PEDESTRIAN WIND ENVIRONMENT STATEMENT

52 ALFRED STREET, MILSONS POINT

WD035-04F02(REV0)- WS REPORT

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Prepared for:

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EXECUTIVE SUMMARY

This report presents an opinion on the likely impact of the proposed development located at 52 Alfred Street, Milsons Point on the local wind environment at the critical outdoor areas within and around the subject site. The effect of wind activity has been examined for the three predominant wind directions for the region, namely the north-easterly, southerly, and westerly winds. The analysis of the wind effects relating to the proposed development have been carried out in the context of the surrounding buildings, local wind climate, building morphology and land topography.

The conclusions of this report are drawn from our extensive experience in this field and are based on an examination of the latest architectural drawings received 24 July 2020 by Koichi Takada Architects. No wind tunnel testing has been undertaken for the subject development, and hence this report addresses only the general wind effects and any localised effects that are identifiable by visual inspection. Any recommendations in this report are made only in-principle and are based on our extensive experience in the study of wind environment effects.

The results of this assessment indicate that adverse wind conditions are expected in some of the outdoor trafficable areas of the subject development. The presence of nearby buildings provides some benefits in shielding the development from the predominant southerly and north-easterly winds. However, the pedestrian footpath areas along Alfred Street and Glen Street are exposed to the predominant southerly and north-easterly winds.

Furthermore, due to the east-west and north-south aligned through site links, these areas may be potentially be affected by the prevailing winds that funnel through. There is the also the potential for pressure driven wind entry issues due to the north-easterly winds along the thoroughfare between the retail tenancies areas due to the entry/exit located on opposite aspects of the building. The westerly winds have the potential to down wash off the western building façade, and funnel through the through site links.

The outdoor private balconies and terraces areas on Levels 12 to Level 16 are susceptible the prevailing winds, potentially resulting in adverse wind conditions. The communal open areas on the ground floor and Level 15 are potentially exposed to prevailing north-easterly, westerly, and southerly winds due to limited shielding from surrounding buildings and orientation with respect to the prevailing winds.

The following treatments are recommended to mitigate these potential wind effects:

Pedestrian Footpaths and Through-Site Links:

- Retention of proposed tree planting along Alfred Street. These trees should be of a densely foliating evergreen species to ensure year-round wind mitigation, and capable of growing to a height of 3-5m with a minimum of a 4m wide canopy.

- Continuous 2-3m wide awning on eastern and southern aspects over Ground Level trafficable areas.
- Sloped 2-3m wide canopy over the stairs.
- Full height screen (25-30% porous) at western end of retail area near the top of the stairs.
- 1.2–1.5m high localised operable screens for any seating areas.
- Sliding doors on eastern aspect entry.
- Baffle screen at the northern and southern entries of the Public Walkway.

Common Open Space on Ground Floor:

- Hedge planting along the perimeter of the terrace, located on the western aspect of the development. For the proposed landscaping to be effective at ensuring comfortable wind conditions, the shrubs should be of a densely foliating evergreen species capable of growing to height of at least 1.0-1.5m above a 1m high planter box.
- Canopy over the Common Open Space with a depth of at least 2-3m.
- 2-3m high impermeable screen along the southern aspect of the Common Open Space.

Private Open Balconies and Terraces on Levels 12-16:

- Impermeable balustrades for all private balconies and terraces
- 2m to full height impermeable inter-tenancy screens for all private balconies and terraces.
- 2m to full height impermeable end screens on the western and southern aspects for the south-western corner balconies for C1 on Levels 13 and 14.
- 2m to full height impermeable end screen for the south-eastern corner balcony on Level 13.
- 2-3m high screens on the eastern and southern aspects for the south-eastern corner balcony on Level 14.
- 2-3m high screen on the western aspect of the southern balcony on Level 14.
- 2-3m high screens on the northern and southern aspects of the eastern private terrace on Level 16.
- 2-3m high screen on the southern aspect of the south-western private terrace on Level 16.

Communal Terrace on Level 15:

- 2-3m high perimeter screening in the form of glazing or planter boxes with vegetation.

