



Opus Research Report 16-529H23.00

Wind Assessment: 114 Adelaide Road, Wellington



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1 Introduction

This wind assessment report describes the expected effects of a proposed development for 114 Adelaide Road, in central Wellington, on wind conditions likely to be experienced by pedestrians in its immediate vicinity. It was prepared at the request of Stephen White of Design Club Architecture, on behalf of IPG Corporation Ltd. The assessment report is intended to address the reporting requirements of the Wellington City Council District Plan for wind effects.

Our assessment of the expected wind effects of the proposed development is based on our wide experience of assessing wind conditions in Wellington. This review was carried out to determine the existing wind speed levels, and assess the likely levels of wind speed changes. No wind tunnel testing has been performed on the proposal for this assessment. A visit to the site was made on Monday 21st November, during a period of light to moderate northerly winds. Plans of the proposed development provided by Design Club Architecture were used for this assessment.

2 The Site, the Area and the Proposed Development

The development site is located on the southwest corner of the intersection of Adelaide Road and Drummond Street, in the southern part of central Wellington. The site is approximately square and relatively flat, but the terrain is beginning to slope up towards the west. Figure 1 shows an aerial view of the area, which includes the outline of the development site, and the directions of the prevailing winds. The northern two-thirds of the site is currently occupied by a two-storey building with a heritage rated facade, while the southern third is occupied by a single-storey building. Figure 2 shows views of the existing situation.

Most of the buildings lining the western side of Adelaide Road are low-rise to medium-rise commercial or industrial blocks, ranging from one to several storeys in height. Immediately to the west of the site of interest there is a transition to low to medium-rise residential apartments and houses. The comparatively wide expanse of Adelaide Road and the open spaces in front of the buildings on the eastern side of the road create a large open north-south link through this area of the city. This particular area of Wellington has seen relatively little redevelopment in recent years, and has relatively low numbers of pedestrians, both on Adelaide Road and Drummond Street. However, it is important to realise that Wellington City Council is trying to encourage development in this area.

The proposed development is a seven-storey building around 21m high, which retains the existing heritage façade, albeit with a restored ~1.2m high parapet. On the ground floor there is space for a café, as well as vehicle access and services, with apartments on the levels above. The ground floor and the two floors above sit behind the heritage façade and restored parapet. Above this the remaining four floors are set back from the Adelaide Road and Drummond Street boundaries by 2m

or more, apart from at the southeast corner, where the facade comes out to the street, immediately above the loading area below. Figure 3 shows perspective views of the proposed development.

