northeasterly winds with the proposed building massing, which redirected and subsequently accelerated the wind flow around the project site.
- Under the bridge connection between Towers T1 and T2 at southern end of the Urban Room (Sensor 18). These were caused by downwash and channelling of southwesterly winds under the bridge.
- At the southeastern corner of AON Tower at Level 1 (Sensor 77) due to southwesterly winds around the accelerating around the corner.
- On Tower T2 Level 7 terrace where downwashed northeasterly and southwesterly winds can impact conditions (Sensors, 83, 87 - 89). It is understood that the bridge connecting the two towers is not trafficable on this level (representative Sensor 89).

3.3.2 Wind Comfort

Wind comfort conditions within and around the Proposed Development within the context of the existing surroundings are shown in Figures 1B. Wind speeds around the site are anticipated to increase following the completion of the Proposed Development. The following key observations are noted with regard to wind comfort around the proposed site:

- The entrances to the buildings are expected to achieve Category B or better, aligning with the intended use of the area.
- Wind conditions along the western parts of Customs Street, the southern parts of Lower Hobson Street, and majority of the Urban Room located between Towers T1 and T2 are anticipated to remain comfortable for passive pedestrian activity (Categories A & B), meeting the target comfort levels.
- Elevated wind speeds ranging from Category C to Category D were observed along street fronts and around the bridge connecting between Towers T1 and T2 within the Urban Room. Such conditions would be appropriate for active pedestrian usage along walkways or thoroughfares but would not be suitable for passive activities such as outdoor seating.
- Additional exceedances of wind comfort criteria were noted at the grade level in the following areas:
    - Along Lower Hobson Street around the northwest corner of the site (Sensors 8 and 9) due to the acceleration of prevailing winds from the southwest and northeast.
    - At the corner of Lower Hobson Street and Quay Street (Sensors 39 to 42) due to prevailing winds redirected by the tower form.
    - An isolated uncomfortable wind condition was under the bridge connection between Tower T1 and Tower T2 at the southern end of the Urban Room (Sensor 18).
    - Within the bus shelter near Lower Albert Street, wind conditions jump a category compared to the existing site - from Category D to Category E (Sensors 30 to 33). This is potentially due to the winds redirected by the additional massing introduced by to the Proposed Development and accelerating under the canopy of the bus shelter. Note that Category B or better are targeted for these spaces.
    - Around the southeastern corner of the AON Tower at grade level and along Level 1 (Sensors 29 and 77).
- The Level 7 open terrace exhibited wind speeds varying from Category C to Category D which are not favourable for prolonged passive usage as intended for these spaces.
- Wind conditions within the upper-level private balconies of Tower T2 were also assessed to provide an understanding of wind comfort levels. Note that wind comfort on balconies can exhibit notable variability based on the wind direction and position of an individual relative to the balustrade, partitions, screens, and other architectural elements. Due to the relatively small size of individual balconies compared to the scale of the physical model, precise assessment presents inherent instrumentation challenges. Nonetheless, the analysis indicates that wind conditions across these terraces are expected to range from Category A in sheltered zones to Category C in more exposed areas. These conditions are considered acceptable for private use, as balcony occupancy is discretionary and residents can retreat indoors during adverse weather. To improve wind conditions further for balconies with more than one aspect exposed, it is typically recommended to include full-height screening, either impermeable or with a porosity of approximately 50%, along one of the open aspects.

3.4 Mitigation Configuration

3.4.1 Mitigation Elements

Wind mitigation elements have been indicated in Figures 1C and 2C attached to this report and included the following primary elements:

- Retention of free roof between the Towers with a 1m gap above P3, and inclusion of free roof to the south side of the bridge between Towers T1 and T2 extending from Level 2 datum and offset from the southern façade line by 2m.
- A 2.5 m solid balustrade along the southern end of Level 1 to reduce infiltration of southwesterly winds, a solid screen at the corner of P3 (near Sensor 9), and a central 2m high porous screen between Towers T1 and T2 within the southern parts of the Urban Room (near Sensor 19).
- The north ground level awning of Tower T2 was extended to a total projection of 4 m, with all gaps fully enclosed to enhance wind protection. Notably, the awning extends approximately 0.5 m beneath the tower undercroft and maintains a clearance of 1 m from the building façade.
- Inclusion of additional details in the existing models such as the full-height screen separating the AON corridor along Customs Street, inclusion of columns and existing step and solid balustrade adjacent to the entrance to AON Building. Additional elements included modelling of retaining wall along Customs Street, columns and upstand along the vehicle bridge over Lower Hobson Street, inclusion of screening and other details for bus stops and pedestrian shelters along Quay Street and Lower Albert Street.
- Inclusion of existing and proposed landscaping measures within and around the site, as indicated in landscape drawings received on 1 August 2025. In addition, 3 m tall trees and 1.5 to 2 m tall dense shrubs were also included at the northwest corner Tower T2 along Lower Hobson Street. Other changes to the landscape were also explored as part of the workshop and are indicated in Image 6.

