

APPENDIX O – WIND IMPACT ASSESSMENT SMCSWSPS-RWD-OSN-EN-REP-000001

STATE SIGNIFICANT DEVELOPMENT, DEVELOPMENT
APPLICATION (SSD DA)

PEDESTRIAN WIND TUNNEL TESTS FOR:
PITT STREET NORTH OVER STATION DEVELOPMENT
SYDNEY, AUSTRALIA

REVISION A

June 18, 2020

RWDI # 2003971

PREPARED FOR

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EXECUTIVE SUMMARY

RWDI was retained to conduct a pedestrian wind assessment for the proposed Pitt Street North Over Station Development in Sydney (Image 1A). Wind-tunnel testing was undertaken for 6 scenarios to determine the predicted wind conditions for the area. These scenarios included the current existing site massing, the approved Stage 1 Massing Envelope and proposed Detailed Design of the development, with the effect of the 201 Elizabeth Street massing (existing vs Stage 1 DA massing envelope) also considered for each scenario (Images 2A through 2F). The measured data from the wind tunnel studies were combined with the local wind records (Image 3) to predict the potential wind comfort and safety conditions with comparison against the Lawson Wind Comfort Criteria as noted in the Stage 1 Development Consent approval. The results are shown on site plans in Figures 1A through 3F, while the associated wind speeds are listed in Table 1. These results can be summarised as follows:

- Wind speeds on and around the proposed project site are expected to be lower during the winter period, compared to the summer months.
- In the Detailed Design configuration, wind conditions on, and immediately around the project site at ground level, are predicted to be within the acceptable thresholds for pedestrian safety in all configurations. Wind speeds are predicted to generally be calm with most locations meeting criteria for Pedestrian Sitting or Standing in the winter and summer months.
- Wind conditions on the terraces at the Levels 10 and 11 are generally predicted to be suitable for passive pedestrian use throughout the year. The exception is the southeast corner of Level 10 due to localised higher wind speeds caused by side-streaming of the north-easterly winds around this corner, which are predicted to cause exceedance of the safety criterion for general access but expected to be tolerable for able-bodied occupants. Wind control measures discussed in this report will help reduce the wind speeds, enabling suitable use by occupants.

SEARS REQUIREMENTS

This report has been prepared in response to the requirements contained within the Secretary's Environmental Assessment Requirements (SEARS) dated 25 October 2019. Specifically, this report has been prepared to respond to the SEARS requirements summarised in the table below.

SEARS requirements pertaining to wind impacts

Item	Description of Requirement	Section Reference (this report)
SEARs 5 – Visual and amenity impacts (Wind)	Include a wind assessment (based on wind tunnel testing), identifying the impact of the proposal on surrounding wind conditions and any required measures to ameliorate wind impacts at podium level and street level.	Details of the wind tunnel testing are included in Section 2, with a discussion of the measured wind conditions around the project site in Section 3 and the attached Figures 1A to 3F, and Table 1.

CONDITIONS OF CONSENT

This report has also been prepared in response to the following Condition of Consent for the State Significant Development Concept (SSD 8875) for the OSD summarised in the table below.

Concept approval of Conditions of Consent – Wind impacts

Item	Description of Requirement	Section Reference (this report)
B3 – Built form and Urban design	The detailed development application shall address the following built form considerations: i) wind mitigation arising from compliance with Condition B11 below	Discussion of the measured wind conditions and any recommended mitigation options are included in Section 3.
B11 – Wind impacts	Wind Impact Assessment including computer modelling of the detailed building form. Compliance shall be demonstrated with the Lawson wind comfort criteria through the incorporation of mitigation measures within the detailed design.	A description of the Lawson criteria is included in Section 2.3, with the results of the wind tunnel testing provided in Section 3.3 and the attached Figures 1A to 3F, and Table 1.



TABLE OF CONTENTS

EXECUTIVE SUMMARY

SEARS REQUIREMENTS

CONDITIONS OF CONSENT

1 INTRODUCTION1

1.1 Project Description..... 1

1.2 Sydney Metro Description..... 2

1.3 Objectives3

2 BACKGROUND AND APPROACH.....4

2.1 Wind Tunnel Study Model 4

2.2 Meteorological Data..... 11

2.3 Pedestrian Wind Criteria12

3 RESULTS AND DISCUSSION 13

3.1 Existing Site Conditions.....13

3.2 Stage 1 Massing Envelope.....13

3.3 Detailed Design 14

4 APPLICABILITY OF RESULTS..... 16

5 REFERENCES..... 17

LIST OF FIGURES

Figure 1A: Pedestrian Wind Comfort Conditions – Existing – Summer
Figure 1B: Pedestrian Wind Comfort Conditions – Existing with 201 Elizabeth Massing Envelope – Summer
Figure 1C: Pedestrian Wind Comfort Conditions – Stage 1 Massing Envelope – Summer
Figure 1D: Pedestrian Wind Comfort Conditions – Stage 1 Massing Envelope with 201 Elizabeth Massing Envelope-Summer
Figure 1E: Pedestrian Wind Comfort Conditions – Detailed Design – Summer
Figure 1F: Pedestrian Wind Comfort Conditions – Detailed Design with 201 Elizabeth Massing Envelope – Summer

Figure 2A: Pedestrian Wind Comfort Conditions – Existing – Winter
Figure 2B: Pedestrian Wind Comfort Conditions – Existing with 201 Elizabeth Massing Envelope – Winter
Figure 2C: Pedestrian Wind Comfort Conditions – Stage 1 Massing Envelope – Winter
Figure 2D: Pedestrian Wind Comfort Conditions – Stage 1 Massing Envelope with 201 Elizabeth Massing Envelope-Winter
Figure 2E: Pedestrian Wind Comfort Conditions – Detailed Design – Winter
Figure 2F: Pedestrian Wind Comfort Conditions – Detailed Design with 201 Elizabeth Massing Envelope – Winter

Figure 3A: Pedestrian Wind Safety Conditions – Existing – Annual
Figure 3B: Pedestrian Wind Safety Conditions – Existing with 201 Elizabeth Massing Envelope – Annual
Figure 3C: Pedestrian Wind Safety Conditions – Stage 1 Massing Envelope – Annual
Figure 3D: Pedestrian Wind Safety Conditions – Stage 1 Massing Envelope with 201 Elizabeth Massing Envelope-Annual
Figure 3E: Pedestrian Wind Safety Conditions – Detailed Design – Annual
Figure 3F: Pedestrian Wind Safety Conditions – Detailed Design with 201 Elizabeth Massing Envelope – Annual

LIST OF TABLES

Table 1: Pedestrian Wind Comfort and Safety Conditions

1 INTRODUCTION

RWDI was retained to conduct a pedestrian wind assessment for the proposed Pitt Street North Over Station Development in Sydney. This report presents the project objectives, background and approach, and a discussion of the results from RWDI's wind tunnel assessment. Conceptual wind control measures are also provided, where necessary.

This report has been prepared to accompany a detailed State Significant Development (SSD) development application (DA) for a commercial mixed-use Over Station Development (OSD) above the new Sydney Metro Pitt Street North Station. The detailed SSD DA is consistent with the Concept Approval (SSD 17_8875) granted for the maximum building envelope on the site, as proposed to be modified.

The Minister for Planning, or their delegate, is the consent authority for the SSD DA and this application is lodged with the NSW Department of Planning, Industry and Environment (NSW DPIE) for assessment. This report has been prepared in response to the requirements contained within the Secretary's Environmental Assessment Requirements (SEARs) dated 25 October 2019.

1.1 Project Description

The project (site shown in Image 1A) is located on the northern side of Park Street, located between Pitt Street and Castlereagh Street. The proposed development consists of a single tower commercial development, situated atop a nine-storey podium, which includes the Pitt Street North Metro Station entrance.

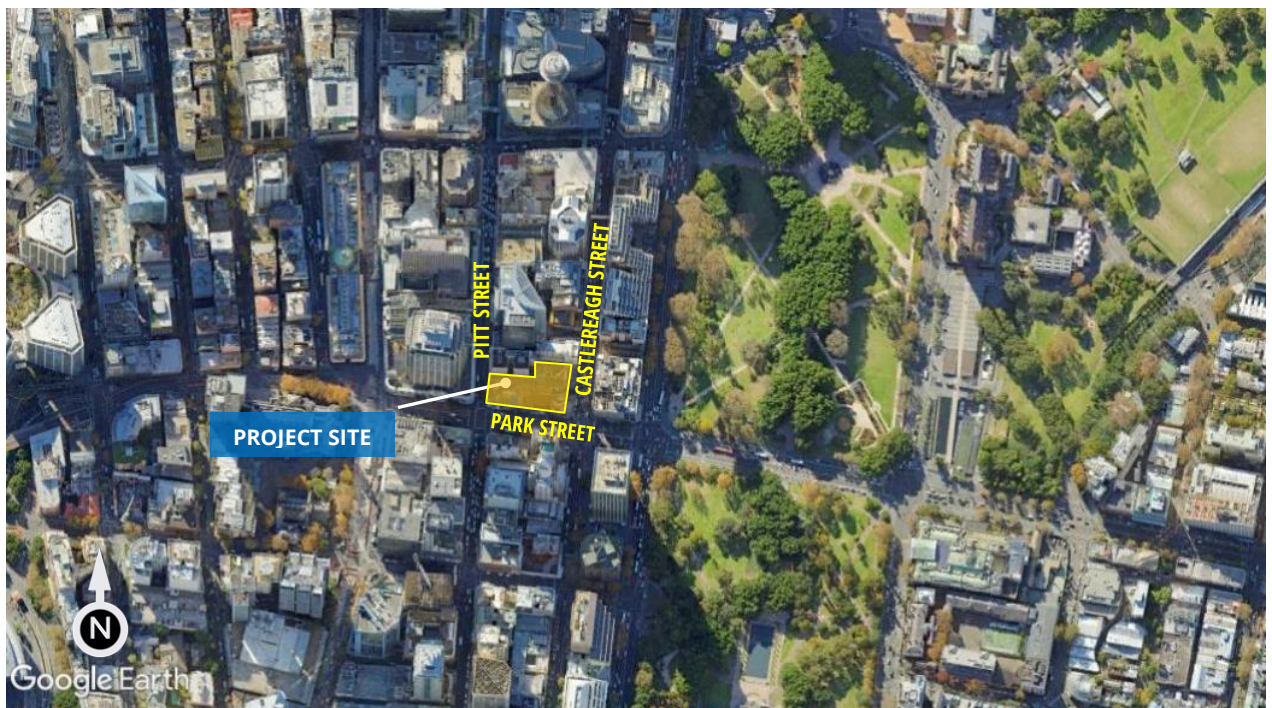


Image 1A: Aerial View of Site and Surroundings (Photo Courtesy of Google™ Earth)

1.2 Sydney Metro Description

Sydney Metro is Australia's biggest public transport program. A new standalone railway, this 21st century network will revolutionise the way Sydney travels.

There are four core components:

- **Sydney Metro Northwest (formerly the 36km North West Rail Link)**
This project is now complete and passenger services commenced in May 2019 between Rouse Hill and Chatswood, with a metro train every four minutes in the peak. The project was delivered on time and \$1 billion under budget.
- **Sydney Metro City & Southwest**
Sydney Metro City & Southwest project includes a new 30km metro line extending metro rail from the end of Metro Northwest at Chatswood, under Sydney Harbour, through new CBD stations and southwest to Bankstown. It is due to open in 2024 with the ultimate capacity to run a metro train every two minutes each way through the centre of Sydney.
Sydney Metro City & Southwest will deliver new metro stations at Crows Nest, Victoria Cross, Barangaroo, Martin Place, Pitt Street, Waterloo and new underground metro platforms at Central Station. In addition it will upgrade and convert all 11 stations between Sydenham and Bankstown to metro standards.
In 2024, customers will benefit from a new fully-air conditioned Sydney Metro train every four minutes in the peak in each direction with lifts, level platforms and platform screen doors for safety, accessibility and increased security.
- **Sydney Metro West**
Sydney Metro West is a new underground railway connecting Greater Parramatta and the Sydney CBD. This once-in-a-century infrastructure investment will transform Sydney for generations to come, doubling rail capacity between these two areas, linking new communities to rail services and supporting employment growth and housing supply between the two CBDs.
The locations of seven proposed metro stations have been confirmed at Westmead, Parramatta, Sydney Olympic Park, North Strathfield, Burwood North, Five Dock and The Bays.
The NSW Government is assessing an optional station at Pyrmont and further planning is underway to determine the location of a new metro station in the Sydney CBD.
- **Sydney Metro – Western Sydney Airport**
Metro rail will also service Greater Western Sydney and the new Western Sydney International (Nancy Bird Walton) Airport. The new railway line will become the transport spine for the Western Parkland City's growth for generations to come, connecting communities and travellers with the rest of Sydney's public transport system with a fast, safe and easy metro service. The Australian and NSW governments are equal partners in the delivery of this new railway.

The Sydney Metro Project is illustrated in Image 1B below.

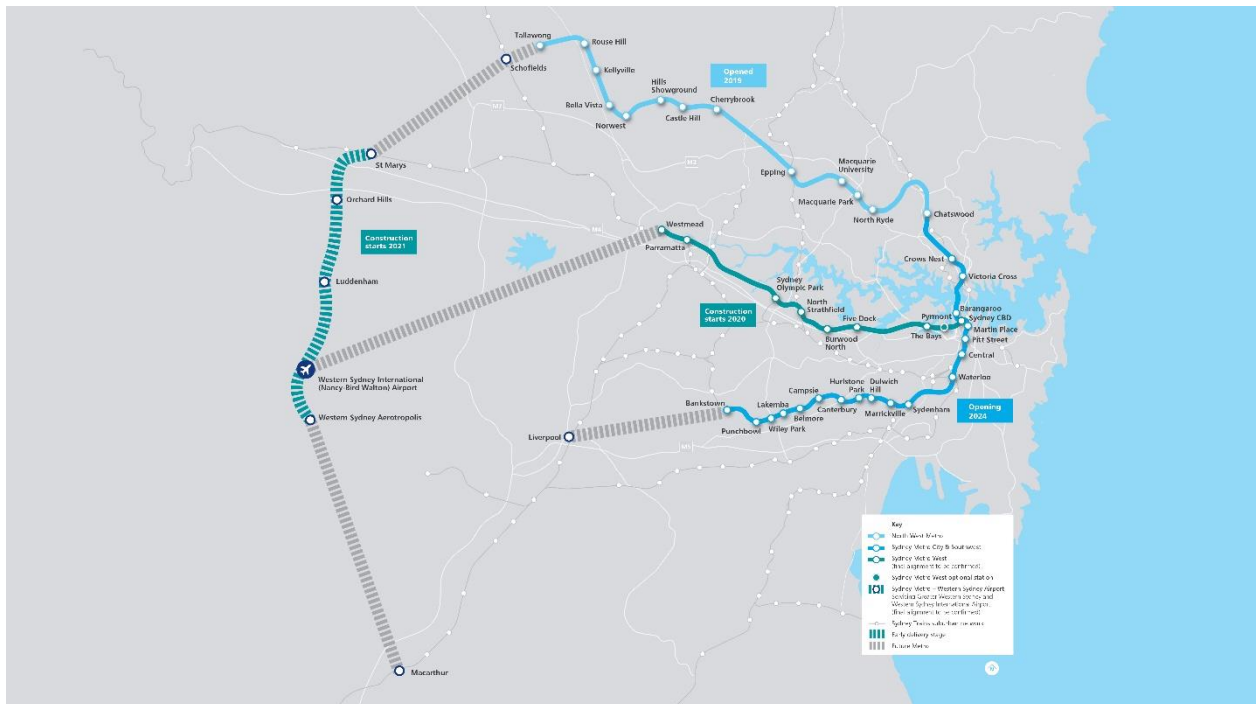


Image 1B – Sydney Metro Alignment Map (Source: Sydney Metro)

On 9 January 2017, the Minister for Planning approved the Sydney Metro City & Southwest - Chatswood to Sydenham project as a Critical State Significant Infrastructure project (reference SSI 15_7400) (CSSI Approval). The terms of the CSSI Approval includes all works required to construct the Sydney Metro Pitt Street Station, including the demolition of existing buildings and structures on both sites (north and south). The CSSI Approval also includes construction of below and above ground works within the metro station structure for appropriate integration with over station developments.

1.3 Objectives

The objective of the study was to assess the potential wind conditions for the pedestrian accessible areas within and around the subject site associated with the addition of the proposed development as well as consideration of an adjacent future development application, and to provide recommendations to minimise adverse effects, if needed. This quantitative assessment was based on wind speed measurements on a scale model of the subject development and its surroundings in one of RWDI's boundary-layer wind tunnels. These measurements were combined with the local wind records and compared to the Lawson Criteria for gauging wind comfort and safety in pedestrian areas. The assessment focused on critical pedestrian areas, public sidewalks and terraces.

2 BACKGROUND AND APPROACH

2.1 Wind Tunnel Study Model

To assess the wind environment around the proposed development, a 1:400 scale model of the project site and surroundings was constructed to be used for the wind tunnel tests of the following 6 configurations:

- A – Current Existing Site and existing surroundings (Image 2A);
- B – Current Existing Site and 201 Elizabeth Street Stage 1 DA Massing Envelope (Image 2B);
- C – Stage 1 Massing Envelope and existing surroundings (Image 2C);
- D – Stage 1 Massing Envelope and 201 Elizabeth Street Stage 1 DA Massing Envelope (Image 2D);
- E – Detailed Design of Development and existing surroundings (Image 2E); and,
- F – Detailed Design of Development and 201 Elizabeth Street Stage 1 DA Massing Envelope (Image 2F).

The wind tunnel model included all relevant surrounding buildings and topography within an approximately 480 m radius of the study site. The upstream wind and turbulence profiles in the atmospheric boundary layer beyond the modelled area were also simulated in RWDI's wind tunnel. The wind tunnel model was instrumented with 39 specially designed wind speed sensors to measure mean and gust speeds at a full-scale height of approximately 1.5 m above terraces and local grade in pedestrian areas within and around the study 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. The placement of wind measurement locations was based on our experience and understanding of the pedestrian usage for this site.

