



APPENDIX M

Wind Assessment - WSP

Wind Assessment: Proposed Ryman Retirement Village, Karori, Wellington

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Disclaimers and Limitations

This report (**Report**) has been prepared by WSP exclusively for Ryman Healthcare Limited (**Client**) in relation to the desktop wind assessment of a Proposed Comprehensive Care Retirement Village in Karori, Wellington (**Purpose**) and in accordance with our offer of service dated 27th November 2019. The findings in this Report are based on and are subject to the assumptions specified in the Report. WSP accepts no liability whatsoever for any reliance on or use of this Report, in whole or in part, for any use or purpose other than the Purpose or any use or reliance on the Report by any third party.

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1 Introduction

This desktop wind assessment considers the actual and potential wind effects of the proposed Ryman Healthcare Limited (Ryman) comprehensive care retirement village (Proposed Village) in Karori, Wellington (Site). This assessment considers the effects of the Proposed Village on wind conditions for (1) pedestrians using the surrounding streets and footpaths, (2) owners and occupiers of the adjacent residential and other properties, (3) public open spaces including Ben Burn Park, Karori Pool and carpark, Karori Normal School and Karori Kids Preschool, and (4) residents, staff and visitors within the Site.

The Proposed Village is located within the Outer Residential Zone defined in the Wellington City District Plan (District Plan). In this part of Wellington there are currently no specific requirements relating to assessment of wind effects of proposed developments in the District Plan. The wind assessment is therefore based on the requirements for the assessment of wind effects contained in the Centres Area sections of the District Plan. It is noted that the Centres Area requirements apply to buildings higher than three stories.

The assessment of the existing wind conditions in the area is based on the expected effects of existing buildings, topography and landscaping on wind flows. The assessment does not consider buildings that have been consented but where construction has not commenced. In this case we are not aware of any significant consented buildings that would impact this assessment.

Assessment of the expected wind effects of the Proposed Village is based on (1) our experience in assessing wind conditions for new buildings and additions in urban areas, and (2) the results of wind tunnel model studies carried out in situations in Wellington with similar sizes and heights of buildings. The most recent of these was a wind tunnel study of a large multi-building residential apartment complex in Wellington for Kainga Ora (Housing New Zealand). No wind tunnel testing has been performed on the Proposed Village for this current assessment.

A visit to the Site was made on Friday 6th December 2019 during a period of moderate northwesterly winds, to assess the scales of the existing buildings and the Proposed Village buildings against the sizes and locations of surrounding buildings, as well as the local topography and landscaping. This assessment is based on plans and drawings of the Proposed Village dated 8th July 2020.

2 The Site, Area and Proposed Village

The Site

The Site is located in Karori, a suburb on the western edge of the Wellington City urban area. It was previously operated as the Wellington Teachers' College and was owned by Victoria University. The irregularly shaped Site is bounded by Donald Street on the eastern side and Campbell Street on the western side. A single row of houses also separates the Site from Scapa Terrace to the south. North of the Site there is a mix of buildings and uses, ranging from residential sized buildings, childcare facilities, the Karori Swimming Pool and Karori Normal School.

The Site is currently occupied by a number of separate but linked buildings, most of which are clustered on the northern part of the Site. These are currently unoccupied, and demolition work is

underway. There are significant numbers of large mature trees, both exotics and natives, interspersed between the buildings. The southern part of the Site is much more open, and the topography is flatter, having previously been used as sports grounds and courts, as well as for carparking. Figure 1 shows an aerial view of the Site. This Figure shows the site boundary, together with the prevailing wind directions for strong winds over Wellington.



Figure 1: Aerial view of the Site.
shows: the Site boundary (outlined in red)
the prevailing wind directions.

The Area

The aerial photo shown in Figure 1 also illustrates the nature of the surrounding area. Many of the surrounding buildings, particularly to the east, south and west of the Site, are residential blocks that are one or two storeys high. North of the Site there are a number of larger footprint buildings, these being the Karori Swimming Pool, the Karori Normal School buildings and the Huntleigh Home and Retirement Apartments. The topography across the Site and in the surrounding area can be described as somewhat complex and undulating.