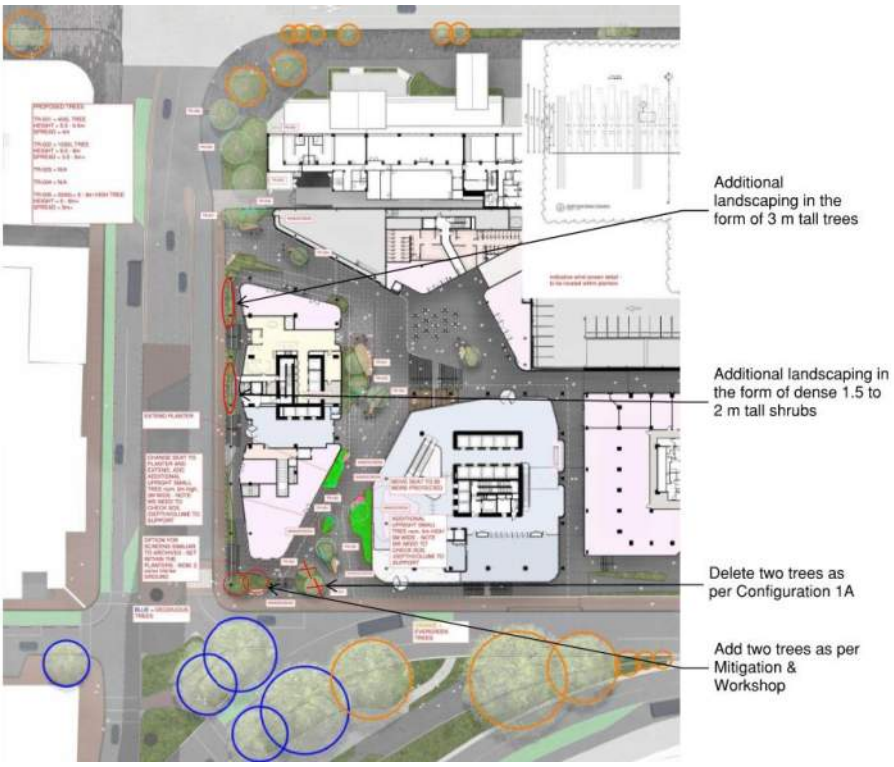


Image 6: Landscape Measures Included in the Mitigation Configuration

3.4.2 Wind Safety

With the inclusion of the wind mitigation measures, wind safety exceedances were resolved at most locations. However, a localised exceedance prevailed at the northwest corner of the project site along Lower Hobson at Sensor 9 (refer to Figure 2C). Note that this is generally consistent with the exiting site scenario which also exhibited a safety exceedance under the pedestrian bridge located just north of this sensor. Hence, overall conditions are likely to remain similar between the two scenarios around this space.

No mitigating elements were included on the Level 7 podium rooftop. Hence, overall wind conditions remained similar to the Proposed Configuration with trafficable areas to the south of Tower 2, represented by Sensors 83, 87 and 88, exceeding the criteria. These will be further developed during detailed design stage of the project.

3.4.3 Wind Comfort

The following key observations are noted with regard to wind comfort around the proposed site with the inclusion of the mitigation elements (shown in Figure 1C):

- The wind environment around the project site was found to improve at majority of the locations with the implementation of the mitigation measures. Wind speeds exceeding the comfort criteria (Category E) were all resolved around the site.
- The bus shelters along Lower Albert Street and along Quay Street are expected to exhibit appropriate wind conditions for their intended use.
- Persistent higher wind speeds were observed along the northwest corner of the site where conditions are expected to remain suitable for active pedestrian use (Category D). Similarly, within the southern parts of the Urban Room in particular under the link bridge between Towers 1 and 2, wind speed can increase locally to Category D. Hence seating areas should be avoided in these areas.
- The southeastern corner of Tower 1 and the southeastern corner of the AON Building exhibited slightly high wind speeds suitable for active pedestrian use (Category C). Note that these are only marginally over Category B.
- The upper-level terrace at Level 7 and balcony areas showed wind conditions similar to the proposed scenario as no measures were included in these spaces.

4 STATEMENT OF LIMITATIONS

Limitations

This report entitled "*Downtown Carpark Redevelopment Pedestrian Wind Study*" was prepared by RWDI Australia Pty Ltd ("RWDI") for Holmes NZ Limited Partnership ("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 ("**Project Data**") 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 and used to construct the scale model of the proposed development, provided as part of the Project Data.

File Name	File Type	Date Received
20241219_DTW_WIND-STUDY-MODEL	Rhino	15 July 2025

The recommendations and conclusions are based on the assumption that the Project Data and the obtained raw climate data are accurate and complete. RWDI assumes no responsibility for any inaccuracy or deficiency in the 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 the Project's design, quality of materials and construction, site conditions, meteorological events, and climate change ("**Project Specific Conditions**"). 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 upon 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.

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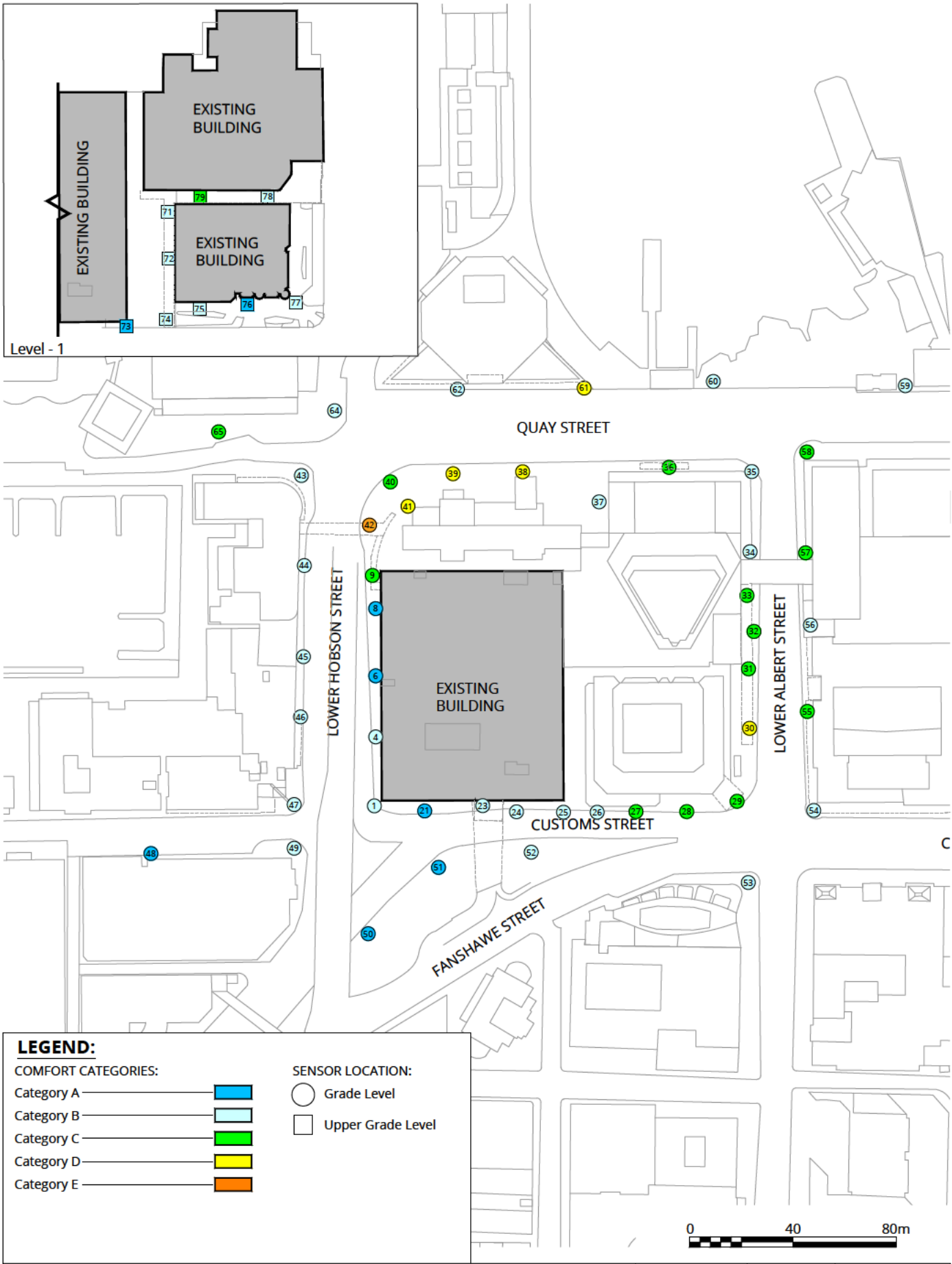
FIGURES