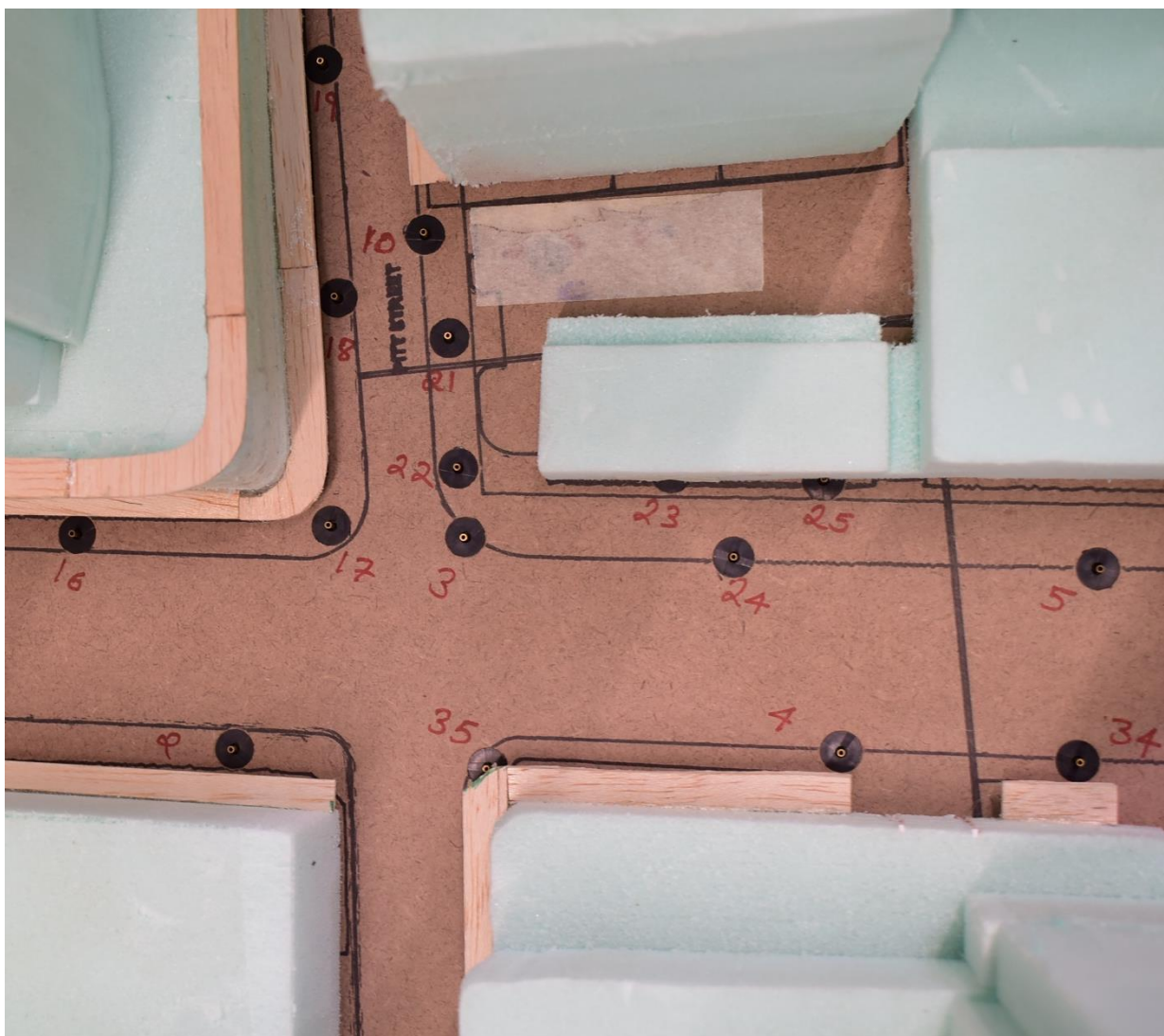
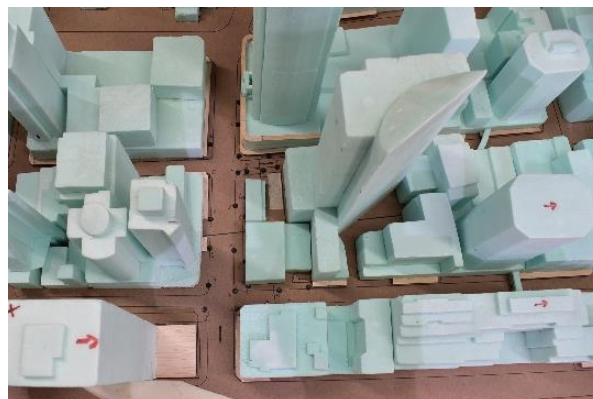


Image 2A: Wind Tunnel Study Model – Existing Site Configuration

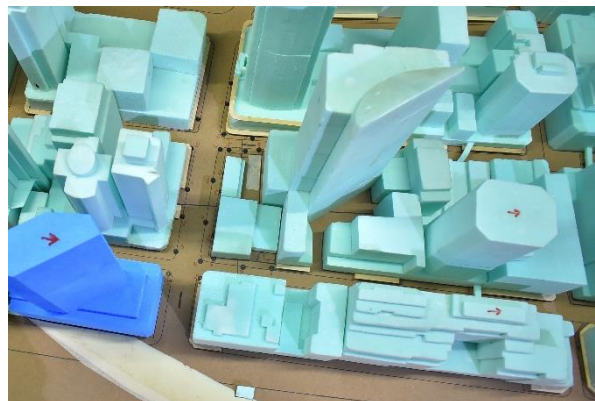
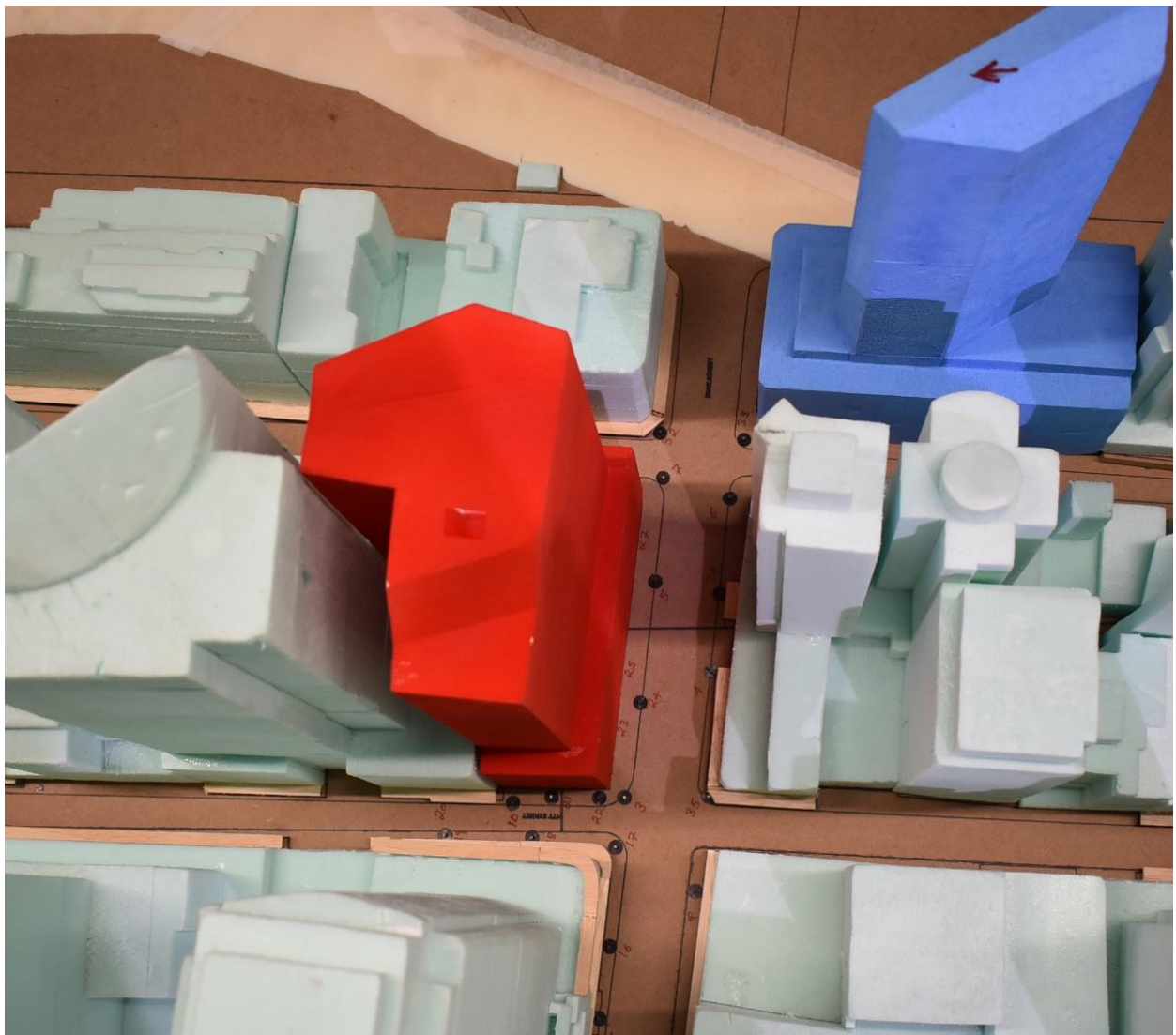


Image 2B: Wind Tunnel Study Model – Existing Site with 210 Elizabeth Street Stage 1 DA Massing Envelope Configuration



Image 2C: Wind Tunnel Study Model – Stage 1 Massing Envelope Configuration



**Image 2D: Wind Tunnel Study Model – Stage 1 Massing Envelope with 210 Elizabeth Street Stage 1 DA
Massing Envelope Configuration**

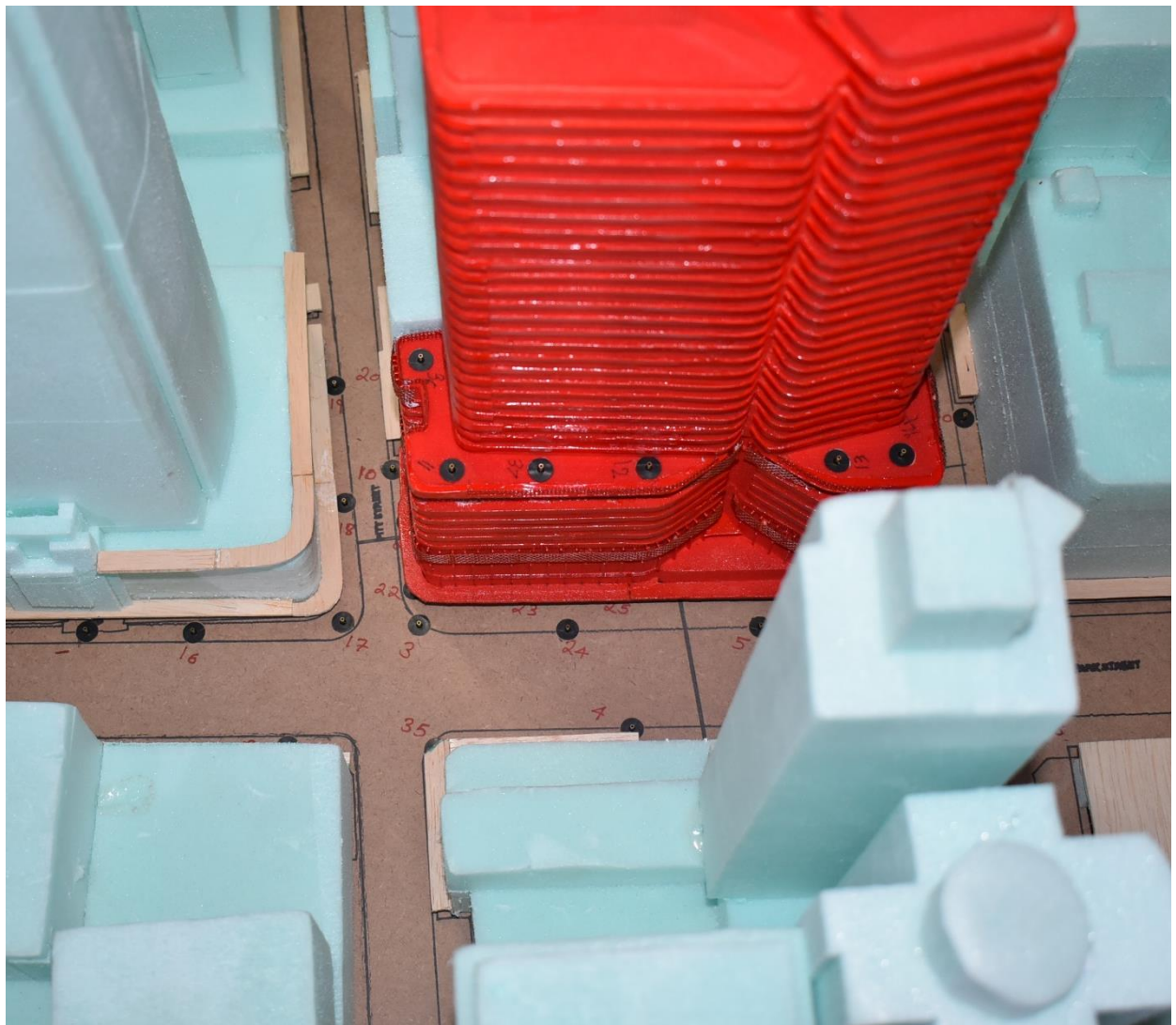
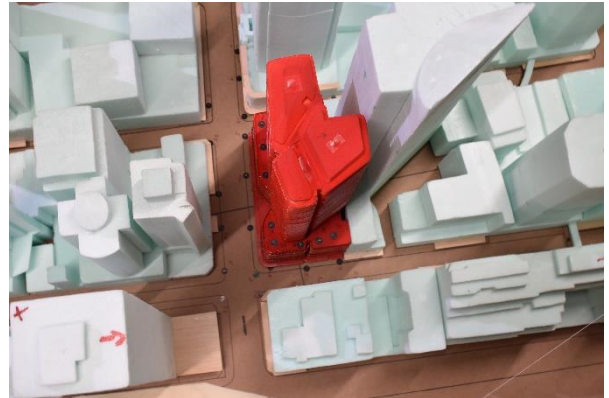


Image 2E: Wind Tunnel Study Model – Detailed Design Configuration

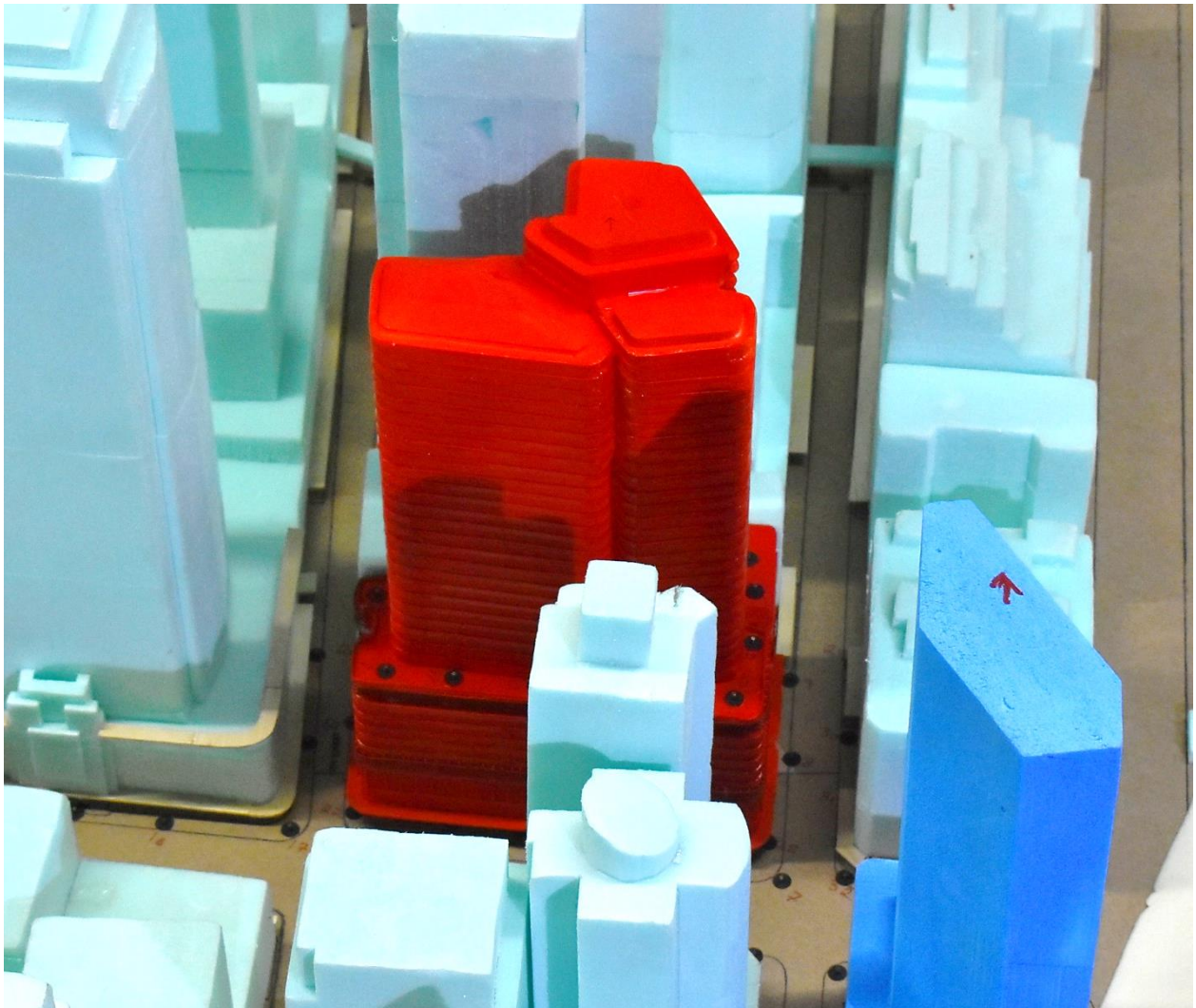


Image 2F: Wind Tunnel Study Model – Detailed Design with 210 Elizabeth Street Stage 1 DA Massing Envelope Configuration

2.2 Meteorological Data

Wind statistics recorded at Sydney International Airport between 1995 and 2019, inclusive, were analysed for the Summer (November through April) and Winter (May through October) seasons. Image 3 graphically depicts the directional distributions of wind frequencies and speeds for these two seasons. Winds from the northeast, south-southeast and south are predominant in the summer season, and winds from the west and northwest directions are predominant in the winter season as indicated by the wind roses. Strong winds of a mean speed greater than 30 km/h measured at the airport (at an anemometer height of 10 m) occur for 10.6% and 8% of the time during the summer and winter seasons, respectively, and are predominantly from the southern directions in both seasons. Strong winds from the northeast are also common in the summer.