The Proposed Village

The Proposed Village involves the retention of two of the existing buildings that front onto Donald Street. These buildings are to be remodelled. A significant number of separate but linked new buildings will be established. These buildings will be relatively evenly spread across most of the

Site, including the previously open areas adjacent to Campbell Street. The linking elements provide completely enclosed or covered access between the buildings in two different groups, one group on the northern part of the Site and the other group on the southern part of the Site. Figure 2 shows a plan view of the proposed new building layout, while Figure 3 shows an oblique view that illustrates the relative heights of the Proposed Village buildings. Figure 4 presents the building height information in terms of the number of storeys.



Figure 2: Proposed Village building layout.

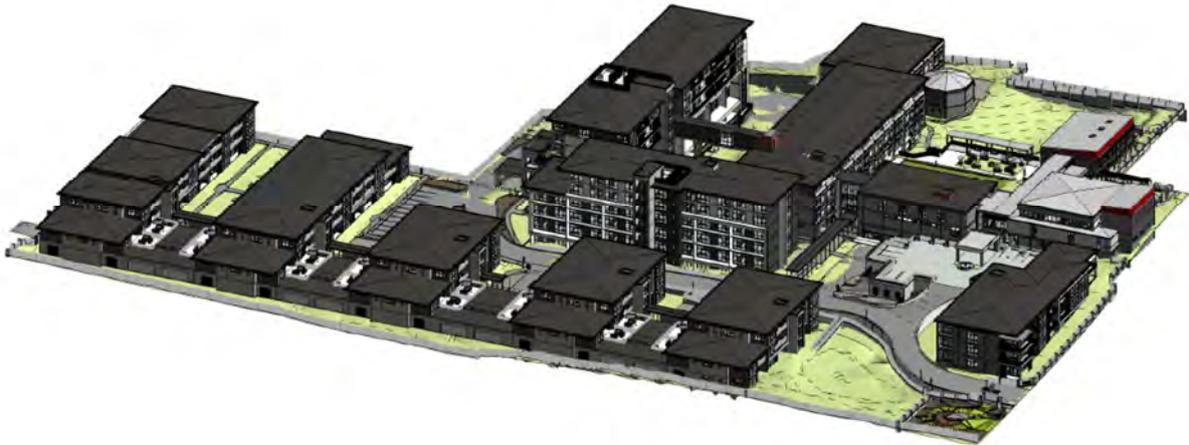


Figure 3: Oblique rendered view of the Proposed Village from the southeast.



Figure 4: Proposed Village building heights (in storeys).

It can be seen from Figures 2 to 4 that the new buildings labelled B02 to B07 and the other buildings adjacent to Donald Street are two or three storeys high. Adjacent to the southern boundary, these blocks also step down in height. The remaining “U”-shaped cluster of new buildings in the northern part of the Site range up to seven levels in height.

There are significant amounts of open space around the new buildings, with separations from each other and from the adjacent neighbouring buildings. As many of the existing mature trees on the Site as is practical will be retained, including in the existing Lopdell Gardens in the northeast part of the site, and in a sizeable area around the southeast corner of the Site. Additional landscaping is also proposed for the open spaces around the new buildings, including in areas adjacent to the site boundaries, which the new buildings are set back from. New fences are proposed along all of the street and internal site boundaries. The fence designs provided in the Fencing Plan range from around 1.5m to 1.8m high and include a mix of (1) metal paling fences, (2) metal paling fences backed by evergreen planting, and (3) timber palisade fencing.

The Proposed Village design includes several design features that are considered to be beneficial in terms of effects on pedestrian wind conditions. These include, (1) the alignment of the new buildings approximately parallel to the prevailing wind directions, (2) the lower building heights around the perimeter of the Site, (3) the setbacks from the site boundaries, (4) the boundary fencing, and (5) the proposed landscaping.

3 District Plan Wind Rules

The Outer Residential Zone has no specific objectives, policies, rules or assessment criteria relating to the wind environment at pedestrian level. While the Proposed Village is not located in the Centres Area Zone, the Centres Areas Zone objectives and policies identify that new buildings over three storeys in height have the potential to create negative wind conditions and Rule [7.3.7.1](#) requires the assessment of the wind environment at ground level for new developments that breach height standards (12m in the Karori town centre).

The Proposed Village contains a number of buildings that will be taller than three storeys (or 12m). This wind assessment therefore considers the potential effects of the Proposed Village on wind conditions both within the Site and within the adjoining areas. This assessment considers the Proposed Village as a whole, rather than focusing on buildings taller than three storeys. This wind assessment also considers both the potential safety and amenity effects from wind conditions. It is noted that the Outer Residential Zone objectives and policies relating to amenity effects (which may be impacted by wind conditions) are identified in the AEE.