CONTENTS

1 INTRODUCTION

An opinion on the likely impact of the proposed design on the local wind environment affecting pedestrians within the critical outdoor areas within and around the subject development is presented in this report. The analysis of wind effects relating to the proposed development has been carried out in the context of the predominant wind directions for the region, building morphology of the development and nearby buildings, and local land topography. The conclusions of this report are drawn from our extensive experience in the field of wind engineering and studies of wind environment effects.

No wind tunnel testing has been undertaken for this assessment. Hence this report addresses only the general wind effects and any localised effects that are identifiable by visual inspection, and any recommendations in this report are made only in-principle.

2 DESCRIPTION OF THE DEVELOPMENT AND SURROUNDINGS

The site is located at 52 Alfred Street, Milsons Point and is bounded by Alfred Street to the east and Glen Street to the west. The site is predominantly bounded by low to mid rise commercial/residential buildings to the north and south in the immediate vicinity. Directly east of the site lies Bradfield Park Bowling Green, Milsons Point Railway Station and low rise buildings. To the west of the site lies low rise buildings followed by Lavender Bay. Further from the site lies North Sydney CBD and residential areas to the north, east and west, as well as Darling Harbour and Sydney CBD to the south. The existing site consists of a building with an approximately the same height and size as the proposed development.

A survey of the local land topography indicates an uphill rise across the site towards the north along Alfred Street. Along Glen Street the land topography slopes down from the south towards the site, and then slopes up with a large gradient to the north after the site. An aerial image of the site and the surroundings is shown in Figure 1.

An aerial image of the subject site and the local surroundings is shown in Figure 1a. A wider view image of the position of the site is illustrated in Figure 1b.

The critical trafficable areas associated with the proposed development, which are the focus of this assessment with regards to wind effects, are detailed as follows:

- Pedestrian footpaths along Alfred Street and Glen Street, east-west through-site links up from Basement 3 to Ground Floor, and north-south Public Walkway on Ground Floor.
- Common Open Space on Ground floor
- Private open balconies on Levels 12-16
- Communal Terrace on Level 15