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

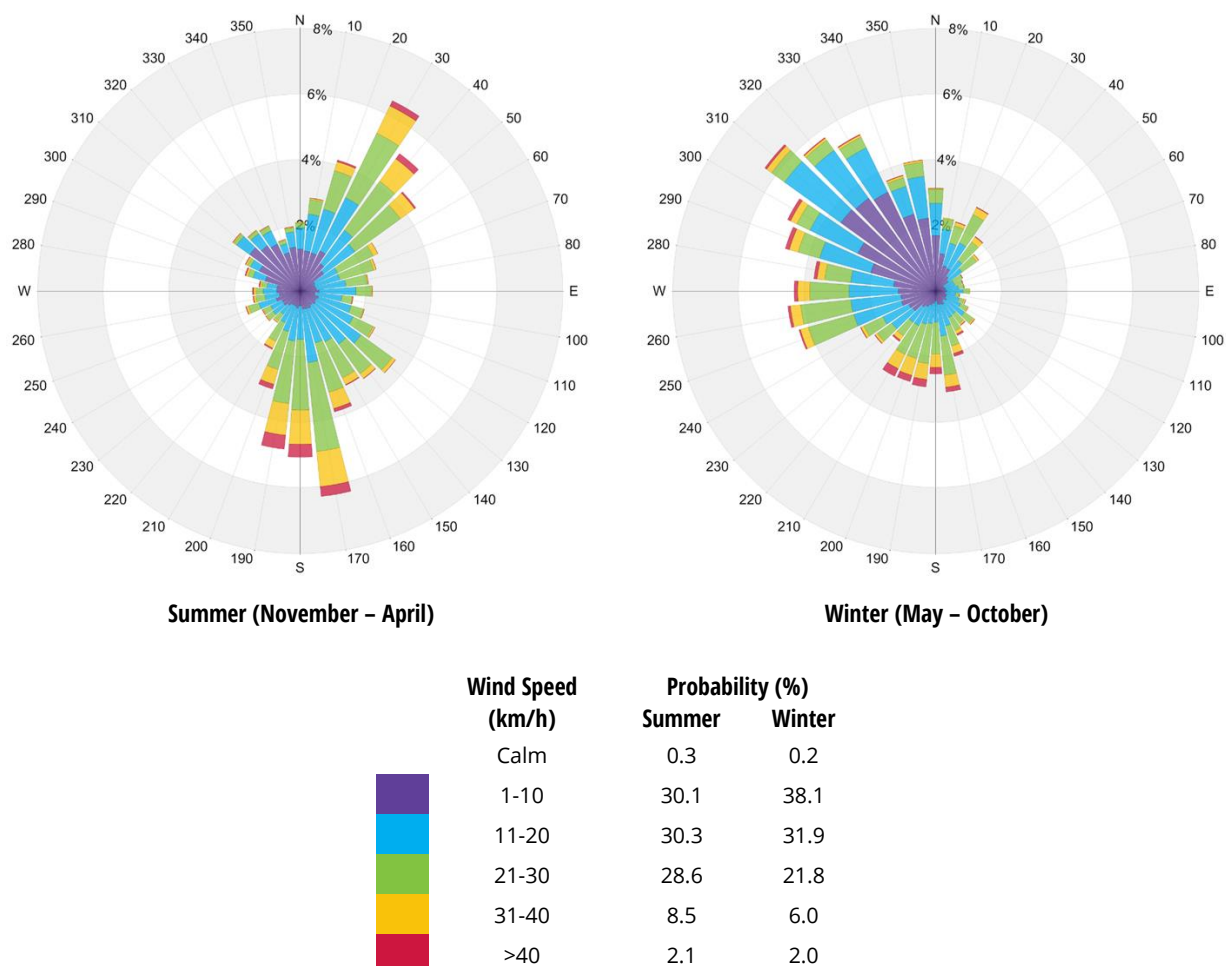


Image 3: Directional Distribution of Winds Approaching Sydney International Airport from 1995 to 2019

2.3 Pedestrian Wind Criteria

The pedestrian wind comfort and safety conditions are assessed based on the Lawson Criteria. Based on the Development Consent approval for SSD8875, the wind conditions associated with the subject development have been assessed comfort categories prescribed in the Lawson Criteria. In general, the combined effect of mean and gust speeds on pedestrian comfort can be quantified by a Gust Equivalent Mean (GEM).

Comfort Category	Mean/GEM Wind Speed (m/s)	Description
Pedestrian Sitting	≤ 4	Low wind speed where, for example, one could read a newspaper without having it blown away
Pedestrian Standing	≤ 6	Comfortable for standing for a short time of exposure at main building entrances, bus stops, and other places
Pedestrian Walking	≤ 8	Wind speeds that would be acceptable for window shopping or strolling along a downtown street
Business Walking	≤ 10	Wind conditions where the objective is to walk from A to B or for cycling
Uncomfortable	> 10	Winds of this magnitude are considered a nuisance for most activities, and wind mitigation is typically recommended

Notes:

- (1) GEM wind speed = gust speed / 1.85; and,
- (2) GEM wind speeds listed above are based on an exceedance of 5% of the time.

Safety Criterion	Mean/GEM Wind Speed (m/s)	Description
Exceeded	Frequent Pedestrian Area > 15	Excessive gust speeds that can adversely affect a pedestrian's balance and footing.
	Infrequent Pedestrian Area > 20	

Notes:

- (1) GEM wind speed = gust speed / 1.85; and,
- (2) Based on an annual exceedance of 0.022% of the time.
- (3) Wind speeds between 15 m/s and 20 m/s have been categorised acceptable for "Able-bodied" people.

3 RESULTS AND DISCUSSION

The predicted wind conditions are shown on site plans in Figures 1A through 3F 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.

Wind conditions comfortable for Pedestrian Walking are appropriate for sidewalks and walkways as pedestrians will be active and are less likely to remain in one area for prolonged periods of time. Lower wind speeds that meet the criteria for Pedestrian Sitting or Pedestrian Standing are desirable at building entrances for comfortable egress/ingress, and in passive use areas like terraces and amenity areas. The following is a detailed discussion of the suitability of the predicted wind conditions for the anticipated pedestrian use of each area of interest.

3.1 Existing Site Conditions

Wind conditions at the ground level (Figures 1A and 2A), around the perimeter of the building and at most areas in the immediate vicinity that were assessed are predicted to be suitable for their intended uses throughout the year. The range of wind speeds expected meet the criteria for Pedestrian Sitting, Pedestrian Standing or Pedestrian Walking during the summer season. During the winter season, wind speeds are lower, and meet the criteria for Pedestrian Sitting or Pedestrian Standing at all locations assessed.

The replacement of the current 201 Elizabeth Street existing built form with the Stage 1 DA massing envelope (southeast of the project site) is expected to generally reduce wind speeds at several areas on Park Street and Castlereagh Street (Figures 1B and 2B). However an increase in wind speeds is predicted at the northeastern corner of 201 Elizabeth Street. Overall, wind conditions are predicted to continue to meet the criteria for Pedestrian Sitting, Pedestrian Standing or Pedestrian Walking in the areas assessed. These conditions are considered appropriate for pedestrian usage on the footpaths.

Wind conditions at all locations assessed meet the recommended criteria for Pedestrian Safety (Figures 3A and 3B).

3.2 Stage 1 Massing Envelope

The inclusion of the Stage 1 Massing Envelope is expected to reduce the wind speeds west of the project site along Park Street and Pitt Street, as well as to the northeast on Castlereagh Street, when compared to the Existing conditions (Figures 1C and 2C). An increase in wind speeds is predicted at the southeast corner of the site. Overall wind conditions continue to meet the criteria for Pedestrian Sitting, Pedestrian Standing or Pedestrian Walking in the summer and winter months, with relatively lower wind speeds in the summer. These conditions are comparable to the Existing conditions throughout the year.

The inclusion of the 201 Elizabeth Street Stage 1 DA massing envelope is not expected to affect these wind conditions significantly. Wind conditions in the areas assessed are expected to remain acceptable for the intended pedestrian use, as can be seen in Figures 1D and 2D.

Wind conditions at all locations assessed meet the recommended criteria for Pedestrian Safety (Figures 3C and 3D).

3.3 Detailed Design

Ground Level

Wind conditions within and around the subject development are predicted to be calm with wind speeds at most locations assessed, including the main building entrances, expected to meet the criteria for Pedestrian Sitting or Pedestrian Standing in the summer and winter months. Wind speeds at one location across Park Street, south of the project, is predicted to meet the criteria for Pedestrian Walking in the summer.

The addition of the 201 Elizabeth Street Stage 1 DA massing envelope is predicted to increase wind speeds along Park Street and Castlereagh Street, resulting in a relatively larger number of locations where conditions meet the criteria for Pedestrian Walking.

In both scenarios, with and without the 201 Elizabeth massing envelope, the Detailed Design is not expected to cause adverse wind conditions at ground level, and wind speeds overall, are generally lower than in the Existing configuration. Wind conditions at all locations assessed meet the recommended criteria for Pedestrian Safety (Figures 3E and 3F)

Terraces

The wind conditions at most locations on the Levels 10 and 11 terraces areas (on the eastern, southern and western aspects) are predicted to meet the criteria for Pedestrian Sitting or Pedestrian Standing, and therefore, be acceptable for the passive occupant use throughout the year. The southeast corner of the Level 10 terrace is however predicted to be too windy for passive use, with wind speeds meeting the criteria for Pedestrian Walking or Business Walking (Figure 1E) and exceeding the prescribed safety threshold on an annual basis (Figure 3E). This is however noted to be during the summer period of the year when the north-easterly winds are more prevalent, with Pedestrian Standing Conditions achieved during the winter period of the year.

The prevailing winds from the northeasterly direction accelerates around the southeast corner of the podium, resulting in higher wind speeds on the Level 10 terrace (Locations 13 and 14). The planter and landscape details shown in the proposed landscaping plan (SMCSWSPS-SBD-OSN-LA-DWG-001010.pdf, received on 11 June 2020, Image 5) were not modelled for the wind study so as to obtain the worst-case wind conditions at full exposure. The landscape plan shows balustrade edges and raised planting areas along the terrace perimeter on Levels 10 and 11 (Image 4). We understand that tall trees are proposed at the north end of Level 11 and the east and southeast portions of Level 10. These features are expected to reduce the wind speeds on the terrace. For substantial reduction of wind acceleration at the southeast corner of the Level 10 terrace, it is recommended that trees of similar height and crown span (as shown in Image 4) be considered along the east edge of the terrace, in the area indicated in Image 5. Alternatively, porous screens within the landscape area at the south-eastern corner of similar height would aid in reducing this noted sidestream effect. The effectiveness of these measures may be evaluated and quantified through wind tunnel tests when the landscape design has been finalised.

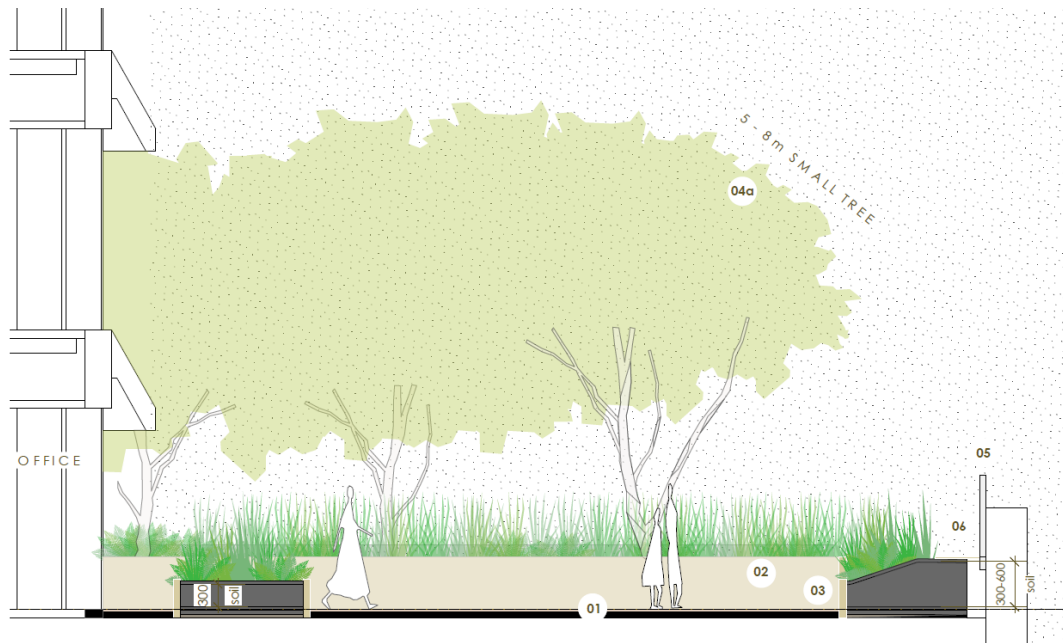


Image 4: Illustration of the Balustrade, Planter and Tree Heights in the Proposed Landscape Plan

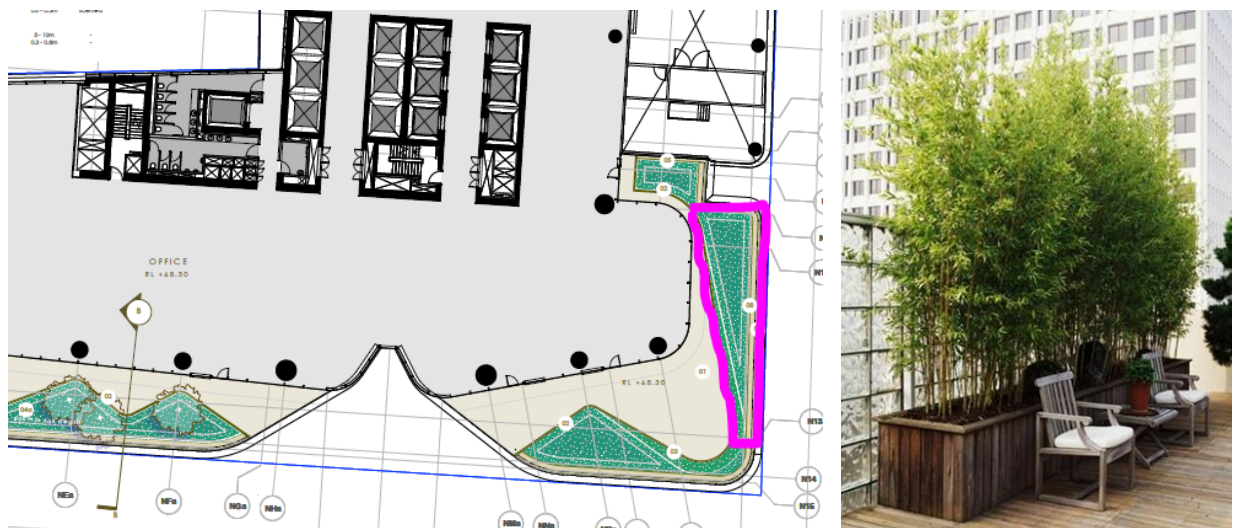


Image 5: Recommended Area for Additional Trees on Level10 (left) and Example of the Scale of Wind Control Measure for the Southeast Corner of the Terrace (right)



4 APPLICABILITY OF RESULTS

The drawings and information listed below were received from Pitt Street North Pty Ltd. and were used to construct the scale model of the proposed Pitt Street North. The wind conditions presented in this report pertain to the proposed as detailed in the architectural design drawings listed in the table below. Should there be any design changes that deviate from this list of drawings, the wind condition predictions presented may change. Therefore, if changes in the design are made, it is recommended that RWDI be contacted and requested to review their potential effects on wind conditions.