This report addresses the wind assessment report requirements set out in Appendix 2 of the Centres Zone – Wind.

The WCC Wind Design Guide has been considered in the assessment of the design of the Proposed Village at section 2 above.

4 Existing Wind Conditions

Over Wellington, the prevailing strong winds are dominated by north to north-westerly and south to south-westerly wind flows, as shown in Figures 1 and 2 in relation to both the existing building layout and proposed building layout. Northerly winds typically occur more frequently than southerly winds for light to moderate winds. However, the highest wind speeds occur with around the same frequency for both direction sectors. Strong southerlies tend to be noticed more by pedestrians because they are often also cold and frequently accompanied by rain.

Pedestrian level wind conditions in this part of Karori are primarily determined by a combination of four factors; (1) the alignment of the streets to the prevailing wind directions, (2) the sizes, positions, designs and heights of the buildings, (3) the sizes and locations of open spaces, and (4)

the local topography. Figure 1 shows that Campbell Street and Donald Street are aligned more parallel to the prevailing wind directions and are therefore more exposed to moderate to strong horizontal wind flows. Scapa Terrace, which is aligned more normal to the prevailing wind directions is therefore more sheltered.

For the purposes of this assessment, the wind speed descriptions listed in Table 1 have been used.

Table 1: Gust 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

Wind tunnel studies in parts of Wellington with similar exposure to the prevailing winds to this Site, e.g. the large multi-building residential apartment complex for Kainga Ora (Housing New Zealand) mentioned earlier, suggest that gust wind speeds in the pedestrian areas within the Site currently range from very low in sheltered areas to moderately high in more exposed locations. There are also likely to be some localised areas of high wind speeds around some of the taller, more exposed, old Teachers College buildings. The lowest speeds will occur mainly in localised sheltered areas immediately downwind of buildings. For example, the old Quad area, towards the northeast corner of the Site is expected to currently be relatively well sheltered in southerly winds. Typically, most of the higher mean and gust wind speeds within the Site are likely to occur in the more open exposed locations on playing fields and court areas, or around the windward corners of the taller, more exposed buildings.

Wind conditions on the streets and footpaths, in other public spaces around the Site, and in the open spaces around the private residences bordering the Site are also expected to mostly range from very low in sheltered areas to moderately high in more exposed areas. The exposure of the locations within and surrounding the Site will vary considerably depending on the wind direction.

5 Effects of the Proposed Village on Wind Conditions

5.1 Wind Effects of Buildings in General

New buildings, or changes and additions to existing buildings, can have a significant impact on wind conditions in the adjacent public and pedestrian areas, footpaths and pavements, both in terms of the mean speeds and gust speeds. By occupying a volume of space, they force wind that would normally flow through this space to take other paths. Significant vertical wind flows, referred to as “downwash”, can be deflected down from higher levels into adjacent areas. Wind can also be channelled or accelerated by rows of buildings, through the gaps between buildings, or around corners. Wind speeds can often be particularly high where these vertical and horizontal wind flows combine, e.g. around the windward corners and sides of a building, or at a street intersection.

Not all the effects of new buildings or additions will cause wind conditions to deteriorate. They can often provide increased shelter to some areas, usually those located immediately downstream. They can also potentially keep wind flows away from pedestrian areas, either by deflecting them into lesser used spaces, or by keeping them well above ground level. Consequently, new buildings or redevelopment of existing buildings may cause some areas to become windier and others to

become less windy, and this will often depend significantly on the wind direction. These effects can be particularly significant when new large buildings replace much smaller existing buildings or occupy a largely or completely vacant site.

Apart from the effects of buildings, and particularly in areas of lower-rise buildings, the effects of landscaping can be significant in providing wind shelter, when suitable trees, shrubs, or hard landscaping elements are used. Fences, screens, trees and other planting, can provide either direct shelter for specific localised areas, or cumulatively they can provide general shelter for wider areas.

The following assessment of wind effects of the Proposed Village on wind conditions, in terms of both amenity and safety, has been divided into sections relating to north to northwesterly winds and south to southwesterly winds, and into those areas outside the Site, i.e. the streets and footpaths, public open spaces and neighbouring properties, and the areas within the Site itself.