Figure 1a: Aerial Image of the Site Location

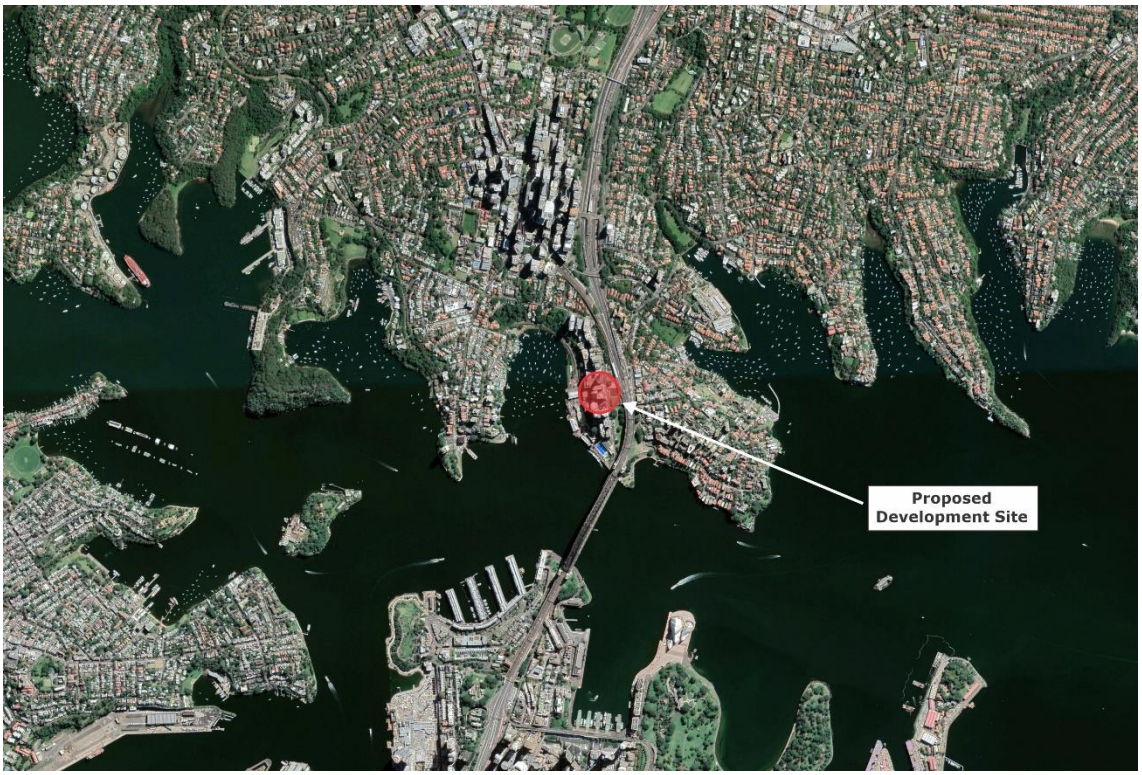

Figure 1b: Wider View Aerial Image of the Site Location

3 REGIONAL WIND

The region is governed by three principal wind directions, and these can potentially affect the subject development. These winds prevail from the north-east, south, and west. These wind directions were determined from an analysis undertaken by Windtech Consultants of recorded directional wind speeds obtained at the meteorological station located at Kingsford Smith Airport by the Bureau of Meteorology. The data has been collected from this station from 1995 to 2016 and corrected so that it represents winds over standard open terrain at a height of 10m above ground level. Figure Figure shows a summary of this analysis in the form of a directional plot of the annual and 5% exceedance mean winds for the region. The frequency of occurrence of these winds is also shown in Figure Figure .

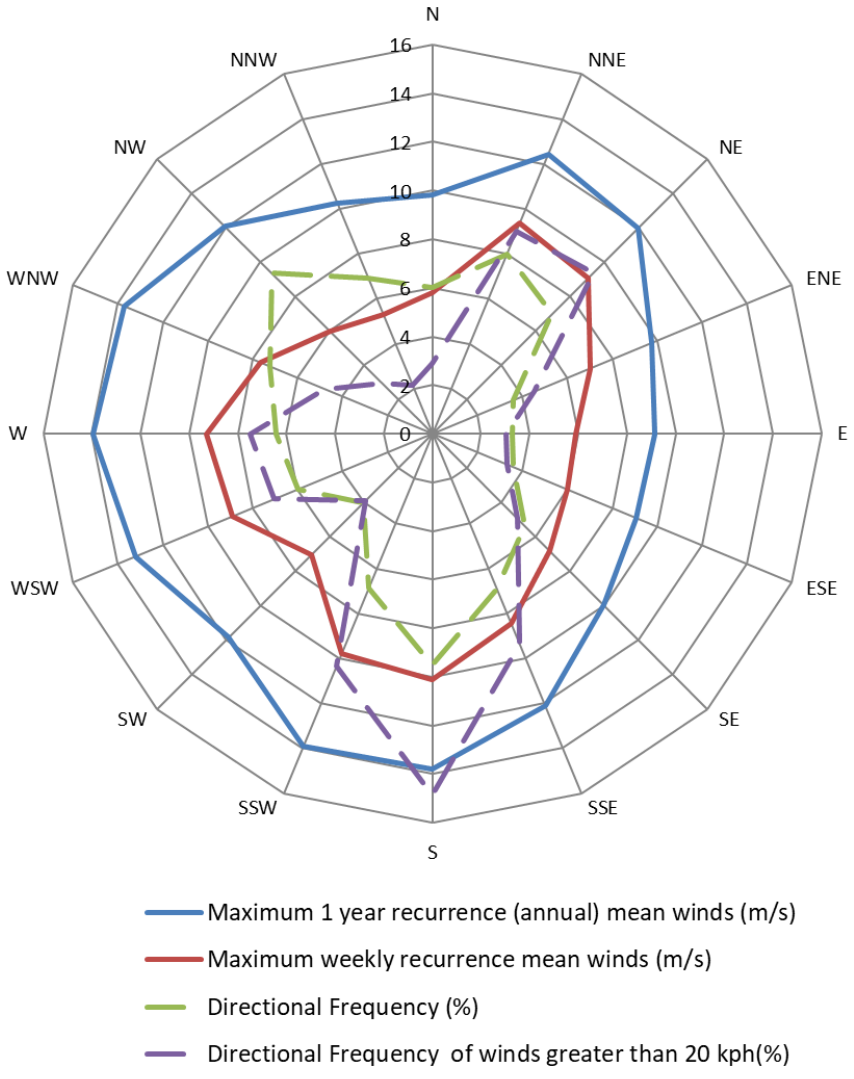

Figure 2: Annual and Weekly Recurrence Mean Wind Speeds, and Frequencies of Occurrence, for the Region (based on observations from the Kingsford Smith Airport meteorological station from 1995 to 2016, corrected to open terrain at 10m)