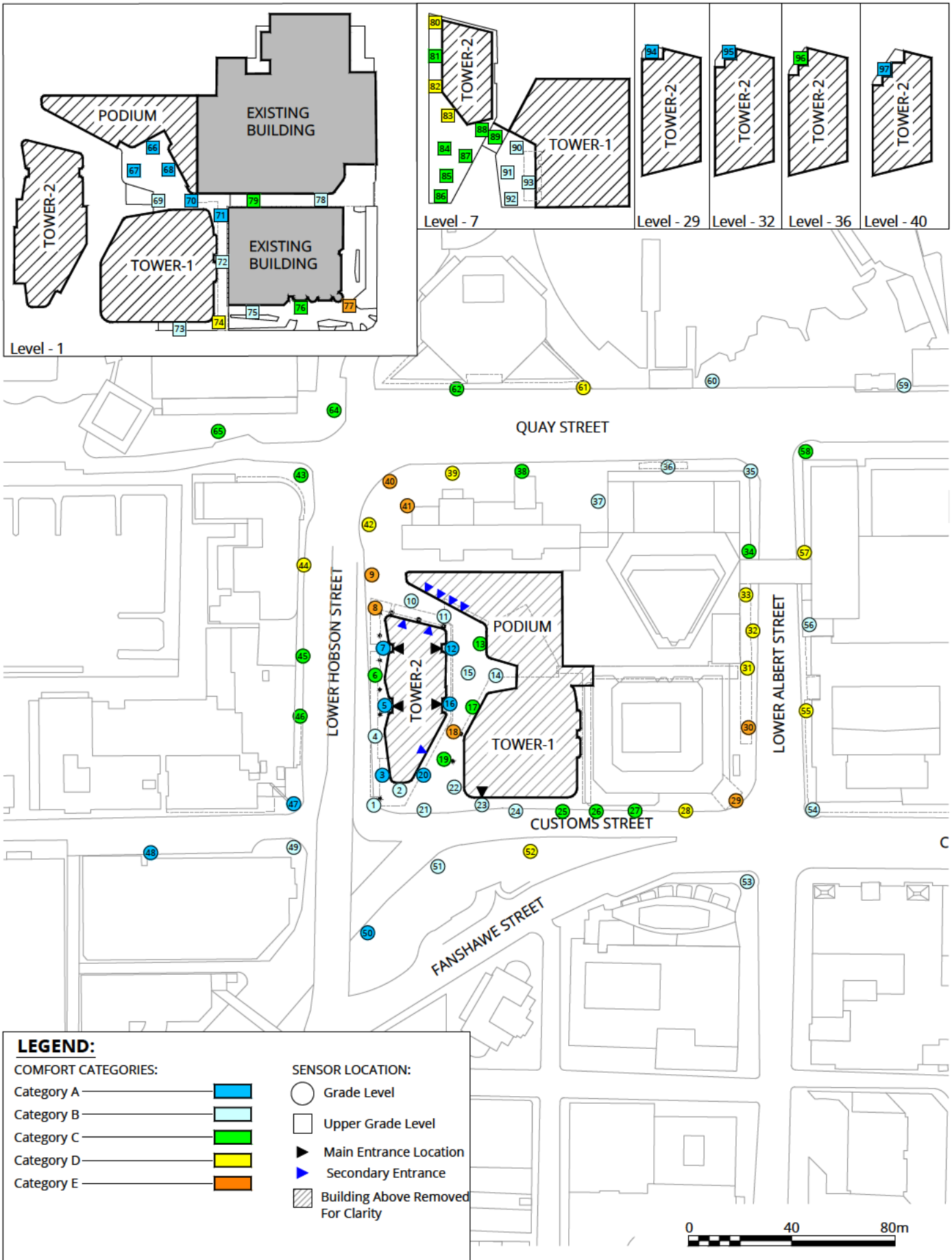
Pedestrian Wind Comfort Conditions
Existing Configuration - Grade & Upper Grade at Level 1
Annual (January to December, 0:00 to 23:00)

True North

Drawn by: AKA | Figure: 1A
Approx. Scale: 1:2000
Date Revised: Aug. 18, 2025

Downtown Carpark Redevelopment - Auckland, NZ

Project #2303718



LEGEND:

COMFORT CATEGORIES:

- Category A
- Category B
- Category C
- Category D
- Category E

SENSOR LOCATION:

- Grade Level
- Upper Grade Level
- Main Entrance Location
- Secondary Entrance
- Building Above Removed For Clarity