5.2 Effects in North to Northwesterly winds

5.2.1 Areas outside the Site

In north to northwesterly winds, pedestrian wind conditions on the streets and footpaths adjacent to the Site are expected to be largely unaffected. This is due to a combination of, (1) the two and three storey heights of the new buildings adjacent to Campbell and Donald Streets, (2) the setbacks of these buildings from the site boundaries, (3) the alignment of their long axes more parallel to the prevailing wind directions, (4) the boundary fencing, and (5) the new landscaping.

However, for a more northwesterly wind direction some of the wind that previously blew across the open sports fields on the Site will be deflected south along Campbell Street by Building B02 (refer Figure 2). Offsetting this deflection, Building B02, fronting onto Campbell Street, will provide some additional shelter for the adjacent footpaths as winds turn more towards the north and northeast. Overall, the amenity in Campbell Street is expected to remain largely as it is currently. On Donald Street the combination of the new Building B07, the boundary fencing, and landscaping will result in wind conditions similar to, or better than, those currently experienced.

Other areas adjacent to the Site lie to the north and south, where there are outside spaces associated with the residential and other buildings, including Karori Pool and carpark, Karori Normal School and Karori Kids Preschool. Those spaces on the north side of the Site should not see any significant changes in wind conditions. This is because, (1) they are upwind of the Proposed Village, (2) the new buildings are generally set well back from the northern site boundary, (3) the differences in height between the existing buildings and the new buildings are not large, (4) boundary fencing is included in the Village design, (5) existing trees are being retained where practical, and (6) new landscaping is proposed.

Wind conditions in the outside spaces to the south of the Site, including those associated with the houses that sit between the Site and Scapa Terrace, are expected to improve with the retirement village. This is primarily due to the increased shelter that the new buildings along this boundary will provide, although the new landscaping will also contribute.

Further south in Scapa Terrace itself, and in Ben Burn Park, wind conditions are expected to be unaffected by the Proposed Village, primarily because of the larger distances downstream.

5.2.2 Areas within the Site

Wind conditions around the new buildings along the southern part of the Site should generally be much better than those currently experienced on the open sports fields and courts. This is due to the combined shelter effects of the buildings themselves, and from proposed new fencing and landscaping.

Around the new buildings on the northern part of the Site, wind conditions are expected to be similar to those currently experienced around the existing taller buildings. The effects of the

slightly greater heights of most of the new buildings on wind conditions is expected to be only small increases in wind speeds. A more significant determinant of wind conditions within the Site will be the balance between the effects of removing existing landscaping elements, mainly planting, and the effects of the addition of new landscaping or other wind mitigation elements. This is discussed later in the report.

5.3 Effects in South to Southwesterly winds

5.3.1 Areas outside the Site

In south to southwesterly winds the overall wind environment on the adjacent streets and footpaths (Donald Street and Campbell Street) is likely to be largely unaffected by the Proposed Village, for many of the same reasons as for northerly to northwesterly winds.

The proposed new buildings on the southern side of the Site are aligned approximately parallel to the prevailing wind directions. They are also only two or three storeys high, are set back from the site boundaries, and boundary fencing, and significant landscaping is proposed. There are expected to be some localised changes in wind conditions, with these being driven by redirection of existing wind flows by the new buildings

In the spaces to the north of the Site, including around the Karori Pool and carpark, Karori Normal School, Karori Kids Preschool and neighbouring residential open spaces, people should not see any worsening of wind conditions due to the new buildings. If anything, the new buildings should provide some additional shelter for those spaces downstream, primarily for those downstream of the western part of the Site.

Wind conditions in the areas to the south of the Site, including Ben Burn Park, are not expected to change in south to southwesterly winds as a result of the Proposed Village because these areas are upwind of the Site, and the new buildings adjacent to the southern site boundary are only two to three storeys high and are set back from the site boundary.

5.3.2 Areas within the Site

Wind conditions within many of the open areas within the Site are expected to be the same or better than those experienced currently at the same locations. Most of these spaces are likely to be relatively well sheltered by the new buildings. Looking at Figure 2, many of these “U” shaped building layouts protect the areas on three sides, e.g. the Bowling Green area. However, some open areas within the Site are likely to be quite windy at times, mainly around the windward corners of the taller buildings on the northern part of the site, even with the currently proposed fencing and landscaping. While wind conditions are not generally expected to be significantly worse than those that currently occur, these localised areas could benefit either from additional targeted landscaping, screening or fencing to improve wind conditions, or combinations of the same options to keep people away from these locations.