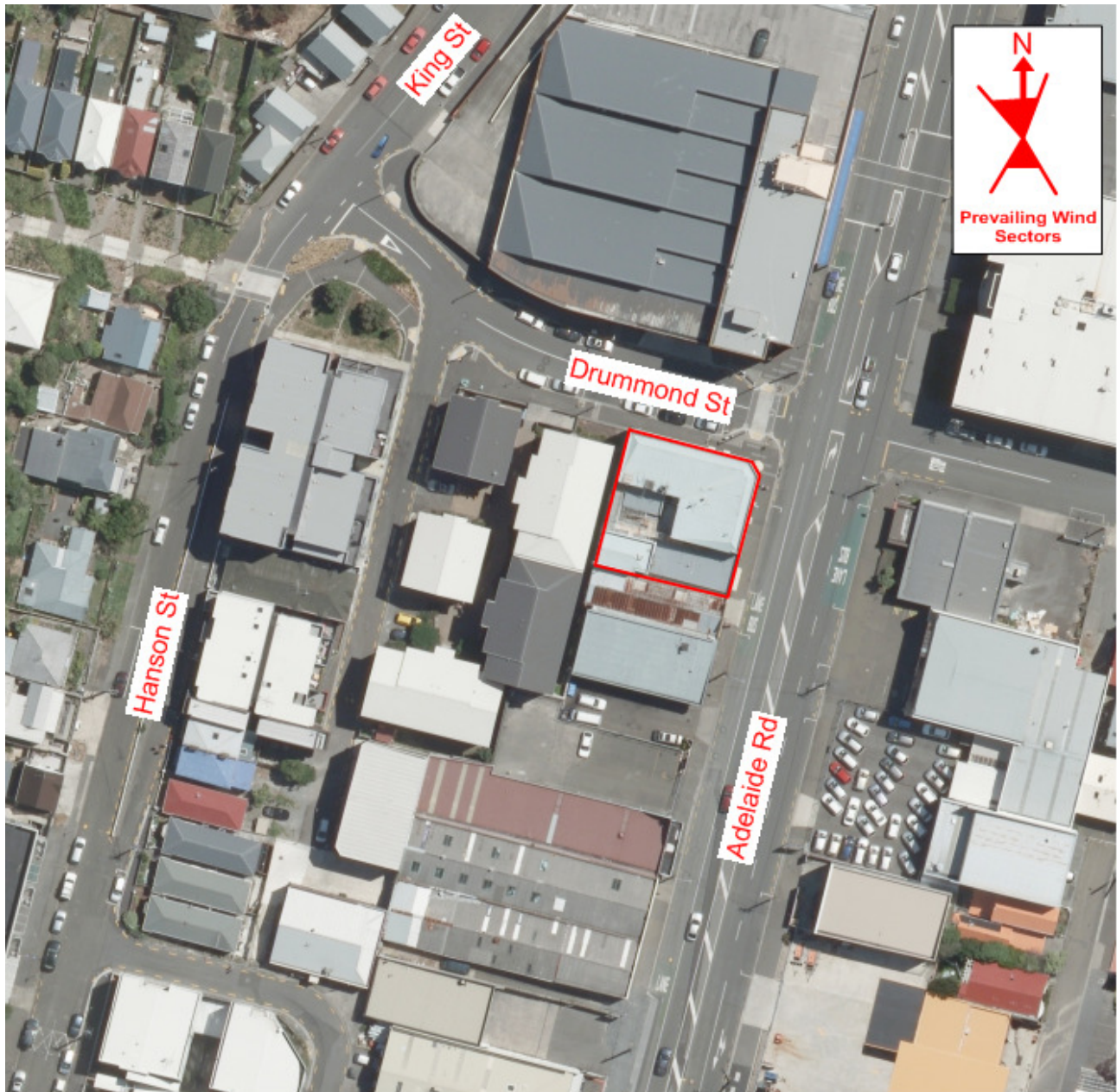


Figure 1. Aerial view of the site (outlined in red) and surrounding area (LINZ, 2016) (also shows the prevailing directions for strong winds)