File Name	File Type	Date Received (dd/mm/yyyy)
SSD 8875_Pitt Street North Over Station Development Concept_Stamped Plans	PDF	22/05/2020

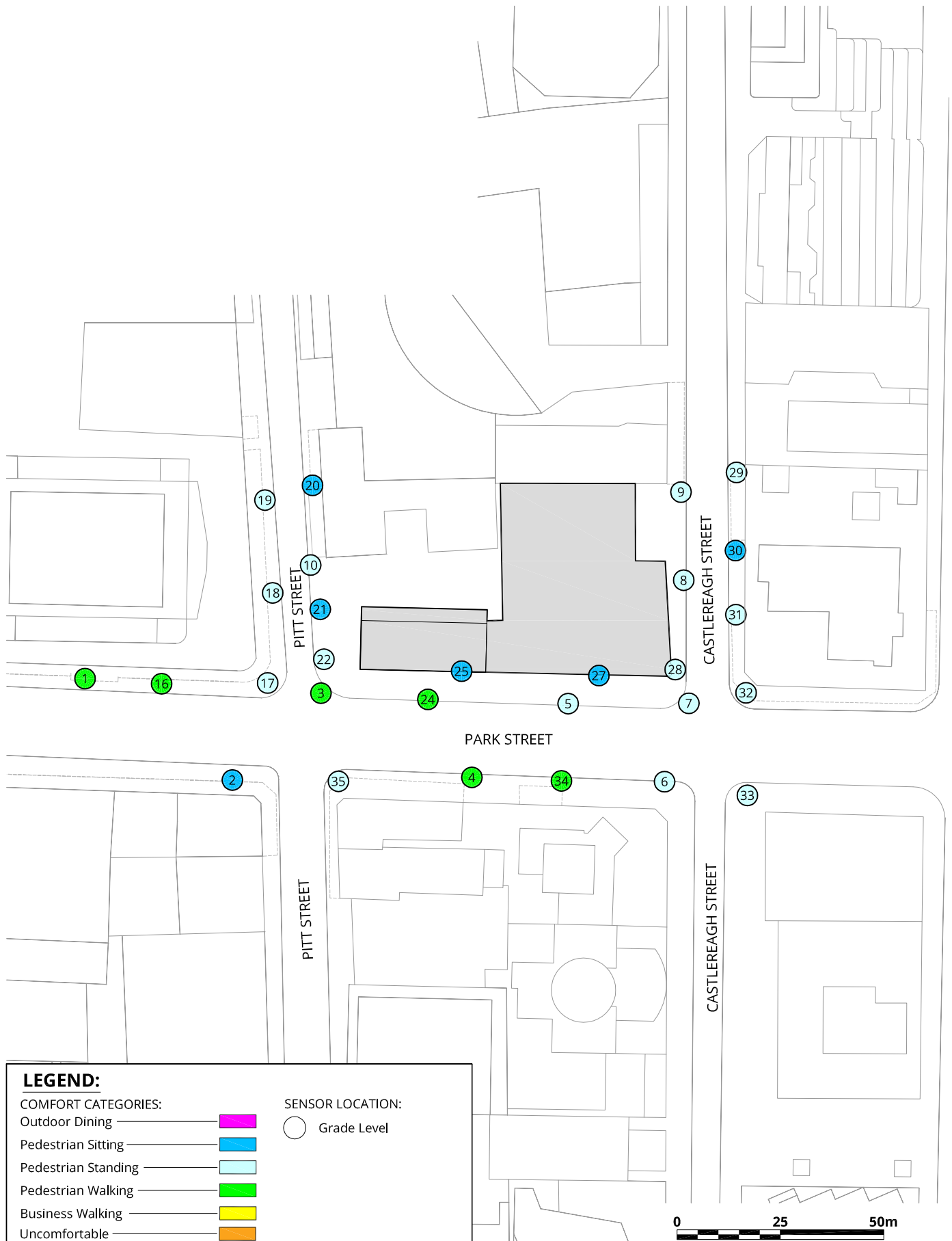


5 REFERENCES

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FIGURES



Pedestrian Wind Comfort Conditions

Existing
Summer (November to April, 0:00 to 23:00)

Pitt Street North - Sydney

True North



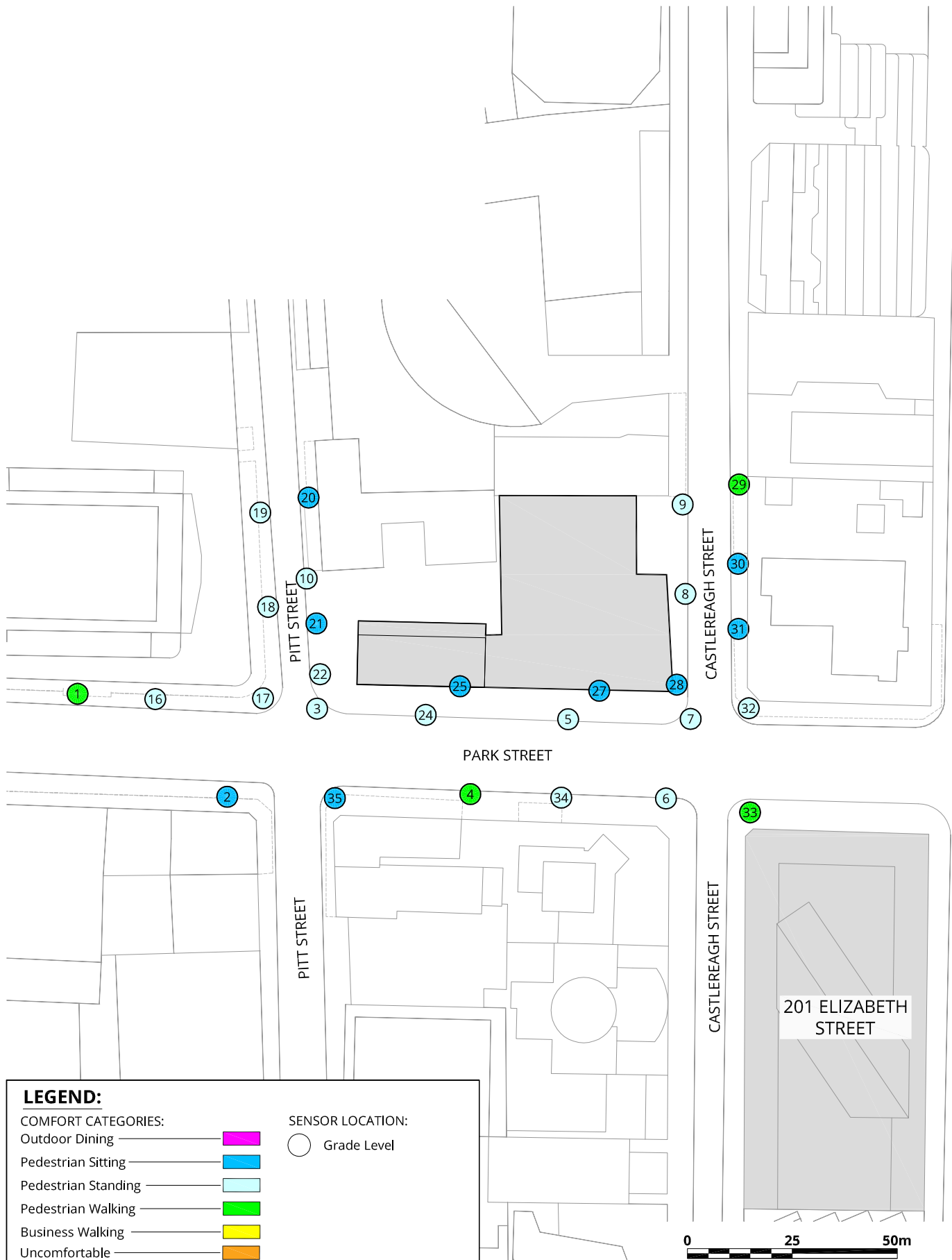
Project #2003971

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Date Revised: Jun. 11, 2020





Pedestrian Wind Comfort Conditions

Existing with 201 Elizabeth Massing Envelope
Summer (November to April, 0:00 to 23:00)

Pitt Street North - Sydney

True North



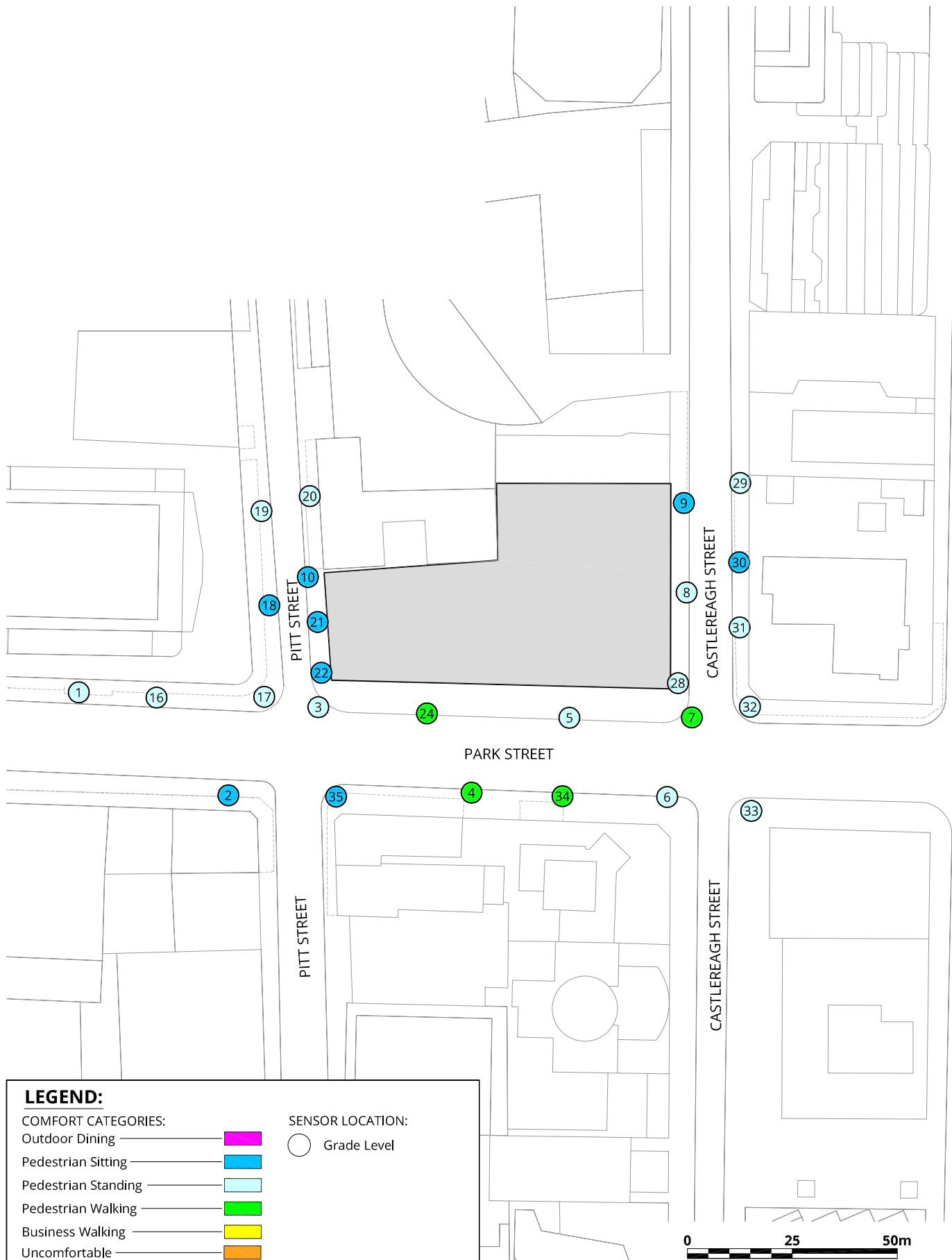
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Date Revised: Jun. 11, 2020





Pedestrian Wind Comfort Conditions

Stage 1 Massing Envelope
Summer (November to April, 0:00 to 23:00)

Pitt Street North - Sydney

True North



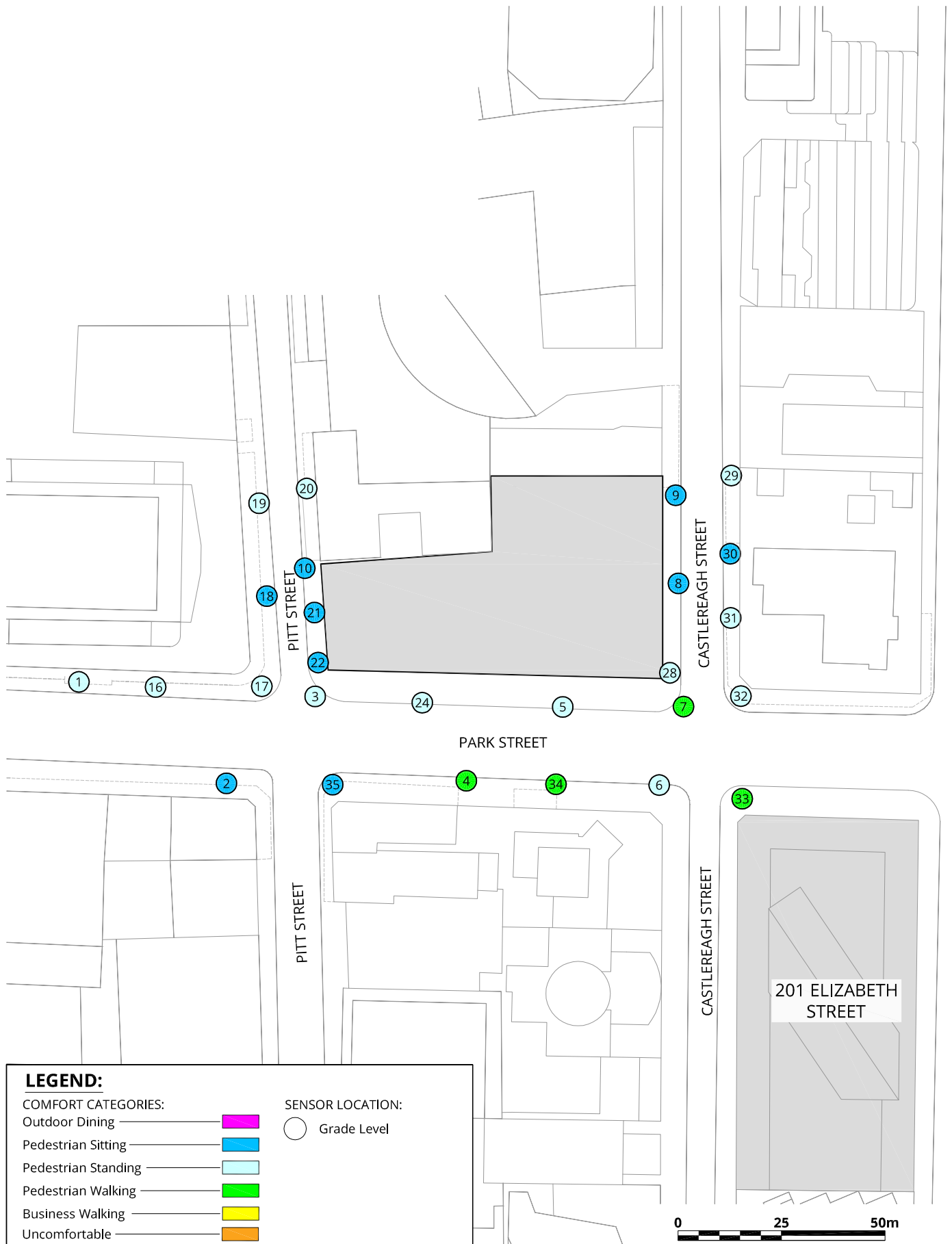
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Date Revised: Jun. 11, 2020





Pedestrian Wind Comfort Conditions

Stage 1 Massing Envelope with 201 Elizabeth Massing Envelope
Summer (November to April, 0:00 to 23:00)

Pitt Street North - Sydney

True North



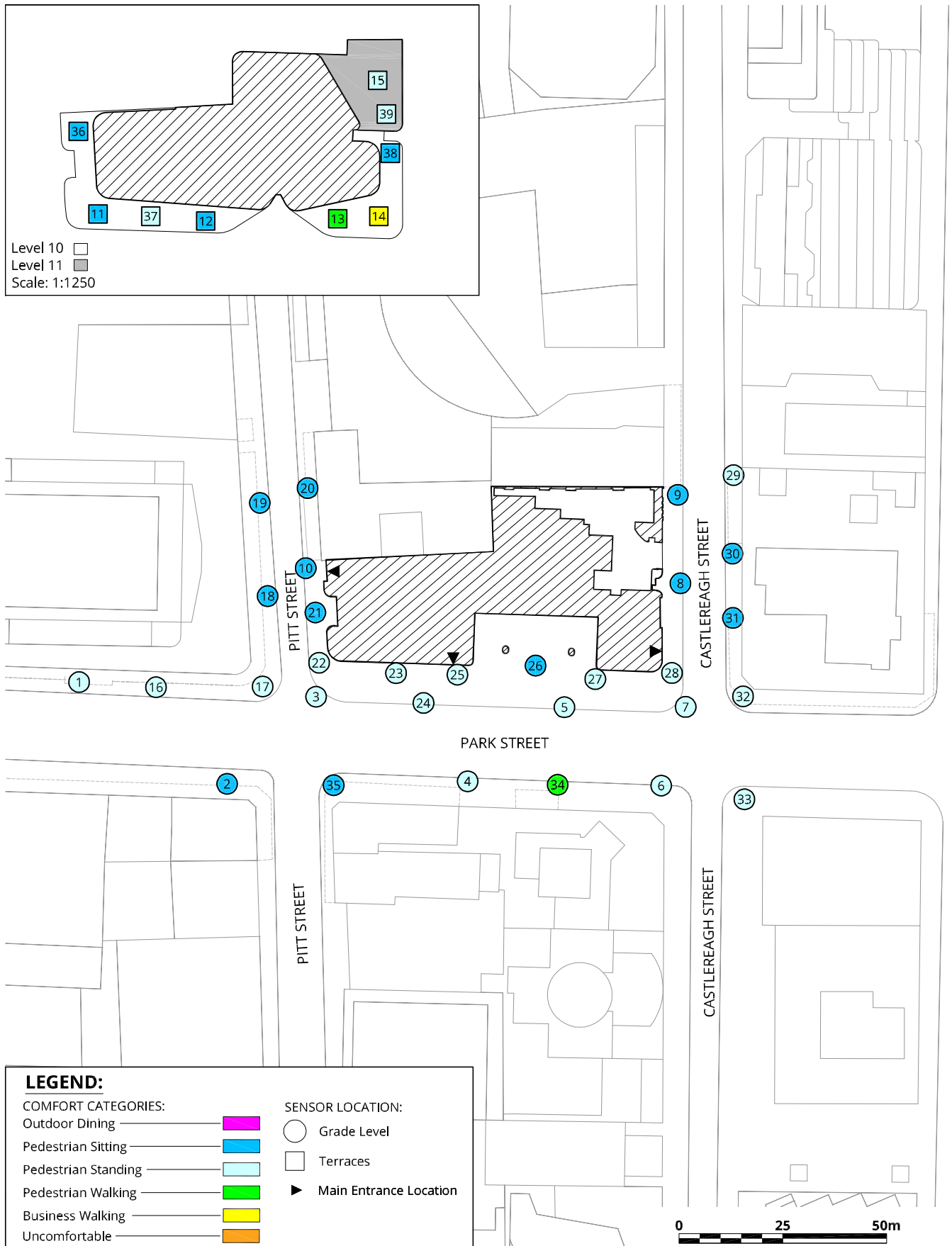
Project #2003971

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Approx. Scale: 1:1250

Date Revised: Jun. 11, 2020





Pedestrian Wind Comfort Conditions

Detailed Design
 Summer (November to April, 0:00 to 23:00)