4 WIND EFFECTS ON PEOPLE

The acceptability of wind in any area is dependent upon its use. For example, people walking or window-shopping will tolerate higher wind speeds than those seated at an outdoor restaurant. Various other researchers, such as A.G. Davenport, T.V. Lawson, W.H. Melbourne, and A.D. Penwarden, have published criteria for pedestrian comfort for pedestrians in outdoor spaces for various types of activities. Some Councils and Local Government Authorities have adopted elements of some of these into their planning control requirements.

For example, A.D. Penwarden (1973) developed a modified version of the Beaufort scale which describes the effects of various wind intensities on people. Table 1 presents the modified Beaufort scale. Note that the effects listed in this table refers to wind conditions occurring frequently over the averaging time (a probability of occurrence exceeding 5%). Higher ranges of wind speeds can be tolerated for rarer events.

Table 1: Summary of Wind Effects on People (A.D. Penwarden, 1973)

Type of Winds	Beaufort Number	Mean Wind Speed (m/s)	Effects
Calm	0	Less than 0.3	Negligible.
Calm, light air	1	0.3 – 1.6	No noticeable wind.
Light breeze	2	1.6 – 3.4	Wind felt on face.
Gentle breeze	3	3.4 – 5.5	Hair is disturbed, clothing flaps, newspapers difficult to read.
Moderate breeze	4	5.5 – 8.0	Raises dust, dry soil and loose paper, hair disarranged.
Fresh breeze	5	8.0 – 10.8	Force of wind felt on body, danger of stumbling
Strong breeze	6	10.8 – 13.9	Umbrellas used with difficulty, hair blown straight, difficult to walk steadily, wind noise on ears unpleasant.
Near gale	7	13.9 – 17.2	Inconvenience felt when walking.
Gale	8	17.2 – 20.8	Generally impedes progress, difficulty balancing in gusts.
Strong gale	9	Greater than 20.8	People blown over.

It should be noted that wind speeds can only be accurately quantified with a wind tunnel study. This assessment addresses only the general wind effects and any localised effects that are identifiable by visual inspection and the acceptability of the conditions for outdoor areas are determined based on their intended use. Any recommendations in this report are made only in-principle and are based on our extensive experience in the study of wind environment effects.

5 RESULTS AND DISCUSSION

The expected wind conditions are discussed in the following sub-sections of this report for the various outdoor areas within and around the subject development. The interaction between the wind and the building morphology in the area is considered and important features taken into account including the distances between the surrounding buildings and the proposed building form, as well as the surrounding landform. Note that only the potentially critical wind effects are discussed in this report.

The recommended criterion for wind conditions for circulation areas is 7.5m/s with a 5% probability of exceedance, whereas short duration stationary activities (e.g. main entrances, cafés, communal terraces etc) will need to satisfy a more stringent comfort criterion of 5.5m/s with a 5% probability of exceedance. Although this assessment is of a qualitative nature, the abovementioned criteria are considered when assessing the wind environment impacts.

5.1 Pedestrian Footpaths and Through-Site Links

The pedestrian footpaths along Alfred Street are shielded from the prevailing westerly winds by the development itself. The development and surrounding buildings also provide some shielding from the north-easterly prevailing winds for Glen Street.

However, the areas located along the eastern aspect of the site is exposed to the direct north-easterly and southerly winds. Due to the limited shielding for this area from the north-easterly winds, there is the potential for these winds to accelerate around the south-eastern corner of the subject development and continue westward to funnel along the through site link. Similarly, the predominant southerly winds have the potential to travel along Alfred Street and side-stream across the trafficable areas along the eastern aspect. The pedestrian trafficable areas along Glen Street on the western aspect are expected to be directly impacted by the westerly and southerly prevailing winds, and they may increase in speed uphill due to the overall site topography.

It is noted that the existing development is of a similar massing to that of the proposed development, and therefore wind conditions can expected to be comparable to the existing wind conditions for a given similar design (e.g. building awning, tower setback, corner chamfer etc.), and similar use of the space (e.g. main entries, shopfronts, waiting areas, seating areas etc.).