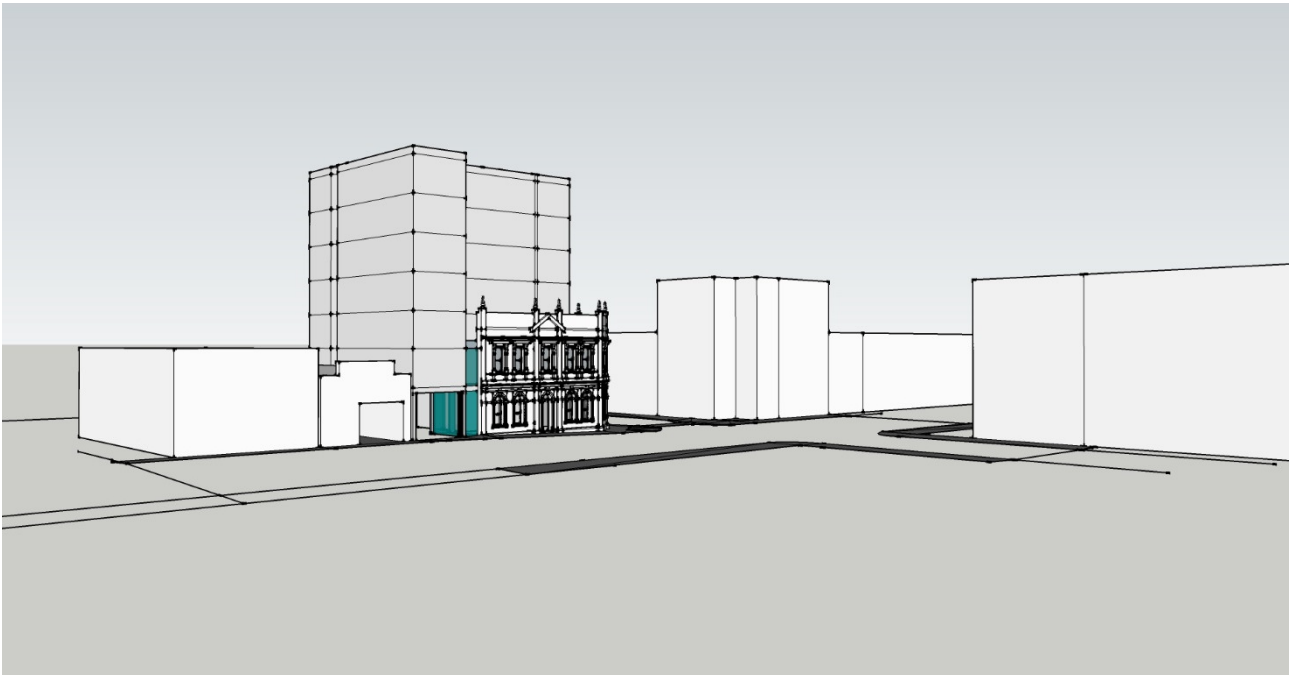


(a) Looking southwest

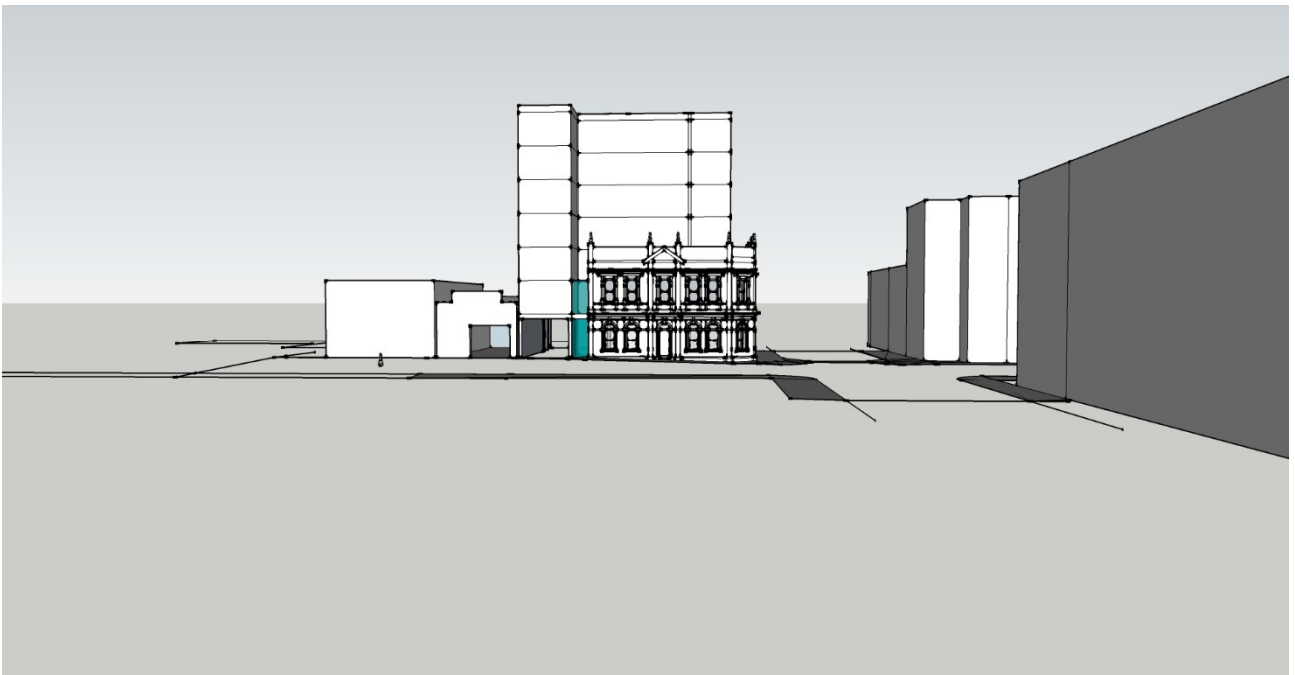


(b) Looking southeast

Figure 2. Views of the existing situation



(a) Looking northwest from Adelaide Road



(b) Looking west from Adelaide Road

Figure 3. Perspective views of the proposed development

3 Wellington City District Plan

3.1 Suburban Area – Centres (Wind)

This wind assessment has been prepared in accordance with the objectives and policies contained in the Chapter 6 (Suburban Area – Centres: Introduction, Objectives and Policies) of the Wellington District Plan. The relevant policies are presented in the excerpt from the District Plan shown below. However, it should be noted that there are no specific rules or standards relating to wind effects in Chapter 7 (Suburban Area – Centres Rules and Centres Standards).