Pitt Street North - Sydney

True North



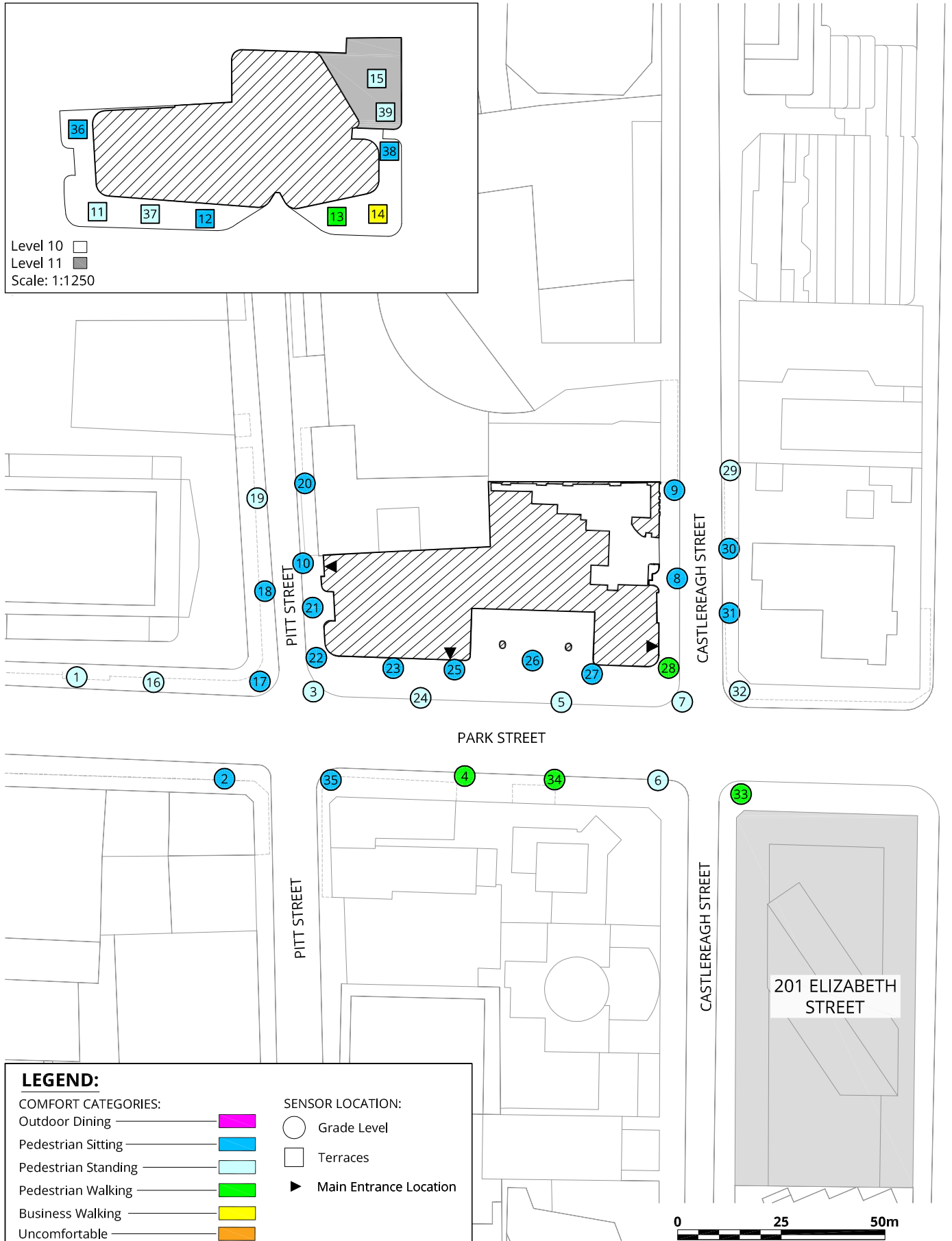
Project #2003971

Drawn by: AKA Figure: 1E

Approx. Scale: 1:1250

Date Revised: Jun. 11, 2020





Pedestrian Wind Comfort Conditions

Detailed Design with 201 Elizabeth Massing Envelope
 Summer (November to April, 0:00 to 23:00)

Pitt Street North - Sydney

True North



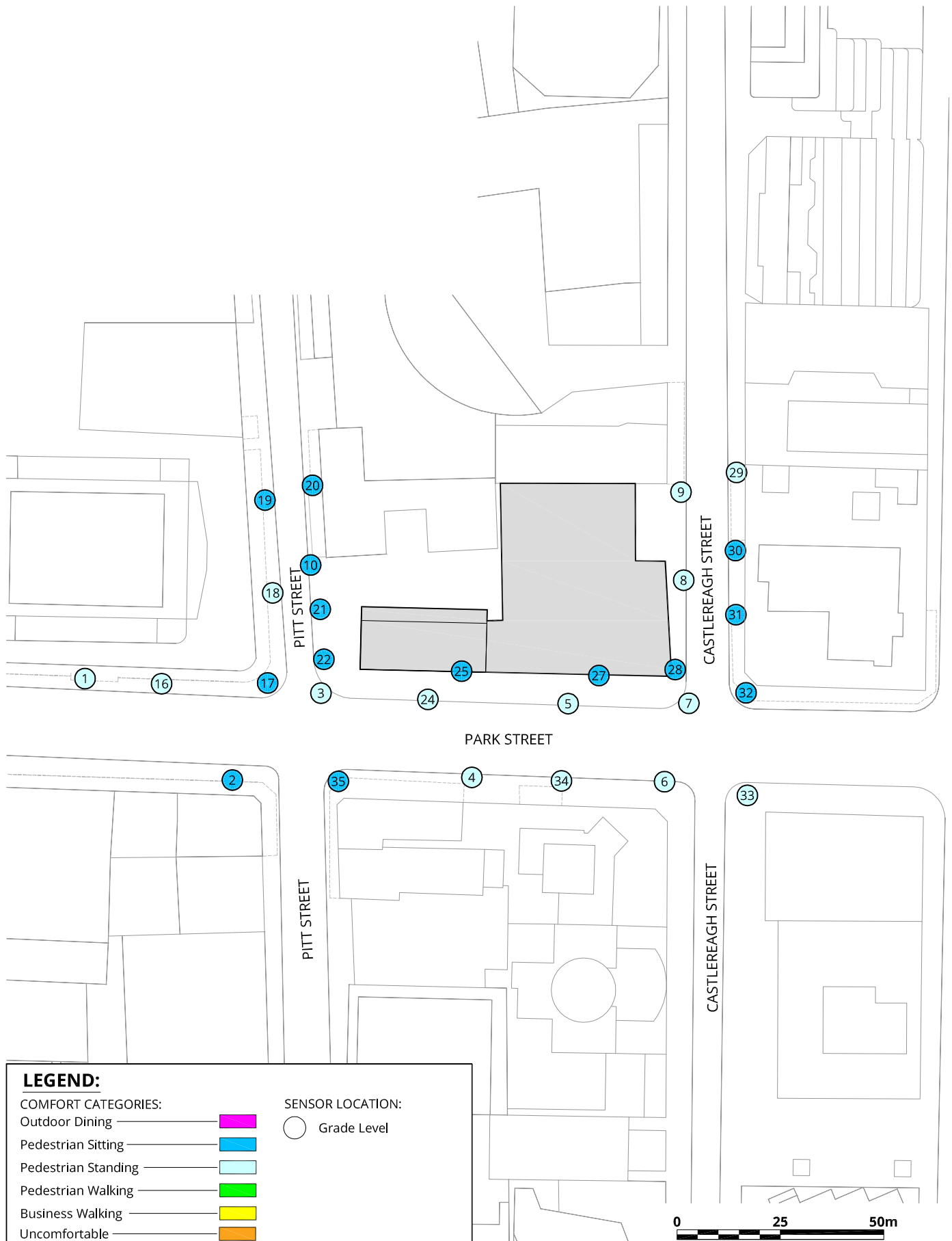
Project #2003971

Drawn by: AKA Figure: 1F

Approx. Scale: 1:1250

Date Revised: Jun. 11, 2020





Pedestrian Wind Comfort Conditions

Existing
Winter (May to October, 0:00 to 23:00)

Pitt Street North - Sydney

True North



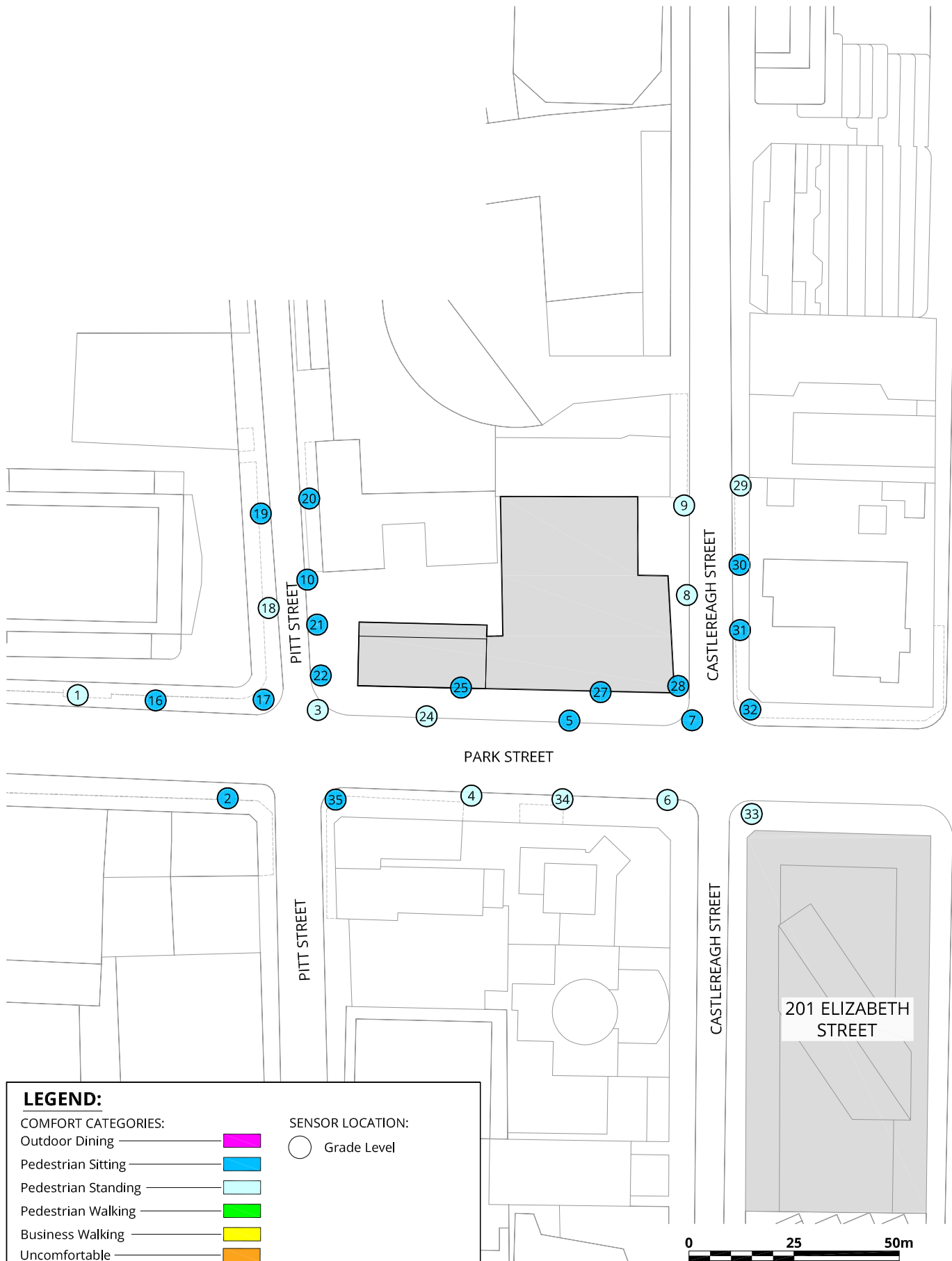
Project #2003971

Drawn by: AKA Figure: 2A

Approx. Scale: 1:1250

Date Revised: Jun. 11, 2020





Pedestrian Wind Comfort Conditions

Existing with 201 Elizabeth Massing Envelope
Winter (May to October, 0:00 to 23:00)

Pitt Street North - Sydney

True North



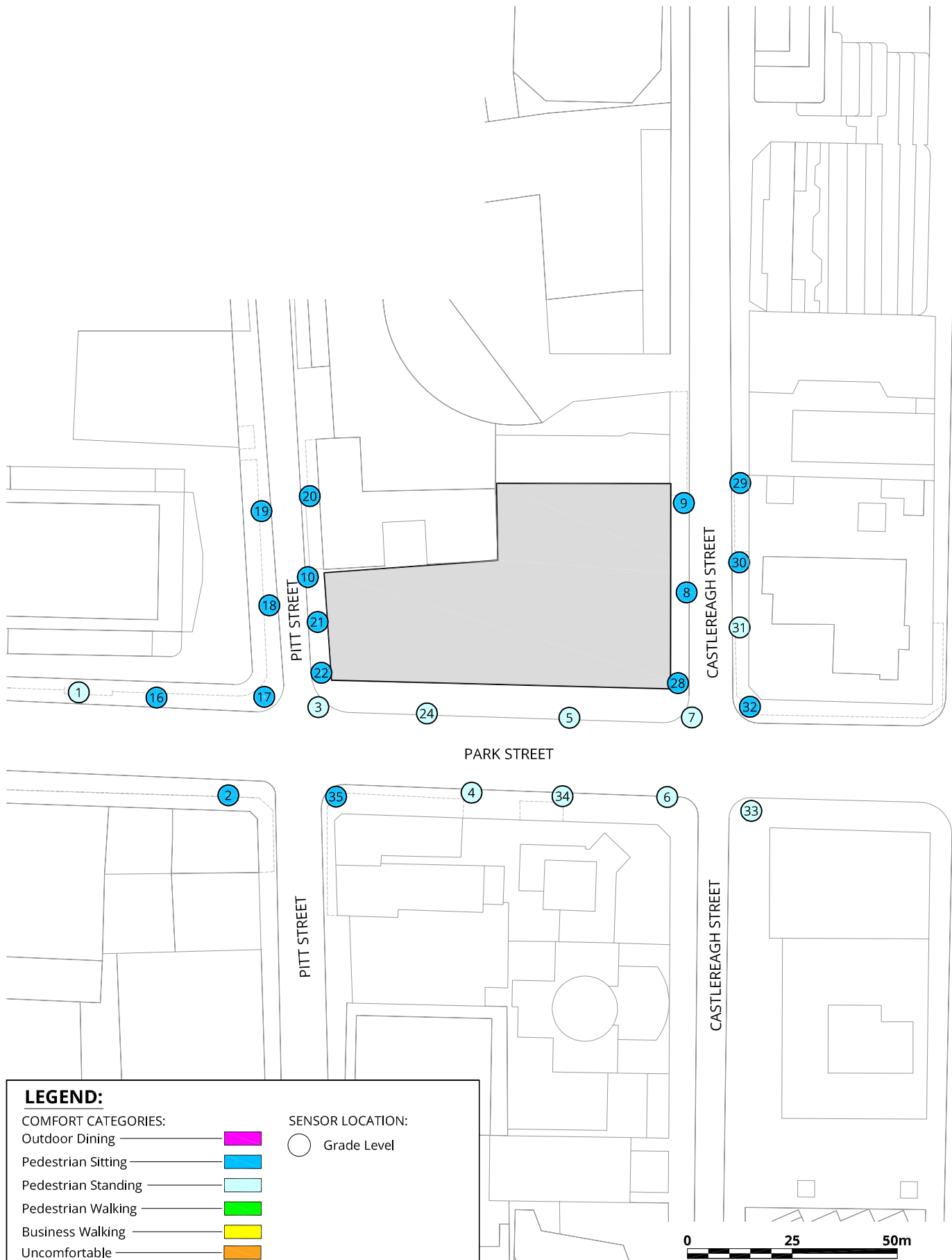
Project #2003971

Drawn by: AKA Figure: 2B

Approx. Scale: 1:1250

Date Revised: Jun. 11, 2020





Pedestrian Wind Comfort Conditions

Stage 1 Massing Envelope
Winter (May to October, 0:00 to 23:00)

Pitt Street North - Sydney

True North



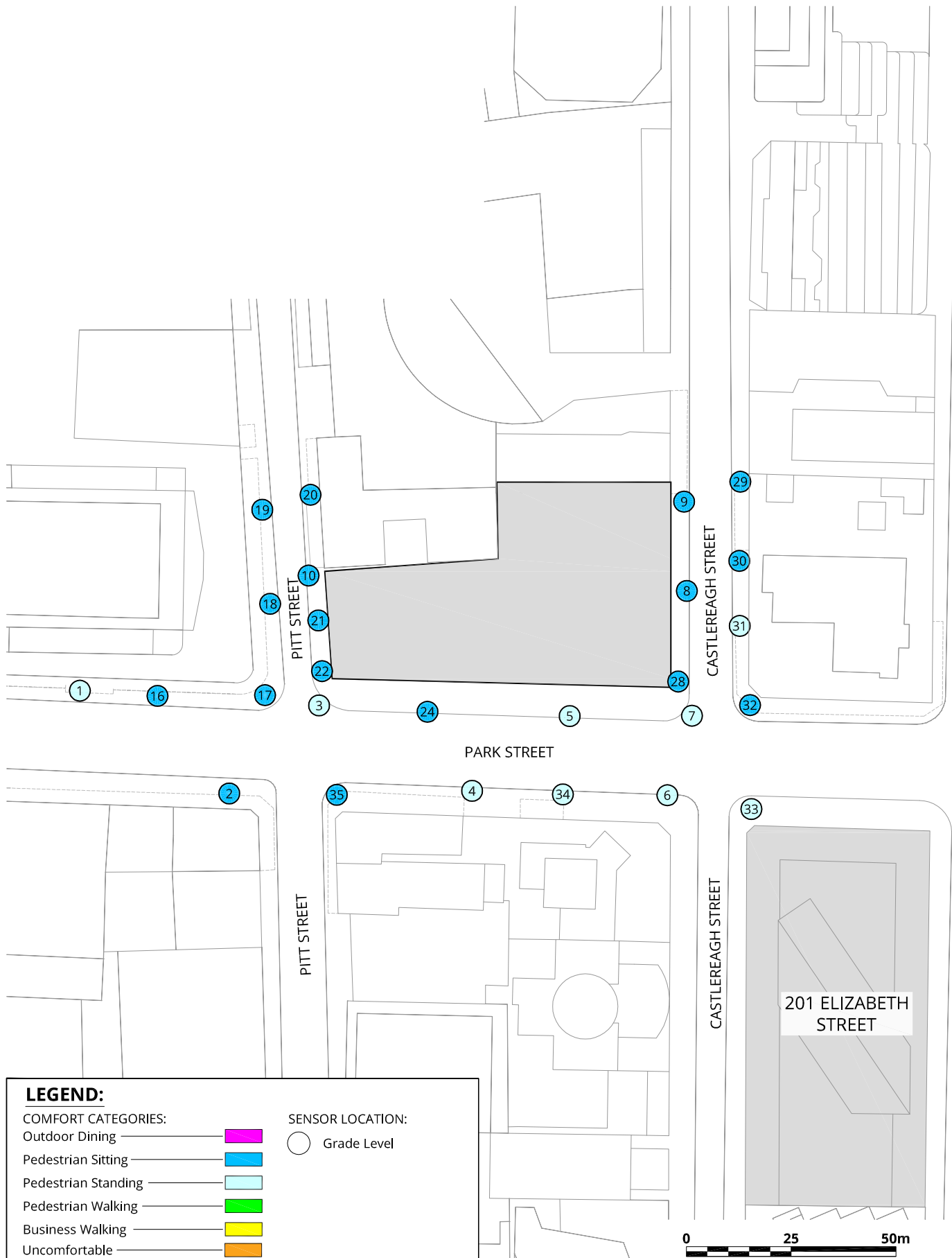
Project #2003971

Drawn by: AKA Figure: 2C

Approx. Scale: 1:1250

Date Revised: Jun. 11, 2020





Pedestrian Wind Comfort Conditions

Stage 1 Massing Envelope with 201 Elizabeth Massing Envelope
Winter (May to October, 0:00 to 23:00)