Due to the east-west alignment of the through site link on the southern aspect, the southern retail areas may be potentially exposed to the direct westerly winds. The westerly winds have the potential to funnel between the subject development and the southern neighbouring building resulting in adverse wind conditions. Similarly, the westerly winds have the potential to down wash off the western building façade and funnel down towards the through site link.

It is recommended to retain the proposed tree planting along Alfred Street, as indicated in Figure 3a. Note that for the proposed tree planting to be effective at ensuring comfortable wind conditions for pedestrians, the trees should be of a dense evergreen species to ensure year-round wind mitigation, and capable of growing to a height of 3-5m with a minimum of a 4m wide canopy. An impermeable continuous awning over the Ground Floor pedestrian trafficable areas along the eastern and southern aspects of the development, as indicated in Figure 3a, can help ameliorate the north-easterly winds and westerly winds down-washing off the subject development and causing adverse wind conditions. The awning should continue sloping down the western stairway.

It is recommended to include a full height porous screen (25-30% porosity) at the western end of the retail area near the top of the stairs, such that it meets the awning above, as indicated in Figure 3a. Furthermore, it is recommended that localised operator-controlled screening 1.2-1.5m high be included along the areas where short duration stay is expected, which can be implemented in the case of uncomfortable wind conditions.

The thoroughfare between the retail tenancy areas may be potentially exposed to adverse wind entry issues due to the entry/exit located on two different aspects of the building, which will result in a pressure driven flow. The north-easterly winds have the potential to induce pressure driven flow through Core 1 and out into the Public Walkway. Sliding doors could be installed at the entry/exit to reduce this effect. Similarly, the operability of the sliding doors if exposed to strong pressures should be considered.

The Public Walkway aligned north-south through the site at Ground Floor is expected to funnel the winds through this area. This is due to the alignment of the walkway with respect to the prevailing northerly and southerly winds. It is recommended that baffle screens be incorporated at the northern and southern ends of this walkway to reduce the funnelling impact.

5.2 Common Open Space on Ground Floor

The Ground level Common Open Space located on the western aspect is potentially exposed to westerly winds down-washing off the western façade of the development. It is recommended to include a canopy over the Common Open Space with a depth of at least 2-3m along the western aspect to prevent the predominant westerly winds down washing. A 2-3m high impermeable screen is recommended along the southern aspect. It is also recommended to include the hedge planting along the perimeter of the terrace, as shown in Figure 3a. It should be noted that for the proposed landscaping to be effective at ensuring comfortable wind conditions, the shrubs should be of a densely foliating evergreen species capable of growing to a height of at least 1.0 to 1.5m above a 1.0m high planter box.

5.3 Private Open Balconies and Terraces on Levels 12-16

The private balcony on Level 12 is expected to be suitable for its intended use with impermeable balustrades, as it is recessed into the building form, shielded by the development itself from the north-easterly and westerly prevailing winds. The surrounding buildings to the south provide some direct shielding.

The private balconies and terraces on Levels 13-16 between C1 and C2 are expected to be impacted by the southerly and westerly winds funnelling in between the two building forms. The balconies on the southern aspect are exposed to direct southerly winds and the eastern facing balconies are exposed to the north-easterly prevailing winds. Furthermore, the south-eastern corner balcony/terrace on Levels 14 and 16 are exposed to the southerly and north-easterly winds accelerating around the corner.

It is recommended that the following treatments are implemented for the private balconies and terraces, also shown in Figures 3b to 3f:

- Impermeable balustrades for all private balconies and terraces
- 2m to full height impermeable inter-tenancy screens for all private balconies and terraces.
- 2m to full height impermeable end screens on the western and southern aspects for the south-western corner balconies for C1 on Levels 13 and 14.
- 2m to full height impermeable end screen for the south-eastern corner balcony on Level 13.
- 2-3m high screens on the eastern and southern aspects for the south-eastern corner balcony on Level 14.
- 2-3m high screen on the western aspect of the southern balcony on Level 14.
- 2-3m high screens on the northern and southern aspects of the eastern private terrace on Level 16.
- 2-3m high screen on the southern aspect of the south-western private terrace on Level 16.

With the inclusion of these treatments, it is expected that wind conditions for all the private balconies and terraces will be suitable for their intended uses.