Wind

- 6.2.3.10 **Ensure that new buildings higher than three storeys are designed to avoid, remedy or mitigate any wind problems that they create and where existing wind conditions are dangerous, ensure new development improves the wind environment as far as reasonably practical.**
- 6.2.3.11 **Ensure that the cumulative effect of new buildings and building additions or alterations higher than three storeys do not progressively degrade the pedestrian wind environment.**
- 6.2.3.12 **Encourage the use of wind mitigation measures for buildings higher than three storeys during the early stages of building design and ensure that such measures are contained within the development site.**

Accordingly, the requirement in the District Plan to consider wind effects in this part of Wellington is triggered when the height of a proposed development exceeds three storeys, which can be assumed to be around 12m. One interpretation of these policies is that the effects of a building of less than 12m in height is deemed to be acceptable. The following assessment compares the effects of the proposed development to the existing situation and also to the effects expected for a building three storeys (~12m) in height. It also considers the design of the building with reference to Wellington City Council's Design Guide for Wind (2000). This design guide outlines in non-scientific terms the basics of wind effects caused by buildings and shows how particular relationships can cause or alleviate problems.

3.2 Suburban Area – Centres (Height Limits)

The height limits specified for this area of Wellington are contained in the Centres Appendices of Chapter 7 in the District Plan. The map for this area shows that the height limit for the strip along the west side of Adelaide Road that includes the development site is 18m, while that for the area to the immediate west is 12m.

4 Existing Wind Conditions

Over Wellington City the prevailing strong winds are dominated by north to north-westerly and south to south-westerly wind flows. Their alignment, relative to the development site, is shown in Figure 1. Northerly winds usually occur more frequently than southerly winds for light to moderate winds. However, the maximum wind speeds occur with around the same frequency for both direction sectors. Strong winds from the south are often noticed more by pedestrians because they are often also cold and frequently accompanied by rain.

In this part of Wellington the local wind environment is largely determined by four factors, these being; (1) the orientation of the streets to the prevailing wind directions, (2) the sizes, locations and heights of the buildings, (3) the sizes and locations of open spaces, and (4) the local topography. Strong horizontal wind flows currently occur along Adelaide Road in both northerly and southerly winds, given its alignment relative to the prevailing wind directions, and the degree of channelling that occurs due to the buildings along either side. At the street intersections there can also be significant contributions from the side streets, depending on their orientation to the prevailing wind directions. This can make these intersections some of the windier locations in this part of the city.

In assessing the wind effects of buildings in urban areas, where specific data from wind tunnel studies is unavailable, as is the case here, we recommend the use of the wind speed descriptions as listed in Table 1. Gust wind speeds in the area around the development site are currently typically in the range we would describe as low to high, with the lower speeds mainly occurring in localised sheltered areas immediately downwind of buildings. There are some areas, mainly along Adelaide Road itself, where gust wind speeds at times are likely to approach or exceed the Safety Criteria threshold of 20m/s specified in the Wellington District Plan.

Table 1: Wind Speed Range Descriptions

Gust Wind Speed Range	Description
11m/s and below	very low
12 - 14m/s	low
15 - 17m/s	moderate
18 - 20m/s	moderately high
21 - 23m/s	high
24 - 26m/s	very high
27m/s and above	extremely high

5 Effects of the Proposed Development on Wind Conditions

5.1 General

New buildings, or even changes and additions to an existing building, can have a significant impact on pedestrian wind conditions in the surrounding areas. By occupying space they force wind that previously flowed through these spaces to take other paths. Wind flows can be deflected down from higher levels into adjacent areas, or channelled through gaps between buildings, or accelerated

around corners. Some of the highest wind speeds occur where these vertical and horizontal wind flows combine, most often around the windward corners and sides of a building. However, new buildings or additions will not always cause wind speeds to increase significantly. New buildings can often provide increased shelter to some areas, typically those immediately downwind. They can also potentially deflect wind flows away from pedestrian areas, either into lesser used areas, or well above ground level. Accordingly, new building developments can cause wind speeds to increase in some areas, and to decrease in other areas.