Pitt Street North - Sydney

Project #2003971

True North

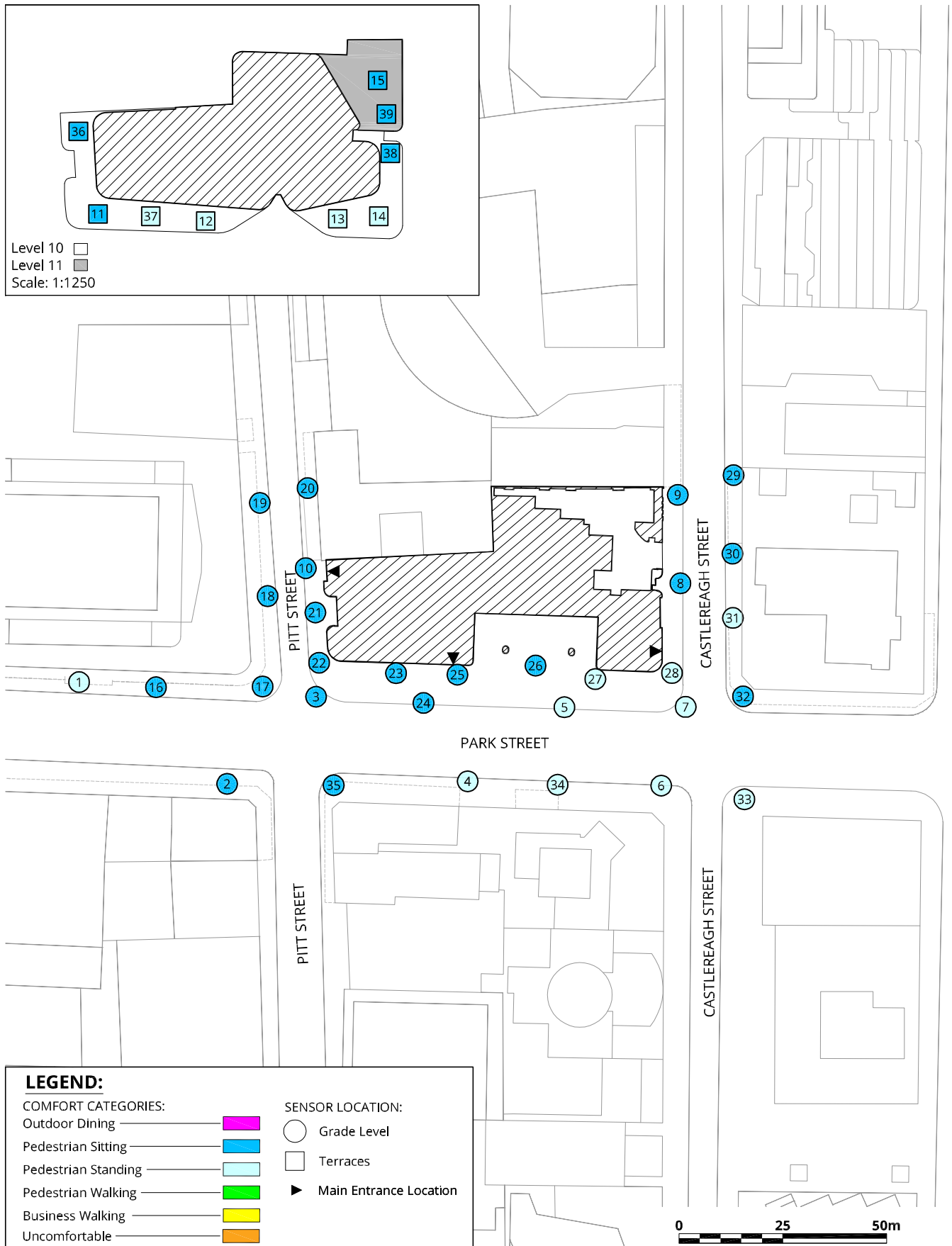


Drawn by: AKA Figure: 2D

Approx. Scale: 1:1250

Date Revised: Jun. 11, 2020





Pedestrian Wind Comfort Conditions

Detailed Design
 Winter (May to October, 0:00 to 23:00)

Pitt Street North - Sydney

True North



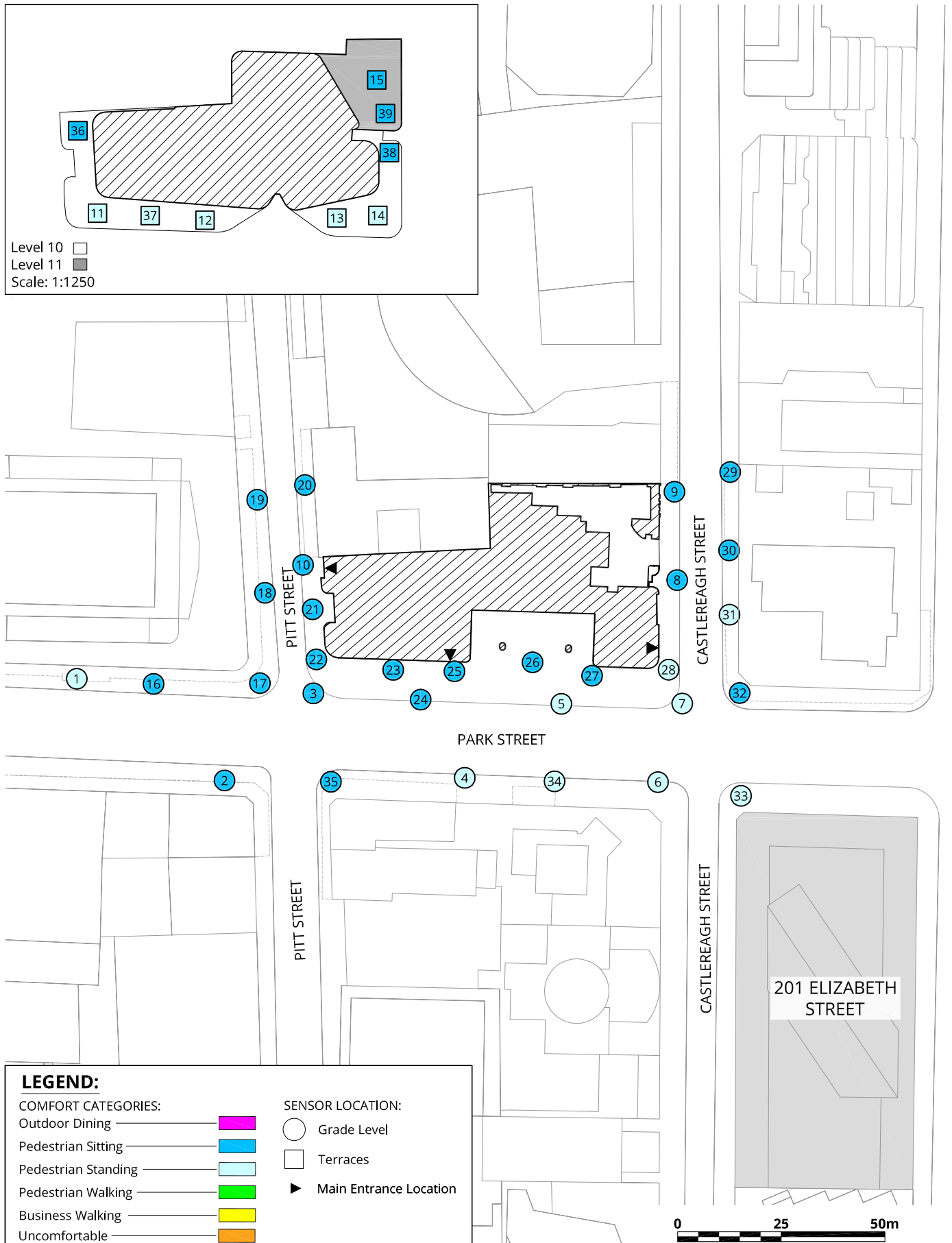
Project #2003971

Drawn by: AKA Figure: 2E

Approx. Scale: 1:1250

Date Revised: Jun. 11, 2020





Pedestrian Wind Comfort Conditions

Detailed Design with 201 Elizabeth Massing Envelope
 Winter (May to October, 0:00 to 23:00)

Pitt Street North - Sydney

True North



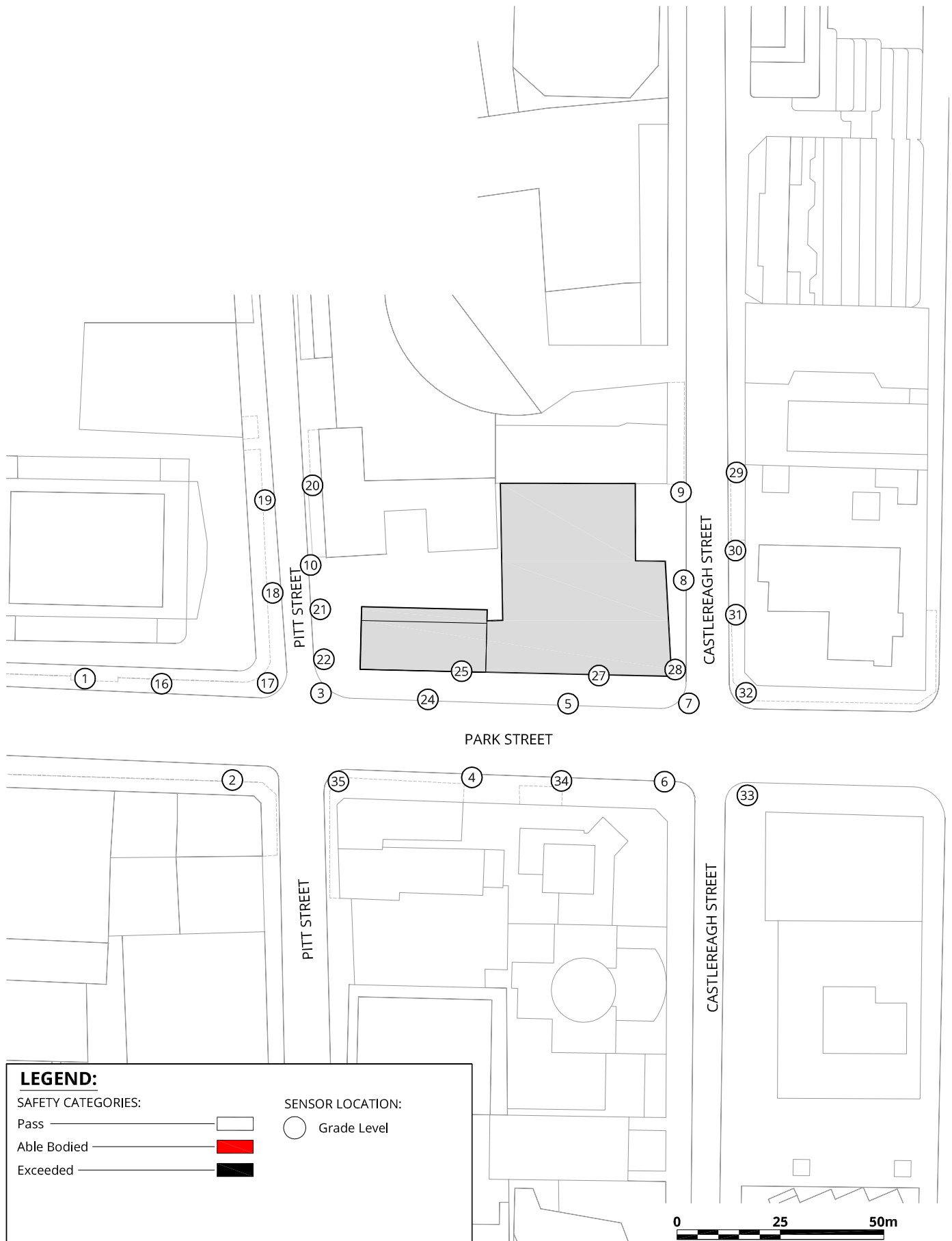
Project #2003971

Drawn by: AKA Figure: 2F

Approx. Scale: 1:1250

Date Revised: Jun. 11, 2020





Pedestrian Wind Safety Conditions

Current Existing Site and existing surroundings
Annual (January to December, 0:00 to 23:00)

Pitt Street North - Sydney

True North



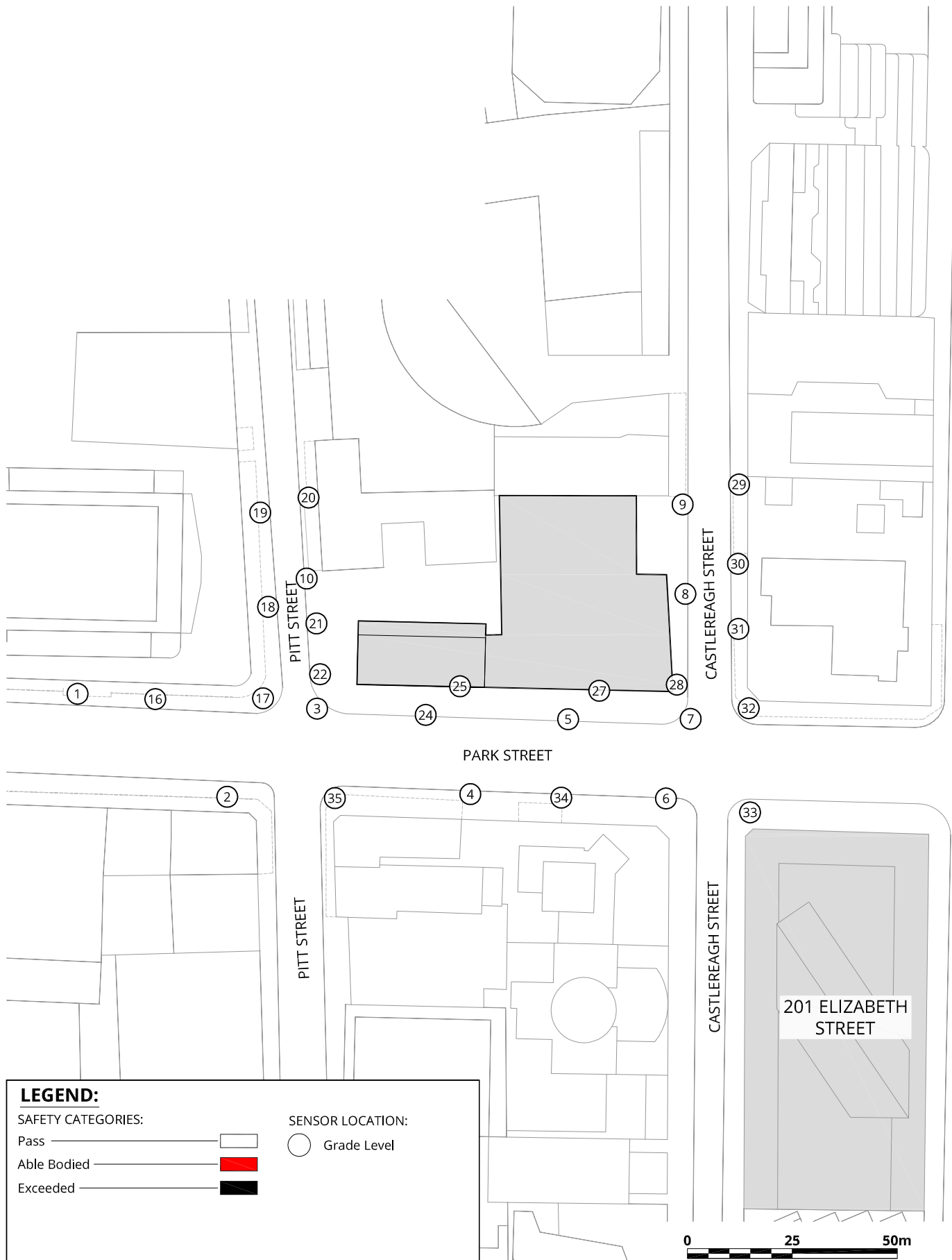
Project #2003971

Drawn by: AKA Figure: 3A

Approx. Scale: 1:1250

Date Revised: Jun. 17, 2020





Pedestrian Wind Safety Conditions

Current Existing Site and 201 Elizabeth Street Stage 1 DA Massing Envelope
Annual (January to December, 0:00 to 23:00)