Pedestrian Wind Comfort Conditions

Proposed Configuration - Grade & Upper Grade Level

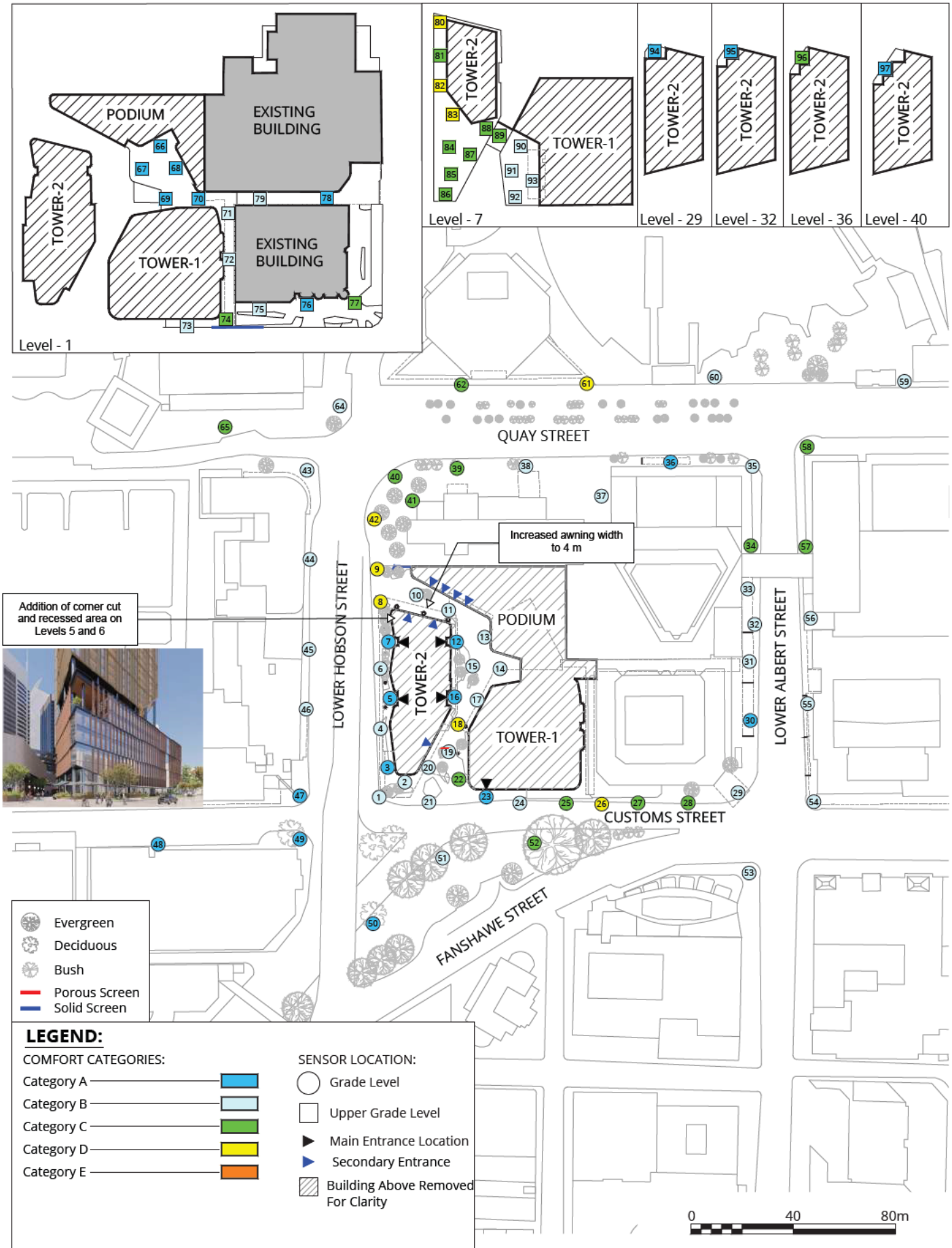
Annual (January to December, 0:00 to 23:00)

Downtown Carpark Redevelopment - Auckland, NZ

Project #2303718

True North

Drawn by: AKA	Figure: 1B
Approx. Scale:	1:2000
Date Revised:	Aug. 18, 2025



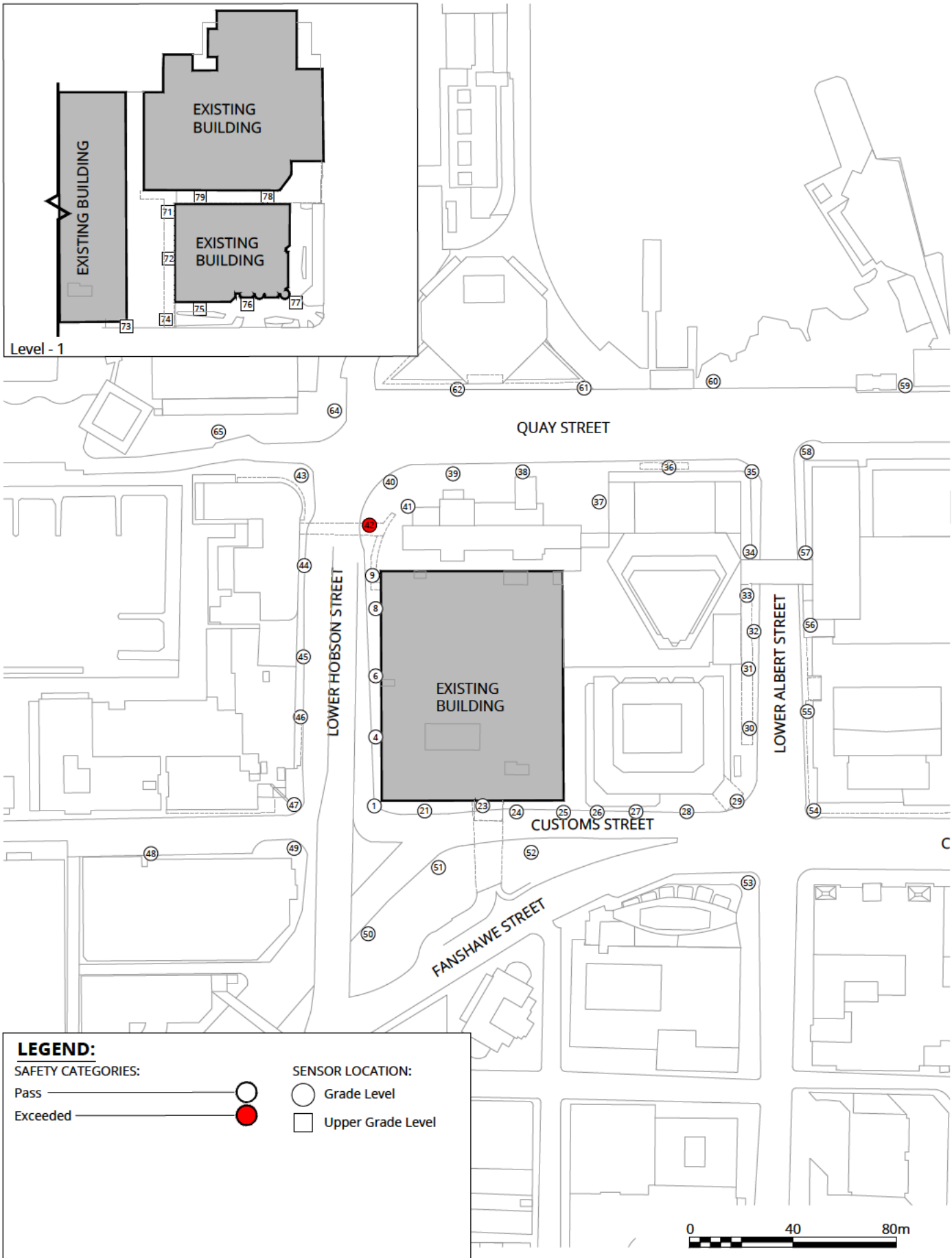
Pedestrian Wind Comfort Conditions
Mitigation Configuration - Grade & Upper Grade Level
Annual (January to December, 0:00 to 23:00)