5.2 Northerly Winds

With a height of around 21m, the proposed development is considerably taller than the existing building. It also sits on a corner site, thereby having two street frontages. Accordingly, it is somewhat exposed to northerly wind flows, but it does receive a moderate amount of shelter from a combination of the upstream buildings and the rising topography to the west. The setback of the façade from Drummond Street should also help redirect some of the vertical wind flows that will be deflected down the windward face of the new building. However, the greater height and bulk of the new building, and the inability to incorporate a canopy because of heritage restrictions, will result in increased wind flows in some localised pedestrian areas adjacent to the site. Wind speeds in small areas of Drummond Street, near the intersection with Adelaide Rd, are expected to increase by around 2m/s or 3m/s. The resulting wind speeds at some locations are expected to be “high”, as described in Table 1. The effects may extend a short distance out into Adelaide Road.

5.3 Southerly Winds

In southerly winds the proposed development will receive some shelter from the neighbouring buildings. These will act as a podium for the new building, and will help to prevent some of its effects from impacting on the surrounding pedestrian areas. However, given its 21m height, a large part of the south end of the new building is exposed to direct wind flows. Some of the wind flow striking the building will be deflected down the south face of the building, around the windward corners, and into the adjacent pedestrian spaces, mainly for the more southwesterly wind directions. Wind speed increases of around 2m/s and 3m/s are expected in Adelaide Road adjacent to the new building. The area of Drummond Street immediately downwind of the site, including the northwest corner of its intersection with Adelaide Road, should become less windy overall because of the increased shelter afforded by the taller and broader new building.

5.4 Overall Assessment – Current Design

The design of the proposed development does incorporate setbacks on both street frontages that will help mitigate its effects on the local wind environment, primarily in northerly winds. Wind conditions would be further mitigated through the inclusion of a canopy along both street frontages, but the heritage listing of the building façade precludes this.

Compared to the existing situation, the net effect of the proposed development on wind conditions in the surrounding pedestrian areas is expected to be a localised deterioration in the local wind environment. This is mostly due to the size and height of the development compared to its immediate neighbours. Compared to the effects expected around a building around 12m high, this being the approximate trigger height for a wind assessment, the full 21m high development would be expected to cause slightly higher wind speed increases over slightly larger but localised areas adjacent to the building.

Without a wind tunnel study it is difficult to quantify exactly either the existing wind speed levels, or the effects of the proposed development. However, wind tunnel studies in similar situations would suggest that there is a small probability that wind speeds at some locations near the building may be increased over the 20m/s Safety Criteria threshold specified in the District Plan.

5.5 Wind Mitigation

The proposed development is the first significant new building planned for this area of Adelaide Road for some time. Accordingly, its effects on the local wind environment will tend to be somewhat greater than those that might come later, if the area becomes more developed as Wellington City Council intends. In this situation we would normally recommend the addition of a canopy to further counteract the expected effects of the taller building, but as mentioned above, the heritage listing of the existing façade precludes this. Accordingly, Wellington City Council needs to assess whether the benefits of retaining the heritage facade without a canopy outweigh the localised increases in wind speeds that are expected in what is currently a relatively low pedestrian area.

6 Concluding Comments

- (1) Existing wind speeds in the immediate area around the site generally range from low to high, with speeds in some localised areas likely to approach or slightly exceed the District Plan Safety Threshold of 20m/s.
- (2) In northerly winds the proposed development is expected to increase wind speeds in localised areas in Drummond Street adjacent to the new building, by 2m/s to 3m/s, compared to the existing situation. This will be driven mainly by vertical wind flows being deflected down the windward north face of the building. However, a good proportion of the effects that could be expected from a building of this height, located as it is among lower neighbouring buildings, will be mitigated by the decision to include significant setbacks from both the street frontages of the building.
- (3) In southerly winds the development is somewhat sheltered by the neighbouring buildings, but is still much taller. As a result, wind speed increases of between 2m/s and 3m/s compared to the existing situation are also expected in areas of Adelaide Road adjacent to the new building.
- (4) Compared to a building ~12m in height, which is the height that triggers the requirement for a wind assessment report, the full 21m high building is expected to cause slightly higher wind speed increases over slightly larger but localised areas around the building.
- (5) There is a small probability that wind speeds at some locations around the proposed development may be increased over the Safety Criteria threshold specified in the District Plan.
- (6) It is likely that, combined with the building setbacks, a canopy along the street frontages would help to mitigate the effects of the height of the new building and provide significant additional shelter, particularly for the area around the Drummond Street – Adelaide Road intersection. However, this is precluded by the heritage listing on the existing building façade.

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