5.4 Communal Terrace on Level 15

The Communal Terrace on Level 15 is exposed to direct winds from the north-easterly and southerly prevailing directions. This is despite some shielding offered by the tall buildings further to the south of the site. The high intertenancy screens on the northern and western

aspects of the terrace are expected to improve conditions within this space. However, due to the communal use of the area, 2-3m high perimeter screening or vegetation is recommended be implemented on the eastern aspect and can be extended around to the southern aspect for further direct wind mitigation to improve the conditions for the occupants, as shown in Figure 3e. Wind tunnel testing can be undertaken to optimise the size and extent of these recommended treatments.

Figure 3a: Suggested Treatment Strategy – Ground Level Plan

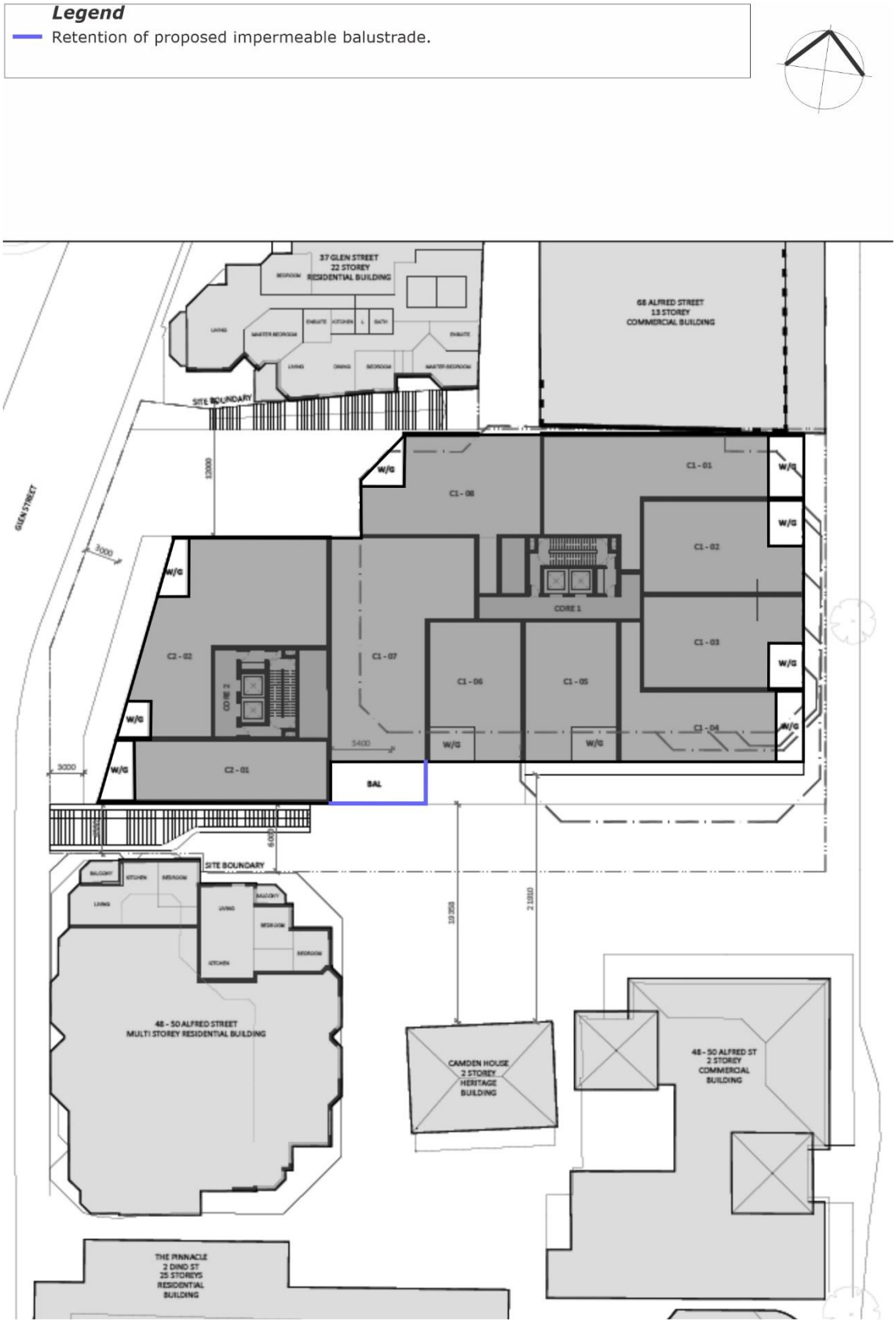

Figure 3b: Suggested Treatment Strategy – Level 12 Plan