5.4 Overall Assessment of Development Design

In terms of managing the potential effects on wind conditions in the surrounding streets, public open spaces and adjacent properties, the Proposed Village design includes several beneficial design features. These features include, (1) the alignment of the new buildings approximately parallel to the prevailing wind directions, (2) the lower building heights around the perimeter of the Site, (3) the setbacks from the site boundaries, (4) the boundary fencing, and (5) the proposed landscaping. Other features intended to provide better amenity for residents, visitors and staff at the Proposed Village include the enclosed linkages and covered walkways between many of the buildings.

Overall, it is not expected that the public will notice any difference in the amenity of the street and public open space areas around the outside perimeter of the Proposed Village. Wind conditions may improve for the properties to the south of the Site, adjacent to Scapa Terrace.

The features described above will also mean wind conditions experienced within the Site will generally be the same or better than those which are currently experienced within the Site.

6 Additional Wind Mitigation

When considering the need for any additional wind mitigation for the Proposed Village, it is important to identify what is trying to be achieved. In this case the effects of the Proposed Village on wind conditions external to the Site are expected to be relatively small, and additional wind mitigation is not considered necessary.

Wind conditions within the Site are expected to be the same or better overall than the existing conditions. Nevertheless, some localised areas are expected to be windy at times. The need for any additional wind mitigation will therefore be driven by the intended function of the Site as a retirement village, and the intended usage of different spaces by residents, staff or visitors. It also means that any additional wind mitigation that is contemplated for specific spaces should be in the form of landscaping, including planting, vertical screens or walls.

Providing wind shelter for large sites or areas can be prohibitively expensive. It can also potentially compromise views or access for residents, staff or visitors. Accordingly, it is more appropriate to target wind mitigation in those areas which will be used for short or long duration outdoor activities, or that act as primary pedestrian routes into the Proposed Village, or between the buildings.

Two points to consider in thinking about wind mitigation are that (1) the effects can be cumulative, and (2) the effects of softer mitigation elements, such as planting, will not be fully realised until they are fully mature. For example, in this case the shelter effects of any boundary fencing, and nearby planting will be cumulative, but the full benefits will not be realised until the trees and shrubs are mature. In addition, unless the planting is evergreen, with relatively dense foliage, the benefits will either be small or only be realised for some of the time.

Given the current Proposed Village design includes significant fencing and landscaping, the need for additional wind mitigation targeting specific areas should be considered as pedestrian/resident use patterns within the Proposed Village develop as part of the detailed design of the landscaping for the Site.

7 Concluding Comments

- (1) Existing wind conditions in and around the Site currently are likely to range from low to high. They are largely dictated by the alignment of the streets to the prevailing winds, the sizes, locations and heights of the buildings, the sizes and location of open space and the local topography.
- (2) The layout of the Proposed Village design has included some intelligent design choices with respect to wind effects. These include (a) the alignment of the buildings approximately parallel to the prevailing wind directions, (b) the massing of the lower height elements closer to the perimeter of the Site and higher rise elements towards the centre of the Site, (c) the setbacks of the buildings from the site boundary, (d) the inclusion of substantial boundary fences, (e) substantial landscaping, and (f) the inclusion of enclosed or covered linkages between many of the buildings within the Proposed Village.
- (3) In north to northwesterly winds the Proposed Village will have a relatively small effect on overall wind conditions on the adjacent streets and footpaths, or in the neighbouring properties. The same will also be true in south to southwesterly winds, because of the design features listed in (2) above. Pedestrians are unlikely to notice any change in the amenity of the surrounding streets and footpaths. Accordingly, additional mitigation of wind effects external to the Site is not considered to be necessary.

- (4) Wind conditions within the Site with the Proposed Village are expected to generally be the same or better than those currently experienced around the Site. Many of the open spaces will be reasonably well sheltered by the new buildings. However, not all of the open spaces will be well sheltered or better than the existing conditions, or not well sheltered for particular wind directions, and some spaces are expected to be windy.
- (5) There is potential for wind conditions within the Site, to be further improved using additional planting (trees and shrubbery), screens and fencing. However, we would suggest it would be more appropriate to wait for pedestrian/resident use patterns to develop to assess the need for additional wind mitigation, and target this in the most appropriate locations as part of the detailed design of landscaping for the Site.

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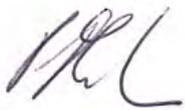
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