Downtown Carpark Redevelopment - Auckland, NZ

Project #2303718

True North

Drawn by:	AKA	Figure:	1C
Approx. Scale:	1:2000		
Date Revised:	Sep. 9, 2025		



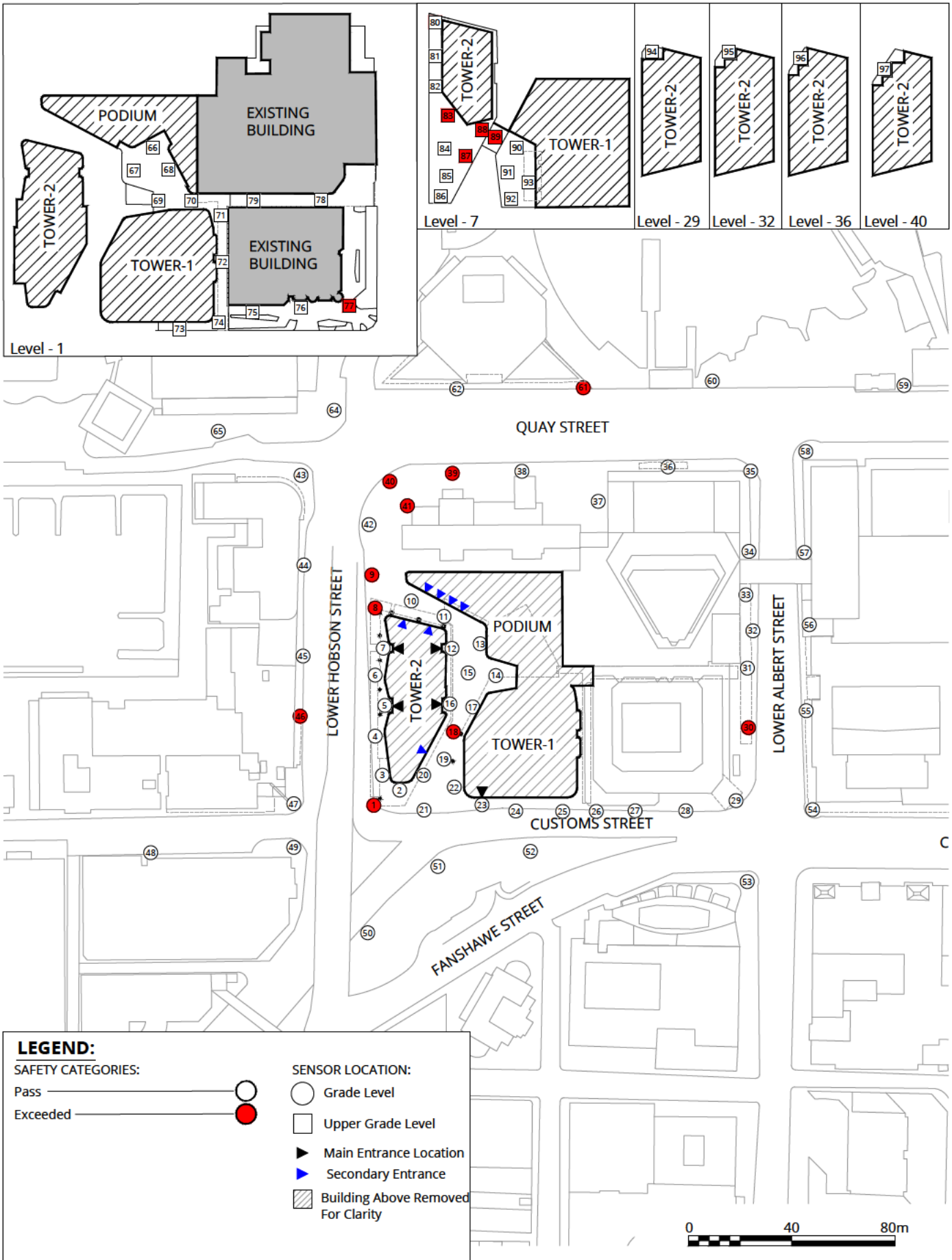
Pedestrian Wind Safety Conditions
Existing Configuration - Grade & Upper Grade at Level 1
Annual (January to December, 0:00 to 23:00)