Pitt Street North - Sydney

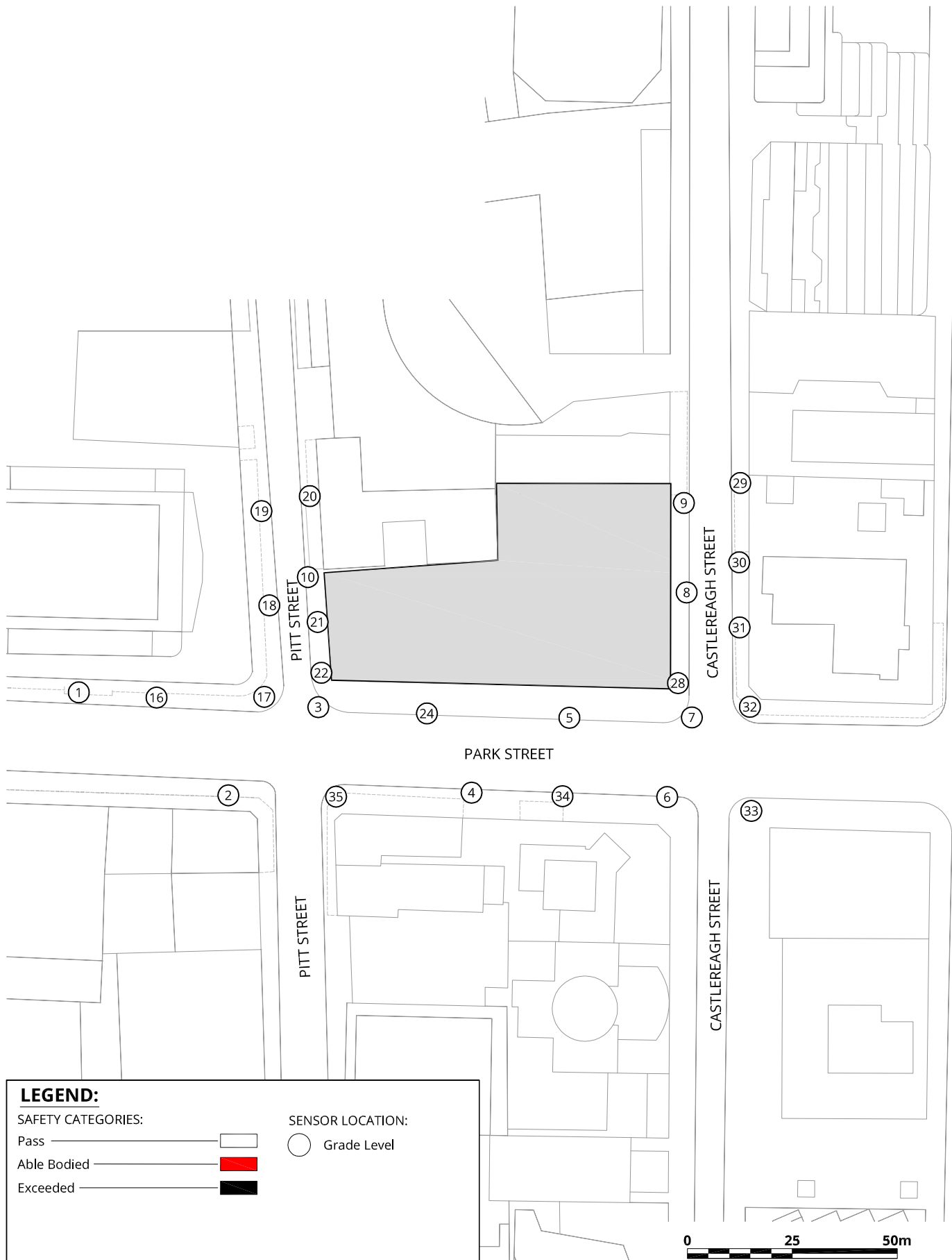
True North



Project #2003971

Drawn by: AKA	Figure: 3B
Approx. Scale:	1:1250
Date Revised:	Jun. 17, 2020





Pedestrian Wind Safety Conditions

Stage 1 Massing Envelope and Existing Surroundings
Annual (January to December, 0:00 to 23:00)

Pitt Street North - Sydney

True North



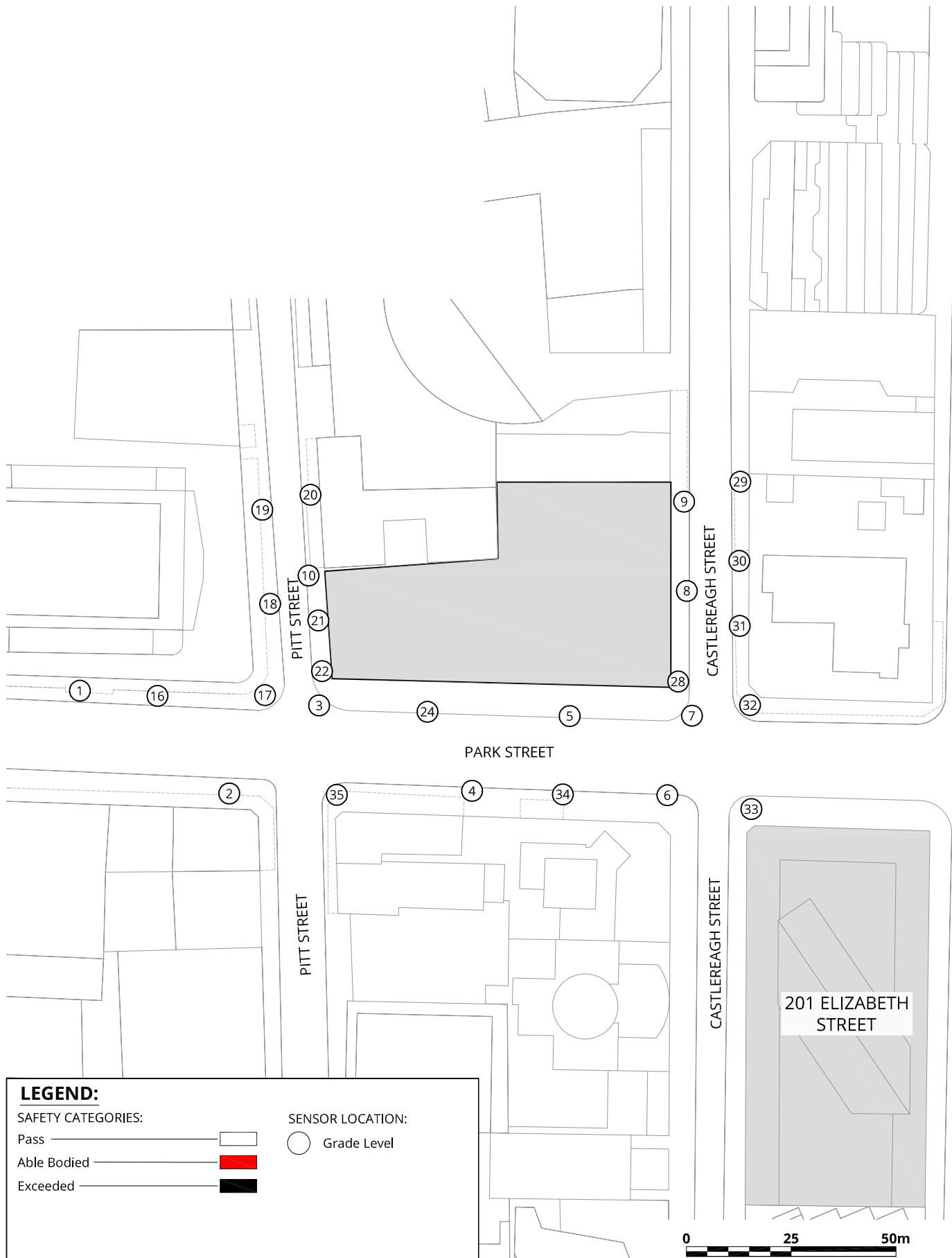
Project #2003971

Drawn by: AKA Figure: 3C

Approx. Scale: 1:1250

Date Revised: Jun. 17, 2020





Pedestrian Wind Safety Conditions

Stage 1 Massing Envelope and 201 Elizabeth Street Stage 1 DA
Massing Envelope
Annual (January to December, 0:00 to 23:00)

Pitt Street North - Sydney

True North



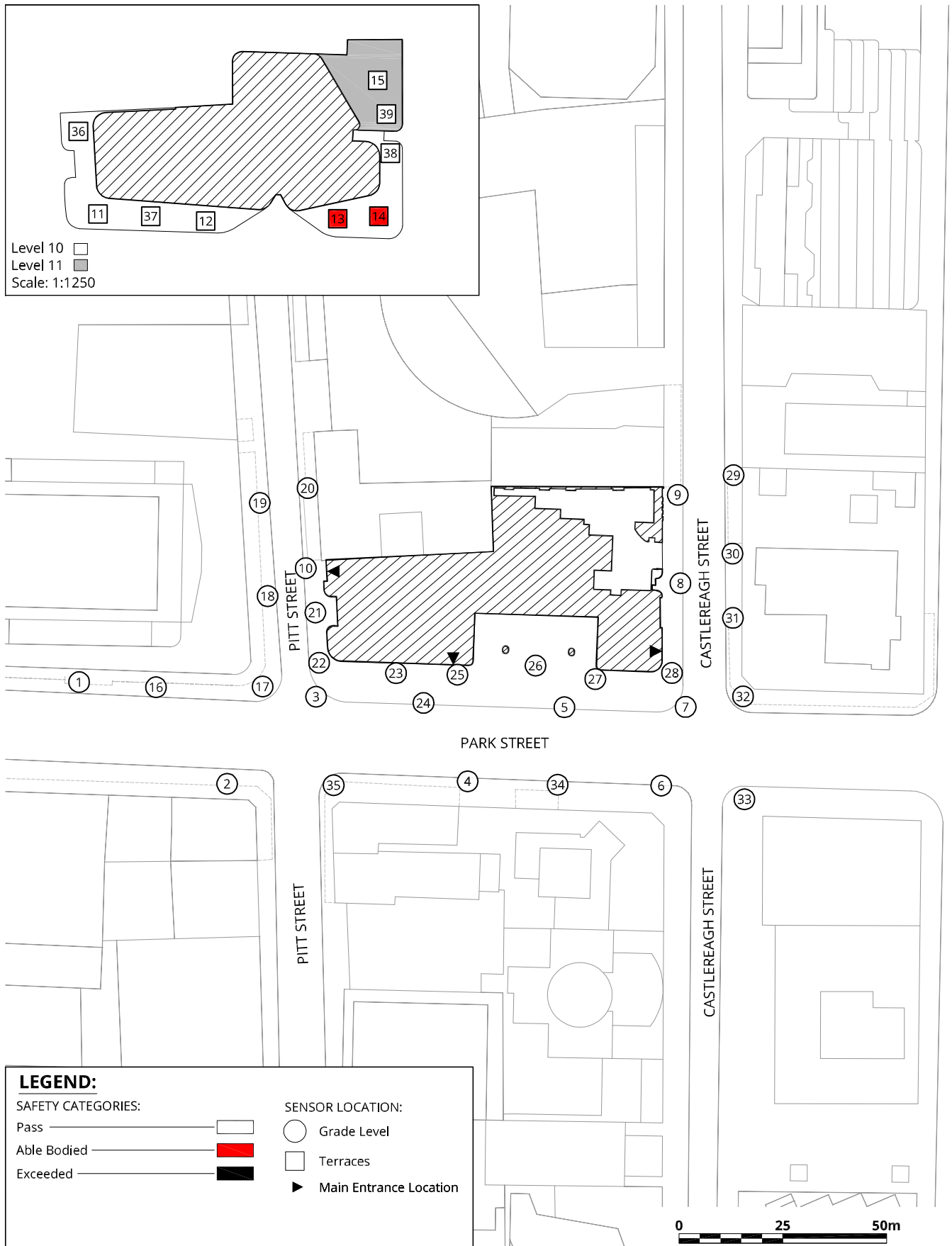
Project #2003971

Drawn by: AKA Figure: 3D

Approx. Scale: 1:1250

Date Revised: Jun. 17, 2020





Pedestrian Wind Safety Conditions

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

Pitt Street North - Sydney

True North



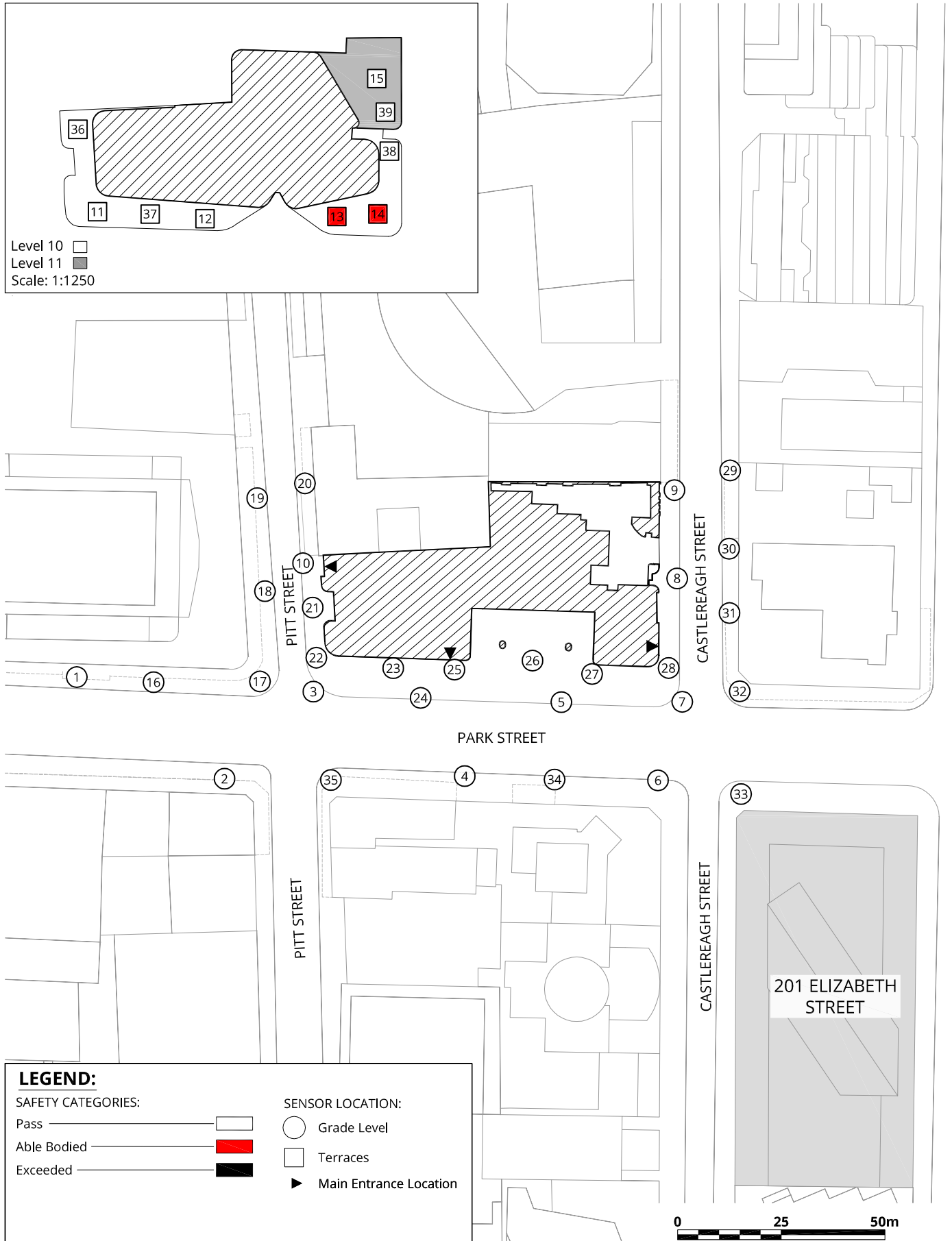
Project #2003971

Drawn by: AKA Figure: 3E

Approx. Scale: 1:1250

Date Revised: Jun. 11, 2020





Pedestrian Wind Safety Conditions

Detailed Design with 201 Elizabeth Massing Envelope
 Annual (January to December, 0:00 to 23:00)

Pitt Street North - Sydney

True North



Project #2003971

Drawn by: AKA Figure: 3F

Approx. Scale: 1:1250

Date Revised: Jun. 11, 2020



A decorative graphic on the left side of the page. It features a solid blue right-angled triangle in the top-left corner. A large, light-grey circle with a thin white border overlaps the triangle and extends across the middle and bottom of the page. The word 'TABLES' is centered within the grey circle.