Figure 3c: Suggested Treatment Strategy – Level 13 Plan

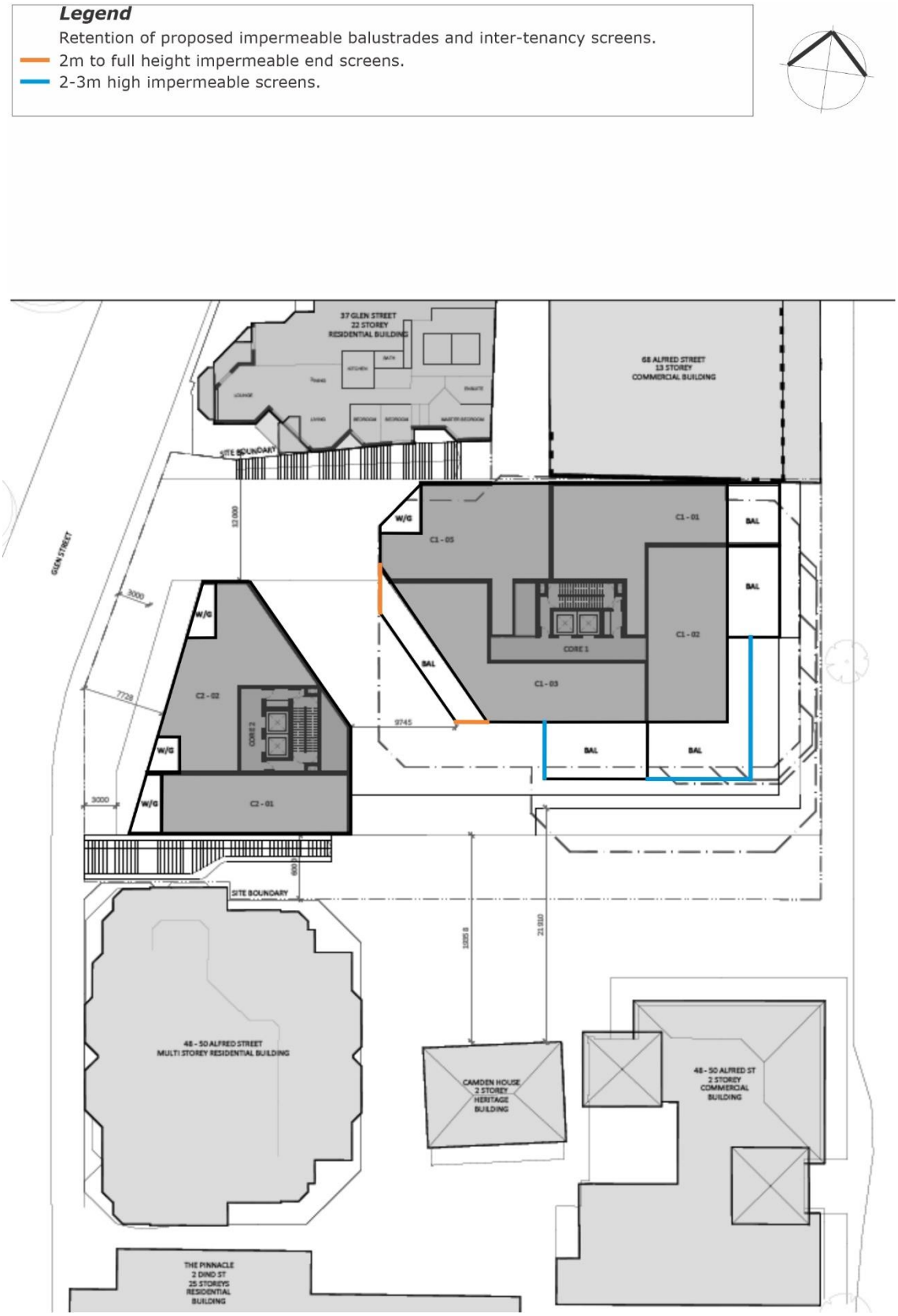

Figure 3d: Suggested Treatment Strategy – Level 14 Plan

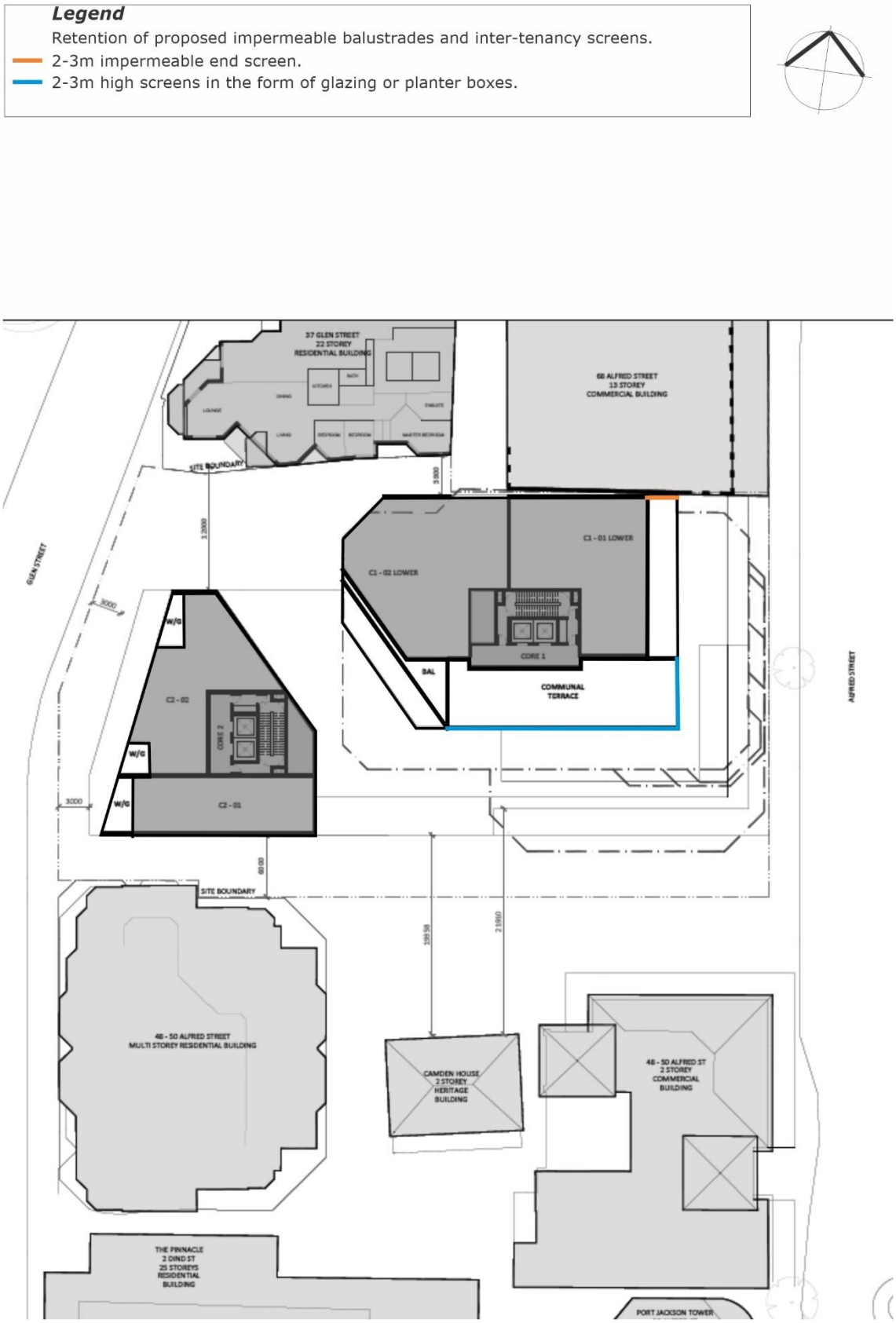

Figure 3e: Suggested Treatment Strategy – Level 15 Plan

Legend

Retention of proposed impermeable balustrades and inter-tenancy screens.

2-3m high screens.

Figure 3f: Suggested Treatment Strategy – Level 16 Plan

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