Downtown Carpark Redevelopment - Auckland, NZ

Project #2303718

True North

Drawn by: AKA	Figure: 2A
Approx. Scale:	1:2000
Date Revised:	Aug. 18, 2025



Pedestrian Wind Safety Conditions

Proposed Configuration - Grade & Upper Grade Level

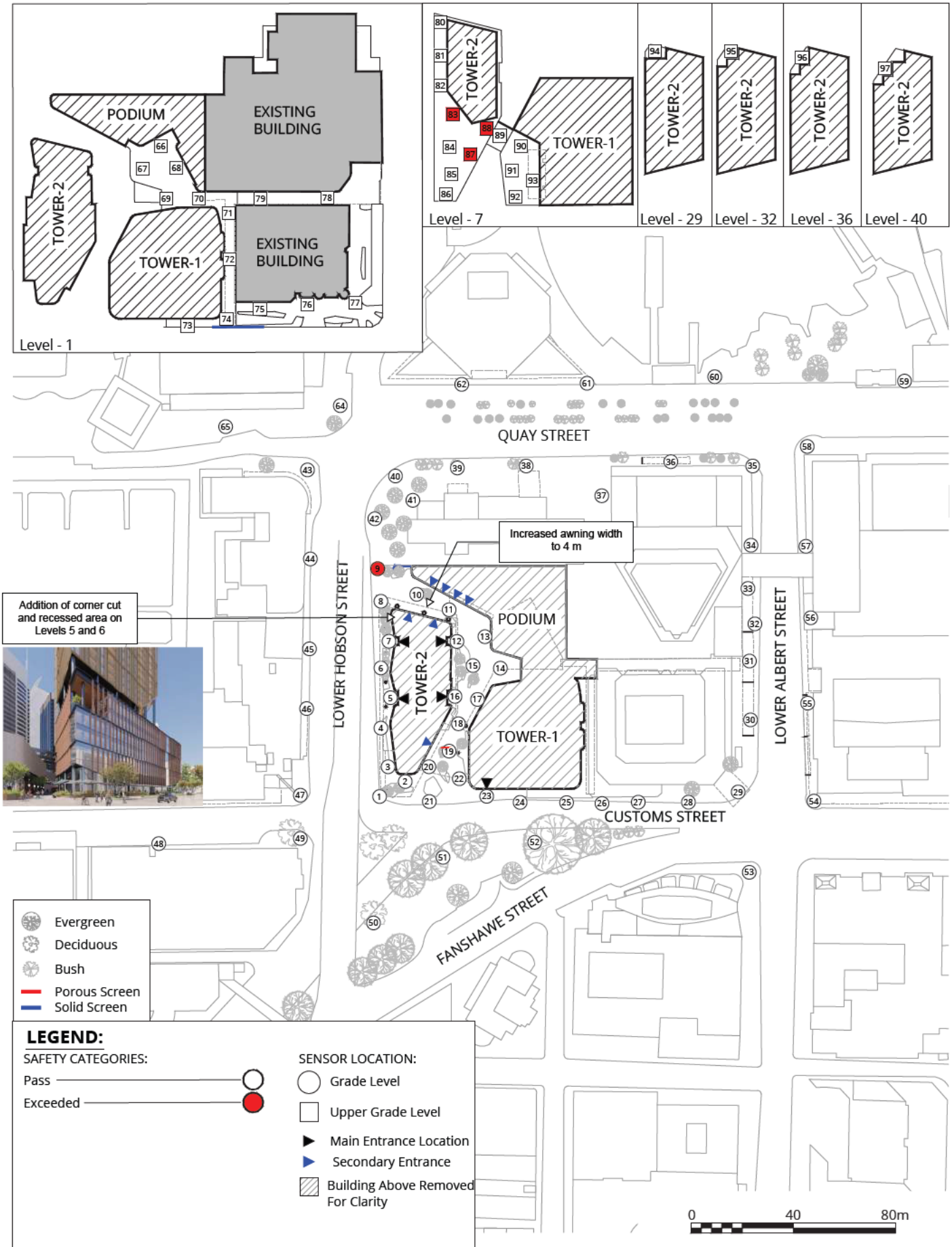
Annual (January to December, 0:00 to 23:00)

Downtown Carpark Redevelopment - Auckland, NZ

Project #2303718

True North

Drawn by: AKA	Figure: 2B
Approx. Scale:	1:2000
Date Revised:	Aug. 18, 2025



Pedestrian Wind Safety Conditions

Mitigation Configuration - Grade & Upper Grade Level

Annual (January to December, 0:00 to 23:00)