TABLES

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (m/s)	Rating	Speed (m/s)	Rating	Speed (m/s)	Rating
1	Config A	8	Pedestrian Walking	5	Pedestrian Standing	15	Pass
	Config B	7	Pedestrian Walking	5	Pedestrian Standing	12	Pass
	Config C	6	Pedestrian Standing	5	Pedestrian Standing	10	Pass
	Config D	6	Pedestrian Standing	5	Pedestrian Standing	10	Pass
	Config E	6	Pedestrian Standing	5	Pedestrian Standing	11	Pass
	Config F	6	Pedestrian Standing	5	Pedestrian Standing	9	Pass
2	Config A	4	Pedestrian Sitting	4	Pedestrian Sitting	8	Pass
	Config B	4	Pedestrian Sitting	4	Pedestrian Sitting	8	Pass
	Config C	4	Pedestrian Sitting	4	Pedestrian Sitting	7	Pass
	Config D	4	Pedestrian Sitting	3	Pedestrian Sitting	7	Pass
	Config E	4	Pedestrian Sitting	4	Pedestrian Sitting	7	Pass
	Config F	4	Pedestrian Sitting	3	Pedestrian Sitting	7	Pass
3	Config A	8	Pedestrian Walking	5	Pedestrian Standing	14	Pass
	Config B	6	Pedestrian Standing	5	Pedestrian Standing	11	Pass
	Config C	6	Pedestrian Standing	5	Pedestrian Standing	10	Pass
	Config D	5	Pedestrian Standing	5	Pedestrian Standing	10	Pass
	Config E	6	Pedestrian Standing	4	Pedestrian Sitting	11	Pass
	Config F	5	Pedestrian Standing	4	Pedestrian Sitting	8	Pass
4	Config A	7	Pedestrian Walking	5	Pedestrian Standing	13	Pass
	Config B	7	Pedestrian Walking	5	Pedestrian Standing	12	Pass
	Config C	7	Pedestrian Walking	5	Pedestrian Standing	12	Pass
	Config D	7	Pedestrian Walking	5	Pedestrian Standing	12	Pass
	Config E	6	Pedestrian Standing	5	Pedestrian Standing	11	Pass
	Config F	7	Pedestrian Walking	5	Pedestrian Standing	12	Pass
5	Config A	6	Pedestrian Standing	5	Pedestrian Standing	11	Pass
	Config B	5	Pedestrian Standing	4	Pedestrian Sitting	9	Pass
	Config C	6	Pedestrian Standing	5	Pedestrian Standing	10	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (m/s)	Rating	Speed (m/s)	Rating	Speed (m/s)	Rating
	Config D	5	Pedestrian Standing	5	Pedestrian Standing	9	Pass
	Config E	6	Pedestrian Standing	5	Pedestrian Standing	11	Pass
	Config F	5	Pedestrian Standing	5	Pedestrian Standing	10	Pass
6	Config A	6	Pedestrian Standing	5	Pedestrian Standing	10	Pass
	Config B	6	Pedestrian Standing	5	Pedestrian Standing	10	Pass
	Config C	6	Pedestrian Standing	5	Pedestrian Standing	10	Pass
	Config D	6	Pedestrian Standing	6	Pedestrian Standing	11	Pass
	Config E	6	Pedestrian Standing	5	Pedestrian Standing	11	Pass
	Config F	6	Pedestrian Standing	5	Pedestrian Standing	11	Pass
7	Config A	5	Pedestrian Standing	5	Pedestrian Standing	9	Pass
	Config B	5	Pedestrian Standing	4	Pedestrian Sitting	8	Pass
	Config C	7	Pedestrian Walking	6	Pedestrian Standing	12	Pass
	Config D	8	Pedestrian Walking	6	Pedestrian Standing	13	Pass
	Config E	6	Pedestrian Standing	5	Pedestrian Standing	10	Pass
	Config F	6	Pedestrian Standing	5	Pedestrian Standing	11	Pass
8	Config A	5	Pedestrian Standing	5	Pedestrian Standing	10	Pass
	Config B	5	Pedestrian Standing	5	Pedestrian Standing	9	Pass
	Config C	5	Pedestrian Standing	3	Pedestrian Sitting	8	Pass
	Config D	4	Pedestrian Sitting	3	Pedestrian Sitting	8	Pass
	Config E	4	Pedestrian Sitting	3	Pedestrian Sitting	8	Pass
	Config F	4	Pedestrian Sitting	3	Pedestrian Sitting	8	Pass
9	Config A	5	Pedestrian Standing	5	Pedestrian Standing	10	Pass
	Config B	6	Pedestrian Standing	5	Pedestrian Standing	10	Pass
	Config C	4	Pedestrian Sitting	3	Pedestrian Sitting	8	Pass
	Config D	4	Pedestrian Sitting	4	Pedestrian Sitting	8	Pass
	Config E	4	Pedestrian Sitting	3	Pedestrian Sitting	8	Pass
	Config F	4	Pedestrian Sitting	3	Pedestrian Sitting	8	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (m/s)	Rating	Speed (m/s)	Rating	Speed (m/s)	Rating
10	Config A	5	Pedestrian Standing	4	Pedestrian Sitting	9	Pass
	Config B	5	Pedestrian Standing	4	Pedestrian Sitting	8	Pass
	Config C	4	Pedestrian Sitting	3	Pedestrian Sitting	7	Pass
	Config D	4	Pedestrian Sitting	3	Pedestrian Sitting	7	Pass
	Config E	4	Pedestrian Sitting	3	Pedestrian Sitting	6	Pass
	Config F	3	Pedestrian Sitting	3	Pedestrian Sitting	6	Pass
11	Config A	-	-	-	-	-	-
	Config B	-	-	-	-	-	-
	Config C	-	-	-	-	-	-
	Config D	-	-	-	-	-	-
	Config E	4	Pedestrian Sitting	4	Pedestrian Sitting	9	Pass
	Config F	5	Pedestrian Standing	5	Pedestrian Standing	9	Pass
12	Config A	-	-	-	-	-	-
	Config B	-	-	-	-	-	-
	Config C	-	-	-	-	-	-
	Config D	-	-	-	-	-	-
	Config E	4	Pedestrian Sitting	5	Pedestrian Standing	10	Pass
	Config F	4	Pedestrian Sitting	5	Pedestrian Standing	10	Pass
13	Config A	-	-	-	-	-	-
	Config B	-	-	-	-	-	-
	Config C	-	-	-	-	-	-
	Config D	-	-	-	-	-	-
	Config E	8	Pedestrian Walking	6	Pedestrian Standing	16	Exceeded
	Config F	8	Pedestrian Walking	5	Pedestrian Standing	16	Exceeded
14	Config A	-	-	-	-	-	-
	Config B	-	-	-	-	-	-

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (m/s)	Rating	Speed (m/s)	Rating	Speed (m/s)	Rating
	Config C	–	–	–	–	–	–
	Config D	–	–	–	–	–	–
	Config E	10	Business Walking	6	Pedestrian Standing	17	Exceeded
	Config F	10	Business Walking	6	Pedestrian Standing	17	Exceeded
15	Config A	–	–	–	–	–	–
	Config B	–	–	–	–	–	–
	Config C	–	–	–	–	–	–
	Config D	–	–	–	–	–	–
	Config E	5	Pedestrian Standing	4	Pedestrian Sitting	9	Pass
	Config F	5	Pedestrian Standing	4	Pedestrian Sitting	9	Pass
16	Config A	7	Pedestrian Walking	5	Pedestrian Standing	12	Pass
	Config B	6	Pedestrian Standing	4	Pedestrian Sitting	10	Pass
	Config C	5	Pedestrian Standing	4	Pedestrian Sitting	9	Pass
	Config D	5	Pedestrian Standing	4	Pedestrian Sitting	8	Pass
	Config E	5	Pedestrian Standing	4	Pedestrian Sitting	10	Pass
	Config F	5	Pedestrian Standing	4	Pedestrian Sitting	8	Pass
17	Config A	6	Pedestrian Standing	4	Pedestrian Sitting	11	Pass
	Config B	5	Pedestrian Standing	4	Pedestrian Sitting	9	Pass
	Config C	6	Pedestrian Standing	4	Pedestrian Sitting	10	Pass
	Config D	5	Pedestrian Standing	4	Pedestrian Sitting	9	Pass
	Config E	5	Pedestrian Standing	4	Pedestrian Sitting	9	Pass
	Config F	4	Pedestrian Sitting	4	Pedestrian Sitting	7	Pass
18	Config A	6	Pedestrian Standing	5	Pedestrian Standing	11	Pass
	Config B	5	Pedestrian Standing	5	Pedestrian Standing	9	Pass
	Config C	4	Pedestrian Sitting	4	Pedestrian Sitting	7	Pass
	Config D	4	Pedestrian Sitting	4	Pedestrian Sitting	8	Pass
	Config E	4	Pedestrian Sitting	4	Pedestrian Sitting	7	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (m/s)	Rating	Speed (m/s)	Rating	Speed (m/s)	Rating
	Config F	4	Pedestrian Sitting	4	Pedestrian Sitting	8	Pass
19	Config A	5	Pedestrian Standing	4	Pedestrian Sitting	9	Pass
	Config B	5	Pedestrian Standing	4	Pedestrian Sitting	8	Pass
	Config C	5	Pedestrian Standing	4	Pedestrian Sitting	9	Pass
	Config D	5	Pedestrian Standing	4	Pedestrian Sitting	9	Pass
	Config E	4	Pedestrian Sitting	4	Pedestrian Sitting	8	Pass
	Config F	5	Pedestrian Standing	4	Pedestrian Sitting	8	Pass
20	Config A	4	Pedestrian Sitting	4	Pedestrian Sitting	7	Pass
	Config B	4	Pedestrian Sitting	4	Pedestrian Sitting	7	Pass
	Config C	5	Pedestrian Standing	4	Pedestrian Sitting	9	Pass
	Config D	5	Pedestrian Standing	4	Pedestrian Sitting	9	Pass
	Config E	4	Pedestrian Sitting	3	Pedestrian Sitting	8	Pass
	Config F	4	Pedestrian Sitting	4	Pedestrian Sitting	8	Pass
21	Config A	4	Pedestrian Sitting	4	Pedestrian Sitting	8	Pass
	Config B	4	Pedestrian Sitting	4	Pedestrian Sitting	7	Pass
	Config C	3	Pedestrian Sitting	3	Pedestrian Sitting	6	Pass
	Config D	3	Pedestrian Sitting	3	Pedestrian Sitting	6	Pass
	Config E	3	Pedestrian Sitting	3	Pedestrian Sitting	6	Pass
	Config F	3	Pedestrian Sitting	3	Pedestrian Sitting	6	Pass
22	Config A	6	Pedestrian Standing	4	Pedestrian Sitting	11	Pass
	Config B	5	Pedestrian Standing	4	Pedestrian Sitting	8	Pass
	Config C	3	Pedestrian Sitting	3	Pedestrian Sitting	7	Pass
	Config D	3	Pedestrian Sitting	3	Pedestrian Sitting	7	Pass
	Config E	5	Pedestrian Standing	4	Pedestrian Sitting	9	Pass
	Config F	4	Pedestrian Sitting	4	Pedestrian Sitting	8	Pass
23	Config A	3	Pedestrian Sitting	3	Pedestrian Sitting	5	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (m/s)	Rating	Speed (m/s)	Rating	Speed (m/s)	Rating
	Config B	3	Pedestrian Sitting	3	Pedestrian Sitting	5	Pass
	Config C	3	Pedestrian Sitting	3	Pedestrian Sitting	7	Pass
	Config D	3	Pedestrian Sitting	3	Pedestrian Sitting	7	Pass
	Config E	5	Pedestrian Standing	3	Pedestrian Sitting	9	Pass
	Config F	4	Pedestrian Sitting	3	Pedestrian Sitting	6	Pass
24	Config A	8	Pedestrian Walking	5	Pedestrian Standing	14	Pass
	Config B	6	Pedestrian Standing	5	Pedestrian Standing	11	Pass
	Config C	7	Pedestrian Walking	5	Pedestrian Standing	12	Pass
	Config D	6	Pedestrian Standing	4	Pedestrian Sitting	10	Pass
	Config E	6	Pedestrian Standing	4	Pedestrian Sitting	12	Pass
	Config F	5	Pedestrian Standing	4	Pedestrian Sitting	9	Pass
25	Config A	3	Pedestrian Sitting	3	Pedestrian Sitting	6	Pass
	Config B	3	Pedestrian Sitting	3	Pedestrian Sitting	5	Pass
	Config C	–	–	–	–	–	–
	Config D	–	–	–	–	–	–
	Config E	6	Pedestrian Standing	4	Pedestrian Sitting	11	Pass
	Config F	4	Pedestrian Sitting	3	Pedestrian Sitting	6	Pass
26	Config A	–	–	–	–	–	–
	Config B	–	–	–	–	–	–
	Config C	–	–	–	–	–	–
	Config D	–	–	–	–	–	–
	Config E	4	Pedestrian Sitting	3	Pedestrian Sitting	7	Pass
	Config F	3	Pedestrian Sitting	3	Pedestrian Sitting	5	Pass
27	Config A	4	Pedestrian Sitting	3	Pedestrian Sitting	7	Pass
	Config B	4	Pedestrian Sitting	3	Pedestrian Sitting	6	Pass
	Config C	–	–	–	–	–	–
	Config D	–	–	–	–	–	–

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (m/s)	Rating	Speed (m/s)	Rating	Speed (m/s)	Rating
	Config E	5	Pedestrian Standing	5	Pedestrian Standing	9	Pass
	Config F	4	Pedestrian Sitting	4	Pedestrian Sitting	9	Pass
28	Config A	6	Pedestrian Standing	4	Pedestrian Sitting	11	Pass
	Config B	4	Pedestrian Sitting	4	Pedestrian Sitting	8	Pass
	Config C	6	Pedestrian Standing	4	Pedestrian Sitting	10	Pass
	Config D	6	Pedestrian Standing	4	Pedestrian Sitting	11	Pass
	Config E	6	Pedestrian Standing	5	Pedestrian Standing	11	Pass
	Config F	7	Pedestrian Walking	5	Pedestrian Standing	12	Pass
29	Config A	6	Pedestrian Standing	5	Pedestrian Standing	11	Pass
	Config B	8	Pedestrian Walking	5	Pedestrian Standing	13	Pass
	Config C	6	Pedestrian Standing	4	Pedestrian Sitting	10	Pass
	Config D	6	Pedestrian Standing	4	Pedestrian Sitting	10	Pass
	Config E	6	Pedestrian Standing	4	Pedestrian Sitting	10	Pass
	Config F	6	Pedestrian Standing	4	Pedestrian Sitting	11	Pass
30	Config A	4	Pedestrian Sitting	3	Pedestrian Sitting	7	Pass
	Config B	4	Pedestrian Sitting	4	Pedestrian Sitting	7	Pass
	Config C	4	Pedestrian Sitting	4	Pedestrian Sitting	8	Pass
	Config D	4	Pedestrian Sitting	4	Pedestrian Sitting	8	Pass
	Config E	4	Pedestrian Sitting	4	Pedestrian Sitting	8	Pass
	Config F	4	Pedestrian Sitting	4	Pedestrian Sitting	8	Pass
31	Config A	5	Pedestrian Standing	4	Pedestrian Sitting	9	Pass
	Config B	4	Pedestrian Sitting	4	Pedestrian Sitting	7	Pass
	Config C	5	Pedestrian Standing	5	Pedestrian Standing	10	Pass
	Config D	5	Pedestrian Standing	5	Pedestrian Standing	10	Pass
	Config E	4	Pedestrian Sitting	5	Pedestrian Standing	10	Pass
	Config F	4	Pedestrian Sitting	5	Pedestrian Standing	10	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (m/s)	Rating	Speed (m/s)	Rating	Speed (m/s)	Rating
32	Config A	5	Pedestrian Standing	4	Pedestrian Sitting	9	Pass
	Config B	5	Pedestrian Standing	4	Pedestrian Sitting	8	Pass
	Config C	5	Pedestrian Standing	4	Pedestrian Sitting	10	Pass
	Config D	5	Pedestrian Standing	4	Pedestrian Sitting	9	Pass
	Config E	5	Pedestrian Standing	4	Pedestrian Sitting	8	Pass
	Config F	5	Pedestrian Standing	4	Pedestrian Sitting	8	Pass
33	Config A	6	Pedestrian Standing	5	Pedestrian Standing	11	Pass
	Config B	7	Pedestrian Walking	5	Pedestrian Standing	13	Pass
	Config C	5	Pedestrian Standing	5	Pedestrian Standing	9	Pass
	Config D	7	Pedestrian Walking	5	Pedestrian Standing	11	Pass
	Config E	5	Pedestrian Standing	5	Pedestrian Standing	10	Pass
	Config F	7	Pedestrian Walking	5	Pedestrian Standing	12	Pass
34	Config A	7	Pedestrian Walking	5	Pedestrian Standing	13	Pass
	Config B	6	Pedestrian Standing	5	Pedestrian Standing	11	Pass
	Config C	8	Pedestrian Walking	6	Pedestrian Standing	14	Pass
	Config D	8	Pedestrian Walking	6	Pedestrian Standing	14	Pass
	Config E	8	Pedestrian Walking	6	Pedestrian Standing	14	Pass
	Config F	8	Pedestrian Walking	6	Pedestrian Standing	14	Pass
35	Config A	5	Pedestrian Standing	4	Pedestrian Sitting	9	Pass
	Config B	4	Pedestrian Sitting	4	Pedestrian Sitting	8	Pass
	Config C	4	Pedestrian Sitting	4	Pedestrian Sitting	7	Pass
	Config D	4	Pedestrian Sitting	4	Pedestrian Sitting	7	Pass
	Config E	4	Pedestrian Sitting	4	Pedestrian Sitting	7	Pass
	Config F	4	Pedestrian Sitting	4	Pedestrian Sitting	7	Pass
36	Config A	-	-	-	-	-	-
	Config B	-	-	-	-	-	-
	Config C	-	-	-	-	-	-

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (m/s)	Rating	Speed (m/s)	Rating	Speed (m/s)	Rating
	Config D	–	–	–	–	–	–
	Config E	4	Pedestrian Sitting	4	Pedestrian Sitting	9	Pass
	Config F	4	Pedestrian Sitting	4	Pedestrian Sitting	9	Pass
37	Config A	–	–	–	–	–	–
	Config B	–	–	–	–	–	–
	Config C	–	–	–	–	–	–
	Config D	–	–	–	–	–	–
	Config E	5	Pedestrian Standing	5	Pedestrian Standing	10	Pass
	Config F	5	Pedestrian Standing	5	Pedestrian Standing	10	Pass
38	Config A	–	–	–	–	–	–
	Config B	–	–	–	–	–	–
	Config C	–	–	–	–	–	–
	Config D	–	–	–	–	–	–
	Config E	4	Pedestrian Sitting	3	Pedestrian Sitting	7	Pass
	Config F	4	Pedestrian Sitting	3	Pedestrian Sitting	7	Pass
39	Config A	–	–	–	–	–	–
	Config B	–	–	–	–	–	–
	Config C	–	–	–	–	–	–
	Config D	–	–	–	–	–	–
	Config E	5	Pedestrian Standing	4	Pedestrian Sitting	10	Pass
	Config F	5	Pedestrian Standing	4	Pedestrian Sitting	10	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (m/s)	Rating	Speed (m/s)	Rating	Speed (m/s)	Rating
Seasons		Hours		Comfort Speed (m/s)		Safety Speed (m/s)	
Summer	November - April	0:00 to 23:00		(5% Seasonal Exceedance)		(0.022% Annual Exceedance)	
Winter	May - October	0:00 to 23:00		< 2 Outdoor Dining		≤ 15 Pass	
Annual	January - December	0:00 to 23:00 (for safety)		2 - 4 Pedestrian Sitting		≥ 15 Able-Bodied	
				4 - 6 Pedestrian Standing		> 20 Exceeded	
				6 - 8 Pedestrian Walking			
				8 - 10 Business Walking			
				> 10 Uncomfortable			
Configurations							
Config A	Current Existing site and Existing Surroundings						
Config B	Current Existing Site and 201 Elizabeth Street Stage 1 DA Massing Envelope						
Config C	Stage 1 Massing Envelope and E Existing Surroundings						
Config D	Stage 1 Masing Envelope and 201 Elizabeth Street Stage 1 DA Massing Envelope						
Config E	Detailed Design of Development and Existing Surroundings						
Config F	Detailed Design of Development and 201 Elizabeth Street Stage 1 DA Massing Envelope						