Downtown Carpark Redevelopment - Auckland, NZ

Project #2303718

True North

Drawn by:	AKA	Figure:	2C
Approx. Scale:	1:2000		
Date Revised:	Sep. 9, 2025		

TABLES

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Season	Configuration	Wind Comfort		Wind Safety	
			Speed	Rating	Speed	Rating
1	Annual	Existing	2.6	Category B	16	Pass
		Proposed	3.2	Category B	28	Exceeded
		Final Mitigation	3.3	Category B	23	Pass
2	Annual	Existing	-	-	-	-
		Proposed	2.8	Category B	19	Pass
		Final Mitigation	2.4	Category B	13	Pass
3	Annual	Existing	-	-	-	-
		Proposed	2.1	Category A	19	Pass
		Final Mitigation	1.9	Category A	18	Pass
4	Annual	Existing	2.5	Category B	17	Pass
		Proposed	2.9	Category B	19	Pass
		Final Mitigation	2.5	Category B	18	Pass
5	Annual	Existing	-	-	-	-
		Proposed	1.6	Category A	12	Pass
		Final Mitigation	1.3	Category A	8	Pass
6	Annual	Existing	2.1	Category A	15	Pass
		Proposed	3.4	Category C	17	Pass
		Final Mitigation	3.2	Category B	17	Pass
7	Annual	Existing	-	-	-	-
		Proposed	1.8	Category A	13	Pass
		Final Mitigation	1.8	Category A	11	Pass
8	Annual	Existing	2.1	Category A	14	Pass
		Proposed	6.9	Category E	31	Exceeded
		Final Mitigation	4.9	Category D	25	Pass
9	Annual	Existing	3.6	Category C	22	Pass
		Proposed	5.3	Category E	28	Exceeded
		Final Mitigation	5.2	Category D	26	Exceeded
10	Annual	Existing	-	-	-	-
		Proposed	2.5	Category B	19	Pass
		Final Mitigation	3.0	Category B	21	Pass
11	Annual	Existing	-	-	-	-
		Proposed	3.1	Category B	23	Pass
		Final Mitigation	3.0	Category B	25	Pass
12	Annual	Existing	-	-	-	-
		Proposed	1.3	Category A	9	Pass
		Final Mitigation	1.2	Category A	8	Pass
13	Annual	Existing	-	-	-	-
		Proposed	3.6	Category C	20	Pass
		Final Mitigation	2.8	Category B	19	Pass
14	Annual	Existing	-	-	-	-
		Proposed	3.0	Category B	14	Pass
		Final Mitigation	2.4	Category B	12	Pass
15	Annual	Existing	-	-	-	-
		Proposed	2.6	Category B	16	Pass
		Final Mitigation	2.2	Category B	12	Pass
16	Annual	Existing	-	-	-	-
		Proposed	1.9	Category A	9	Pass
		Final Mitigation	1.2	Category A	8	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Season	Configuration	Wind Comfort		Wind Safety	
			Speed	Rating	Speed	Rating
17	Annual	Existing	-	-	-	-
		Proposed	4.0	Category C	21	Pass
		Final Mitigation	3.0	Category B	15	Pass
18	Annual	Existing	-	-	-	-
		Proposed	6.1	Category E	28	Exceeded
		Final Mitigation	4.2	Category D	20	Pass
19	Annual	Existing	-	-	-	-
		Proposed	3.4	Category C	16	Pass
		Final Mitigation	3.2	Category B	16	Pass
20	Annual	Existing	-	-	-	-
		Proposed	2.1	Category A	13	Pass
		Final Mitigation	3.0	Category B	14	Pass
21	Annual	Existing	1.8	Category A	11	Pass
		Proposed	2.4	Category B	16	Pass
		Final Mitigation	2.7	Category B	19	Pass
22	Annual	Existing	-	-	-	-
		Proposed	2.3	Category B	17	Pass
		Final Mitigation	3.6	Category C	19	Pass
23	Annual	Existing	2.2	Category B	15	Pass
		Proposed	2.3	Category B	13	Pass
		Final Mitigation	2.0	Category A	12	Pass
24	Annual	Existing	2.3	Category B	13	Pass
		Proposed	2.5	Category B	15	Pass
		Final Mitigation	2.2	Category B	13	Pass
25	Annual	Existing	2.3	Category B	14	Pass
		Proposed	4.0	Category C	19	Pass
		Final Mitigation	3.6	Category C	18	Pass
26	Annual	Existing	3.0	Category B	16	Pass
		Proposed	4.1	Category C	20	Pass
		Final Mitigation	4.4	Category D	20	Pass
27	Annual	Existing	3.8	Category C	20	Pass
		Proposed	4.0	Category C	18	Pass
		Final Mitigation	3.9	Category C	17	Pass
28	Annual	Existing	3.7	Category C	21	Pass
		Proposed	4.3	Category D	19	Pass
		Final Mitigation	3.8	Category C	17	Pass
29	Annual	Existing	3.8	Category C	21	Pass
		Proposed	5.3	Category E	22	Pass
		Final Mitigation	2.4	Category B	16	Pass
30	Annual	Existing	4.4	Category D	21	Pass
		Proposed	6.1	Category E	26	Exceeded
		Final Mitigation	1.9	Category A	11	Pass
31	Annual	Existing	4.0	Category C	21	Pass
		Proposed	5.2	Category D	23	Pass
		Final Mitigation	2.4	Category B	15	Pass
32	Annual	Existing	4.1	Category C	23	Pass
		Proposed	4.5	Category D	22	Pass
		Final Mitigation	3.1	Category B	16	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Season	Configuration	Wind Comfort		Wind Safety	
			Speed	Rating	Speed	Rating
33	Annual	Existing	3.9	Category C	22	Pass
		Proposed	4.2	Category D	21	Pass
		Final Mitigation	3.3	Category B	19	Pass
34	Annual	Existing	3.3	Category B	24	Pass
		Proposed	3.7	Category C	22	Pass
		Final Mitigation	3.4	Category C	22	Pass
35	Annual	Existing	2.9	Category B	17	Pass
		Proposed	3.1	Category B	21	Pass
		Final Mitigation	3.0	Category B	19	Pass
36	Annual	Existing	3.8	Category C	22	Pass
		Proposed	3.0	Category B	25	Pass
		Final Mitigation	1.7	Category A	10	Pass
37	Annual	Existing	2.3	Category B	13	Pass
		Proposed	2.5	Category B	16	Pass
		Final Mitigation	2.6	Category B	17	Pass
38	Annual	Existing	4.6	Category D	21	Pass
		Proposed	4.1	Category C	24	Pass
		Final Mitigation	2.6	Category B	15	Pass
39	Annual	Existing	4.6	Category D	21	Pass
		Proposed	4.2	Category D	26	Exceeded
		Final Mitigation	3.4	Category C	16	Pass
40	Annual	Existing	3.9	Category C	22	Pass
		Proposed	6.1	Category E	26	Exceeded
		Final Mitigation	4.1	Category C	21	Pass
41	Annual	Existing	4.3	Category D	20	Pass
		Proposed	5.7	Category E	28	Exceeded
		Final Mitigation	3.5	Category C	19	Pass
42	Annual	Existing	6.2	Category E	29	Exceeded
		Proposed	5.2	Category D	23	Pass
		Final Mitigation	4.7	Category D	23	Pass
43	Annual	Existing	2.7	Category B	18	Pass
		Proposed	3.5	Category C	25	Pass
		Final Mitigation	2.7	Category B	17	Pass
44	Annual	Existing	2.3	Category B	16	Pass
		Proposed	4.2	Category D	23	Pass
		Final Mitigation	3.2	Category B	19	Pass
45	Annual	Existing	2.5	Category B	23	Pass
		Proposed	3.7	Category C	24	Pass
		Final Mitigation	3.3	Category B	24	Pass
46	Annual	Existing	2.7	Category B	23	Pass
		Proposed	3.8	Category C	29	Exceeded
		Final Mitigation	3.0	Category B	22	Pass
47	Annual	Existing	2.3	Category B	15	Pass
		Proposed	2.1	Category A	15	Pass
		Final Mitigation	1.8	Category A	12	Pass
48	Annual	Existing	1.9	Category A	11	Pass
		Proposed	1.8	Category A	11	Pass
		Final Mitigation	1.7	Category A	10	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Season	Configuration	Wind Comfort		Wind Safety	
			Speed	Rating	Speed	Rating
49	Annual	Existing	2.4	Category B	15	Pass
		Proposed	2.4	Category B	15	Pass
		Final Mitigation	2.1	Category A	15	Pass
50	Annual	Existing	2.0	Category A	14	Pass
		Proposed	2.1	Category A	17	Pass
		Final Mitigation	1.8	Category A	13	Pass
51	Annual	Existing	1.8	Category A	11	Pass
		Proposed	3.3	Category B	21	Pass
		Final Mitigation	2.9	Category B	20	Pass
52	Annual	Existing	3.2	Category B	19	Pass
		Proposed	5.0	Category D	21	Pass
		Final Mitigation	3.8	Category C	16	Pass
53	Annual	Existing	2.5	Category B	18	Pass
		Proposed	2.6	Category B	18	Pass
		Final Mitigation	2.7	Category B	16	Pass
54	Annual	Existing	2.5	Category B	16	Pass
		Proposed	2.9	Category B	17	Pass
		Final Mitigation	2.5	Category B	16	Pass
55	Annual	Existing	3.9	Category C	19	Pass
		Proposed	5.2	Category D	24	Pass
		Final Mitigation	2.3	Category B	11	Pass
56	Annual	Existing	2.9	Category B	15	Pass
		Proposed	3.3	Category B	18	Pass
		Final Mitigation	2.7	Category B	16	Pass
57	Annual	Existing	3.8	Category C	20	Pass
		Proposed	4.4	Category D	22	Pass
		Final Mitigation	3.6	Category C	21	Pass
58	Annual	Existing	3.5	Category C	21	Pass
		Proposed	4.1	Category C	22	Pass
		Final Mitigation	3.7	Category C	21	Pass
59	Annual	Existing	2.7	Category B	17	Pass
		Proposed	2.6	Category B	19	Pass
		Final Mitigation	2.5	Category B	17	Pass
60	Annual	Existing	2.4	Category B	14	Pass
		Proposed	2.4	Category B	14	Pass
		Final Mitigation	2.3	Category B	14	Pass
61	Annual	Existing	4.9	Category D	23	Pass
		Proposed	5.1	Category D	27	Exceeded
		Final Mitigation	4.6	Category D	22	Pass
62	Annual	Existing	3.2	Category B	24	Pass
		Proposed	4.1	Category C	24	Pass
		Final Mitigation	3.8	Category C	18	Pass
63	Annual	Existing	2.5	Category B	14	Pass
		Proposed	2.6	Category B	15	Pass
		Final Mitigation	2.5	Category B	14	Pass
64	Annual	Existing	3.3	Category B	17	Pass
		Proposed	3.6	Category C	17	Pass
		Final Mitigation	3.1	Category B	18	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Season	Configuration	Wind Comfort		Wind Safety	
			Speed	Rating	Speed	Rating
65	Annual	Existing	3.4	Category C	19	Pass
		Proposed	3.5	Category C	17	Pass
		Final Mitigation	3.7	Category C	17	Pass
66	Annual	Existing	-	-	-	-
		Proposed	1.6	Category A	9	Pass
		Final Mitigation	1.4	Category A	8	Pass
67	Annual	Existing	-	-	-	-
		Proposed	1.4	Category A	9	Pass
		Final Mitigation	1.4	Category A	8	Pass
68	Annual	Existing	-	-	-	-
		Proposed	2.1	Category A	11	Pass
		Final Mitigation	1.8	Category A	10	Pass
69	Annual	Existing	-	-	-	-
		Proposed	2.4	Category B	13	Pass
		Final Mitigation	1.9	Category A	10	Pass
70	Annual	Existing	-	-	-	-
		Proposed	1.8	Category A	10	Pass
		Final Mitigation	1.4	Category A	9	Pass
71	Annual	Existing	2.9	Category B	22	Pass
		Proposed	2.1	Category A	13	Pass
		Final Mitigation	2.6	Category B	15	Pass
72	Annual	Existing	3.3	Category B	21	Pass
		Proposed	2.4	Category B	12	Pass
		Final Mitigation	3.1	Category B	15	Pass
73	Annual	Existing	2.0	Category A	12	Pass
		Proposed	2.9	Category B	16	Pass
		Final Mitigation	2.7	Category B	15	Pass
74	Annual	Existing	2.9	Category B	16	Pass
		Proposed	4.9	Category D	22	Pass
		Final Mitigation	4.0	Category C	18	Pass
75	Annual	Existing	2.2	Category B	15	Pass
		Proposed	3.1	Category B	16	Pass
		Final Mitigation	2.9	Category B	15	Pass
76	Annual	Existing	2.0	Category A	12	Pass
		Proposed	3.9	Category C	18	Pass
		Final Mitigation	1.3	Category A	8	Pass
77	Annual	Existing	2.4	Category B	18	Pass
		Proposed	5.4	Category E	26	Exceeded
		Final Mitigation	3.6	Category C	19	Pass
78	Annual	Existing	3.0	Category B	17	Pass
		Proposed	2.6	Category B	14	Pass
		Final Mitigation	2.1	Category A	13	Pass
79	Annual	Existing	3.7	Category C	18	Pass
		Proposed	3.9	Category C	19	Pass
		Final Mitigation	3.3	Category B	16	Pass
80	Annual	Existing	-	-	-	-
		Proposed	4.5	Category D	25	Pass
		Final Mitigation	4.3	Category D	24	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Season	Configuration	Wind Comfort		Wind Safety	
			Speed	Rating	Speed	Rating
81	Annual	Existing	-	-	-	-
		Proposed	3.6	Category C	23	Pass
		Final Mitigation	3.6	Category C	23	Pass
82	Annual	Existing	-	-	-	-
		Proposed	4.9	Category D	24	Pass
		Final Mitigation	4.7	Category D	24	Pass
83	Annual	Existing	-	-	-	-
		Proposed	5.1	Category D	26	Exceeded
		Final Mitigation	4.9	Category D	26	Exceeded
84	Annual	Existing	-	-	-	-
		Proposed	3.9	Category C	25	Pass
		Final Mitigation	3.9	Category C	24	Pass
85	Annual	Existing	-	-	-	-
		Proposed	3.7	Category C	23	Pass
		Final Mitigation	3.6	Category C	23	Pass
86	Annual	Existing	-	-	-	-
		Proposed	3.4	Category C	21	Pass
		Final Mitigation	3.4	Category C	21	Pass
87	Annual	Existing	-	-	-	-
		Proposed	3.9	Category C	28	Exceeded
		Final Mitigation	3.8	Category C	27	Exceeded
88	Annual	Existing	-	-	-	-
		Proposed	4.0	Category C	29	Exceeded
		Final Mitigation	3.9	Category C	30	Exceeded
89	Annual	Existing	-	-	-	-
		Proposed	3.6	Category C	26	Exceeded
		Final Mitigation	3.6	Category C	25	Pass
90	Annual	Existing	-	-	-	-
		Proposed	2.7	Category B	21	Pass
		Final Mitigation	2.6	Category B	21	Pass
91	Annual	Existing	-	-	-	-
		Proposed	2.7	Category B	17	Pass
		Final Mitigation	2.7	Category B	18	Pass
92	Annual	Existing	-	-	-	-
		Proposed	3.3	Category B	22	Pass
		Final Mitigation	3.1	Category B	24	Pass
93	Annual	Existing	-	-	-	-
		Proposed	3.0	Category B	19	Pass
		Final Mitigation	3.0	Category B	19	Pass
94	Annual	Existing	-	-	-	-
		Proposed	2.0	Category A	18	Pass
		Final Mitigation	2.0	Category A	17	Pass
95	Annual	Existing	-	-	-	-
		Proposed	1.7	Category A	17	Pass
		Final Mitigation	1.7	Category A	16	Pass
96	Annual	Existing	-	-	-	-
		Proposed	3.8	Category C	20	Pass
		Final Mitigation	4.0	Category C	19	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Season	Configuration	Wind Comfort		Wind Safety	
			Speed	Rating	Speed	Rating
97	Annual	Existing	-	-	-	-
		Proposed	1.6	Category A	10	Pass
		Final Mitigation	1.7	Category A	10	Pass

Seasons	Months	Hours	Wind Comfort (m/s)		Wind Safety (m/s)	
Annual	January - December	0:00 - 23:00	≤ 2.1	Category A	≤ 25	Pass
			≤ 3.3	Category B	> 25	Exceeded
			≤ 4.1	Category C		
			≤ 5.2	Category D		
			> 5.2	Category E		

Configurations	
Existing	Existing site and surroundings
Proposed	Project with existing surroundings
Final Mitigation	Post-Workshop Mitigation Test - Sept 2025